POWER, POLITICS AND THE INNOVATION PROCESS: ANALYSIS OF AN ORGANIZATIONAL FIELD IN AGRICULTURE

by

Carolyn P. Egri

B.Comm., The University of British Columbia, 1975
M.Sc.(Business Admin.), The University of British Columbia, 1983

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

in

THE FACULTY OF GRADUATE STUDIES

(Department of Commerce)

We accept this thesis as conforming
to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

January 1994

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Date January 17, 1994

DE-6 (2/88)

ABSTRACT

An analysis of the organizational field of B.C. agriculture was conducted to explore the politics of the innovation process. Agricultural innovations in organic farming, synthetic agrichemicals and biogenetic engineering were studied at the individual, organizational and interorganizational levels. Research questions regarding the innovation decision-making process, innovation championship, organizational politics, organization theory and interorganizational networks were explored.

A total of 137 persons (organic and conventional farmers, BCMAFF employees, farm organization employees) were interviewed in this research study. Data was collected via semi-structured interviews, questionnaires, and analysis of publications to investigate a total of 28 research questions.

Similarities and differences between organic and conventional farmers in respect to their socioeconomic characteristics, motivations, actions and environmentalist beliefs were identified. Organic farmers' basis for their innovation adoption decisions was found to be largely informed by their environmentalist philosophy whereas the primary motivating factor for conventional farmers was economic rather than ideological.

Case studies of 33 farm organizations (20 conventional and 13 organic) were conducted. Organizational fields were found to be defined not only in terms of products, services and geographic location but also in terms of ideology. Within the conventional agriculture organizational field there was a high degree of homogeneity in organizational structures and decision making processes as well as close collaboration with government policy makers. Within the organic agriculture organizational field there was homogeneity in production practices, but heterogeneity in organizational structures, goals and decision making processes based on the radicalness of the environmentalist philosophy of an organization's membership. The formation and operation of interorganizational networks in each organizational field confirmed previous findings of the critical problems in overorganized and underorganized networks.

A longitudinal analysis of organizational politics in the organic agriculture organizational field revealed that institutionalization processes engender political contests among competing interests. The successful championship of an innovative government regulatory system was attributed to the early use of a wide variety of collaborative and competitive political games. Opponents' efforts to neutralize champions' escalation of commitment during the later stages of the innovation development process proved to be ineffective.

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ACKNOWLEDGEMENTS

During the course of completing this dissertation, I learned the importance of family, friends, teachers and colleagues in helping one through the journey of completing one's Ph.D. I am indebted to those who supported me by listening when I needed to talk about the project, by providing advice when I asked for their assistance, and by giving feedback and suggestions for improving the final manuscript. However, there are some who have been especially helpful throughout this process.

Without the love and support of my husband, Allan Collings, this dissertation would not have been possible. Thank you Al for your patience during the times when this dissertation was an all-consuming process, and thank you for keeping the home fires burning during the times I was away. Maybe life will be more "normal" now.

I wish to thank my teacher, mentor and friend, Peter Frost who has helped me in innumerable ways. His initial idea that innovation is a political process was the inspiration for our subsequent research from which the topic of this dissertation arose. Thank you Peter, for your thoughtful guidance on this project and for being a wonderful person to work with on our many other collaborations.

Lastly, I am indebted to the many people who participated in this research study. The generosity and friendliness of the people in B.C. agriculture was a source of inspiration for me. Listening to their stories and experiences in farming has given me much hope for the future of agriculture.

DEDICATION

This Ph.D. dissertation is dedicated to a person who loved to farm, my late father, William Ernest (Ernie) Egri. He taught me the joy of helping plants grow from seed to maturity, and of caring for animals and birds. He and my mother, Helen Egri, taught me the importance of doing what one loves and that working hard has its own rewards. We all wish that he were still with us.

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OVERVIEW

> Farming looks mighty easy when your plow is a pencil, and you're a thousand miles from the corn field.
> --Dwight D. Eisenhower, address, Peoria, Illinois, September 25, 1956.

Given all the technological, economic and social changes which have occurred in the agricultural sector over the past 35 years, how accurate is Eisenhower's statement about the current reality of farming in Canada? Some would assert that the productivity gains that have been made in modern agriculture are evidence of significant technological development and progress. However, others hold a more critical view and point out that these advances have come at a price to individual farmers, to rural communities, and to the natural environment. Both would agree that agriculture in the 1990s is very different than it was in the 1950s and that technological innovations have been instrumental in changing the landscape and practice of modern agriculture.

The adoption and diffusion of innovations has been the subject of many research studies. In his extensive review of the innovation diffusion literature, Rogers (1983, p. xv) observed that there had been over 3000 publications on the topic by 1983. Given the continued promotion of innovation and change as a necessary ingredient for economic and social survival for organizations and societies, there is no doubt that this number has increased significantly since that time. This research study on the politics of innovation in B.C. agriculture is one more in a long tradition of efforts to understand the process by which innovations are developed and adopted.

Innovations do not often occur as discrete products or changes in action but rather as part of larger interrelated sets of innovations. In this research project, three sets or systems of agricultural innovations were attended to -- agrichemical, organic farming, and biogenetic engineering. Each set of innovations is in a different stage of development and adoption. Agrichemical innovations are part of the most established and widespread production system within modern agriculture and represent synthetic chemical solutions to agricultural production problems. Organic farming innovations integrate both established (pre-agrichemical) and new products and practices which are unified by a principle of cultural and nonsynthetic chemical solutions to agricultural production problems. As the most recent technological development in agriculture with very few products available for adoption, biogenetic engineering technology represents future innovations which provide genetic level solutions to agricultural production problems.

Recognizing that human action does not take place sui generis, the approach taken in this study is that of a organizational field analysis focusing on the individual, organizational and interorganizational contexts within which technological and social innovations occur. As defined by institutional theorists DiMaggio and Powell (1983, p. 148), an organizational field consists of:

> ...those organizations that, in aggregate, constitute a recognized area of institutional life: key suppliers, resource and product consumers, regulatory agencies, and other organizations that produce similar services and products.

While sometimes referred to as a holistic case study (Yin, 1984), an analysis of an organizational field is a more inclusive term which more accurately reflects the approach taken in this research project. Specifically, a survey of individuals and organizations in an industrial sector as well as in-depth case studies of organizations and interorganizational networks within that sector was conducted.

There are several research questions which motivated this analysis of an organizational field.[1] The first set of research questions focus on the innovation decision making process in agriculture. Perceptions of innovation attributes such as economic advantage, complexity, compatibility with existing

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[1] In the interests of brevity, the term "field analysis" will be used throughout the dissertation in place of the more extended term "analysis of an organizational field".

practices are analyzed (as done by Rogers, 1983; Zaltman et al., 1973; and others). Comparisons between alternative innovations are conducted by analyzing perceptual and attributional data regarding organic farming, synthetic agrichemical and biogenetic engineering innovations. This research project also examines the influence of communication sources on farmers' perceptions and adoption decisions in regards to each set of innovations. Thus, tentative predictions can be made as to the long term success (in terms of widespread acceptance and diffusion) of organic farming and biogenetic engineering innovations within the agricultural sector.

Another important feature of this field analysis of the innovation process is the study of biogenetic engineering technology in agriculture. Given its newness as a technology, there has been relatively little research conducted on biogenetic engineering as an innovation. To date, much of the non-technical research on this topic has taken the form of surveys of government and industrial representatives about the future viability and means to enhance the development of the biogenetic engineering industry. Other researchers have analyzed the linkages between government, industry and academia in biogenetic engineering R&D and its commercialization. As yet, there have not been any socio-political studies of this innovation in Canada at the level of the potential adopter (i.e., the farmer) as was done in this research project.

Another distinctive feature of this study is that it was conducted during the early stages of the innovation adoption process for organic farming and biogenetic engineering innovations. Information was gathered from individuals and organizational representatives who are <u>currently</u> engaged in the process of adopting and/or championing these innovations within agriculture. Unlike many other studies which often rely on the recollections of individuals after an innovation has either proven itself (or has failed to take root), people were asked questions such as: "What <u>are</u> you doing?" "Why <u>are</u> you doing this?" and "What <u>will</u> you be doing in the future?" While this approach limits the degree to which evaluations of an innovation's eventual success or failure can be made, it does reduce the problems of incomplete recall and retrospective sensemaking while offering a snapshot of the beliefs, motivations and actions of those involved in adopting an innovation while still at an early stage in its diffusion.

The agricultural sector is a relatively unexamined arena for organizational theorists. By choosing a new economic sector for analysis, the theories and research findings based on studies of innovation within other industrial and service sector organizations can be assessed for generalizability. In addition, this field analysis explores a number of research questions which focus on innovation as a political process rather than a purely rational one. The multi-level approach (individual, organizational, interorganizational) of this research project assisted in identifying and understanding whether the course of innovation is one that involves only a rational consideration of the costs and benefits of alternatives or is primarily the result of social and political influence.

This field analysis also encompasses the identification and delineation of the role of innovation champions within and between organizations and interest groups. Thus far, the study of innovation champions has primarily focused on the individual and intraorganizational domains within well organized industries and in formal organizational settings. What has not been studied as extensively is the operation of innovation championship in an organizational field where more "simple" organizational entities (such as farms) predominate.

In regards to organization theory, this field analysis explores a number of research questions regarding the nature and outcomes of political activity between and among individuals, organizations, interest groups and government. Information was obtained and analyzed regarding the political dynamics of individual organizations and interorganizational networks within B.C. agriculture. Of particular interest was the operation of interorganizational networks in organizational environments where a large segment of organizations are voluntary non-profit entities (e.g., farm organizations). What types of leaders are present in these types of organizations? How do they influence others both inside and outside their organizations? Lacking the more traditional power resource bases of industrial managers and leaders, how do they achieve their goals? These are all questions which are relevant to the operation of voluntary interest group organizations. In regards to the study of institutional processes in organizational fields (DiMaggio & Powell, 1983; Tolbert & Zucker, 1983; and others), this research project seeks to understand first, the level of isomorphism (homogeneity--diversity) in organizational fields within conventional and organic agriculture and second, the mechanisms of institutional isomorphic change within each organizational field.

In summary, the research agenda of this project encompasses a wide diversity of theoretical and conceptual issues in the innovation, organizational politics, leadership, social change and government policy literatures. In the following sections of this introductory chapter, the socio-economic historical context within which B.C. agriculture operates is described. This is followed by a brief introductory discussion of the forces for innovation within agriculture and the organizational politics of the innovation process. The general research questions which are investigated in this research project are presented. This introductory chapter concludes with a discussion of the research approach employed in this study and a description of the contents of the remaining chapters in this dissertation.

SOCIO-ECONOMIC CHANGES IN AGRICULTURE

Since WWII, there has been a structural transformation within the agricultural sector. Reflecting the increasing urbanization of Canadian society, there are now fewer farmers operating larger farms than there were 40 years ago. According to Census figures, the peak number of farms in Canada in 1941 was 733,000 (Statistics Canada, 1989). By 1971, this number had declined to 366,110 with the 1991 census showing a further decline of 23.5% to 280,043 (Statistics Canada, 1992a). Accompanying this reduction in the absolute numbers of farms in Canada has been a growth in the average size of individual farm holdings. In 1971, the average Canadian farm was 463 acres whereas by 1991, it was 598 acres (a 29% increase). This shrinkage in absolute numbers, coupled with the growth in farm size, has had several consequences for agricultural employment. There has been a decline in the numbers of individuals employed in Canadian agriculture (474,360 in 1991 compared to 506,000 in 1981). There is now an increased need for hired agricultural labour (23.1% increase from 1980 to 1985) to work these larger land holdings.(Statistics Canada, 1989, 1992e) There has also been growth in the number of tenant farmers such that by 1991, 36.3% of total farm land was rented compared to 1971 when 27.1% of farmland was rented (Statistics Canada, 1992a).

In total, family controlled farms (99.1% of total farms) contributed 94.6% of 1986 aggregate gross farm sales whereas the remaining types of organizations (non-family corporations and others which represent 0.9% of total number of farms) contributed 4.4% of aggregate gross sales. By 1991, 1.4% of farms were non-family corporations (Ewins, 1992). The growing concentration of holdings within the agricultural sector is further demonstrated by the growth in the number of farms which had sales greater than or equal to $100,000. From 1981 to 1991, this segment increased from 36,546 to 68,496 (almost an 87% increase) while the $50,000 to $99,999 sales group decreased marginally (0.8% increase) and all lower categories declined significantly.(Statistics Canada, 1992b)

There has also been an intensification in activity on available farm land. While the total area of farms in Canada remained relatively constant, more land is being brought into crop production (7.3% increase from 1981 to 1991) at the expense of pasture and summer fallow purposes.(Statistics Canada, 1992a)

Taken together, these statistical trends paint a picture of an economic sector undergoing a fundamental transformation towards a concentration of capital in larger holdings. [See Egri (1994, forthcoming) for a more detailed discussion of the implications of this transformation on the labour process in agriculture.] This development in and of itself has created a significant financial barrier to entry into the sector thereby threatening its capability for self-renewal. One indication is the general aging of the farm operator population from 46.9 years in 1981 to 49.1 years in 1991 (Wilson, 1993). The aging of the farmer population in B.C.'s fruit industry is somewhat similar as revealed by a 1991 survey which showed that 31% of orchardists were over 55 years of age (The Western Producer, 1992, July 9). However, analyses conducted by Agriculture Canada (1989) show that the percentage of farmers greater than 60 years of age has remained relatively constant at 20% of the farmer population since 1931. This report also contends that there has been a consistency in farmer age in the 35 year and younger category (i.e., 20%).

Financially, Canadian farmers have had a perilous existence due to low net income levels that have been highly variable (due in large part to unstable and depressed crop prices on national and international markets), and high interest servicing costs on farm debt (18.5% of all operating expenses in 1982)(Auer, 1989). Another factor has been the rising cost of farm inputs contrasted with stable food prices. In the period 1981 to 1989, the farm input price index increased by 16.5% while the farm product price index increased by only 0.2%. One result of low prices paid to farmers has been that Canadian consumers spend only 11.5% of their total personal consumption expenditures on food [compared to 10.4% in the United States, 13.7% in the U.K., 16.8% in France and Germany]. (Ferguson, 1991) While commodity marketing boards (which in 1984-85 controlled 56% of total farm cash receipts) are often targeted as a cause of rising food prices, supply management has tended to benefit multinational agribusiness oligopolies to a greater extent than individual family farmers (Troughton, 1989). Even for regulated food products, the bulk of the increase in consumer food prices has gone to food wholesalers-processors and food retailers rather than to farm producers. For example, from 1980 to 1990 in Ontario, the farm price for chicken has risen 29.8% while the wholesale/processor price has risen by 64.1% and the retail price has risen by 87% (Ferguson, 1991).

In 1988, one third of Canadian farmers experienced financial difficulties and 10% became financially non-viable. The hardest hit in recent years have been the full-time commercial farm operators and those under the age of 35 years (Auer, 1989). To counteract these problems, more farmers are required to seek off-farm employment in order to augment their incomes derived from farming operations.[2] Whereas off-farm sources comprised only 10% of the income of farm families in 1950, this had risen to 58% by 1987 (Auer, 1989).[3] But still, the combination of variable (and often low) market prices for farm products and high debt servicing costs to finance capital expenditures has led to a current crisis where farm foreclosures are becoming increasingly common in the agricultural sector (see Pugh, 1987; Giangrande, 1985). This is despite the existence of substantial government farm subsidy programmes (in particular for grain producers in the Prairie provinces) to supplement farm income levels (Auer, 1989).[4] More recent estimates for the average Canadian farm family (those with farm sales of $50,000-$100,000) reveal that one-quarter of their income is derived from farm sales, an additional one-quarter from government program support payments with the remainder from off-farm sources (The Western Producer, 1993, Feb.4). As found by Wampach (1990) in his study of Quebec farmers from 1971 to 1988, real net income per farmer has slowly decreased during a period of productivity gains and increases in direct payments per farmer from federal and provincial governments. Without government direct payments, farmers would be significantly worse off than otherwise.

In Canada, the financial distress exacerbated by recent developments in the international trade negotiations has prompted the organization of numerous farmer

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[2] These structural changes in agriculture parallel those in the U.S. (USDA, 1981). The urbanization of the American population is clearly demonstrated by the steady decline of rural populations from 30% of the total population in 1920 to 3% by 1980. While the 1970's saw reversal of the earlier trend of net out-migration from rural areas to urban centres, the USDA report identifies that there was no attendant growth in agricultural employment -- total agricultural employment has continued to steadily decline. In fact, 44% of the 3.3 Million farm residents in the 1978 workforce were not employed in agriculture.

[3] In B.C. 51% of farm operators (out of a total of 19,063) are engaged in off-farm employment, the majority of whom are engaged in nonagricultural work. Of this group, 38% work 97-228 days per year at their jobs off the farm while an additional 40% work greater than 229 days a year.

[4] In the 1986-87 crop year when world market prices for grains dropped, the federal government paid out $1.358 billion under the Western Grain Stabilization Act and an additional $1 billion under the Special Canadian Grains Program for an average payout of $17,000 per farmer. (Auer, 1989, pp. 29-31) Agriculture Canada's most recent estimates of government financial support for Canadian farmers is that it amounts to $3.5 to $4.2 Billion in 1992, compared to $2.3 Billion in 1991 (Suderman, 1993).

protest rallies starting in the autumn of 1991. The largest rallies have been in Saskatchewan (7000 farmers attending) and Manitoba (5000 farmers).(Duckworth & Sproat, 1991; Sproat, 1991a, 1991b) A new interprovincial farmer grass roots coalition, the Concerned Farmers of Canada organized a 100 person delegation to go to Ottawa in November 1991. They met with the federal Agriculture Cabinet Minister and other Members of Parliament to present their demands for additional farm level financial assistance, a new national agricultural policy and a renewal of political efforts to resolve the international trade wars (Shein & Swihart, 1991). An additional 1000 dairy farmers later marched in Ottawa to protest the General Agreement on Tariffs and Trade (GATT) agreement (Wilson, 1992a). Farmer protest rallies culminated on February 21, 1992 with 30,000 farmers marching on Parliament Hill to protest developments in GATT negotiations which may erode current trade protection.

In British Columbia, one reason for serious financial distress amongst vegetable and berry growers has been identified as the import of cheap fruits and vegetables from the United States and elsewhere (Schmidt, 1992a, 1992b). The introduction of the Canada-U.S. Free Trade Agreement has most negatively affected vegetable and berry growers in the Fraser Valley with the prospect of the North American Free Trade Agreement being seen as further threatening these producers. The causes are multiple: Canadian producers have relatively higher production input costs, higher interest rates, and higher taxes than their U.S. and Mexican counterparts. Urban encroachment and the B.C. Agricultural Land Reserve are also cited as having a negative impact on the financial viability of B.C. farms. On February 27, 1992, the B.C. Federation of Agriculture organized a rally of 600 farm vehicles down the main street of Abbotsford to protest GATT negotiations (Maynard, 1992). Farmers have lobbied hard for government support payments and for protective anti-dumping legislation against U.S. producers who they claim, are dumping produce in Canada for less than the cost of production and shipping (Country Life in B.C., 1992, May; Noonan, 1992). Farmers' protests against cheaper U.S. imports reached a peak in the summer of 1992 when Fraser Valley vegetable growers organized a lettuce ploughdown (Country Life in B.C., 1992, July). They later gave away 34 tonnes of lettuce, cabbages and potatoes on the steps of the B.C. Parliament buildings while meeting with the Premier and Minister of Agriculture (Brennan, 1992). Their efforts were successful in terms of gaining a new provisional anti-dumping duty on American lettuce but this was considered as providing only a temporary reprieve from current market problems (Schmidt, 1992e).

As this brief review of recent socio-economic changes being experienced in the Canadian agricultural sector indicates, this is an arena undergoing fundamental structural and social changes. However, signals for change are not limited to economic and social factors but also include signals of distress from the natural environment. There is growing evidence that current systems of production which deplete and pollute natural resources threaten the very foundations of agriculture. Nature is proving to be less forgiving or bountiful than once was thought. For example, soil erosion and degradation, depletion of water resources (due to drought conditions in the 1980s and diminishing groundwater supplies), and surface and ground water pollution have all emerged as significant environmental problems in agriculture (National Research Council, 1989; Senate of Canada, 1984; The Conservation Foundation, 1987).

The socio-economic developments in agriculture are related to environmental problems in a number of ways. For example, the practice of conservation oriented agriculture is constrained by the emergence of large agribusiness enterprises. MacRae et al.(1990) cite empirical evidence that operators of large farms are less interested in environmental issues than operators of small farms. Buttel and Larson (1979) found a positive relationship between farm size and the energy intensity of crop production (as measured by BTUs per 1000 acres, per $1000 production, per 1000 bushels of wheat and corn). The sacrifice of long term conservation practices in order to achieve short economic gains is perhaps only a natural result of the need to satisfy financial requirements in a technologically intensive industry (Fairbairn, 1984).

These signs of distress throughout the agricultural sector have implications for the receptivity of farmers to new innovative practices and products. As Van de Ven (1986, p. 604) asserts: "...people will pay attention to new ideas the more they experience personal confrontations with sources of problems, opportunities, and threats which trigger people's action thresholds to pay attention and recognize the need for innovation." The economic conditions within agriculture are forcing individuals and organizations to search for new ideas and solutions to ameliorate current problems. Some responses to these crisis conditions (such as the increase of government subsidies) serve to buttress pre-existing modes of operation and relationships. But this could be a retrogressive and short term response which only supports a system of production which is proving to be ill-suited to current realities.

Another more proactive response is to seek out new and innovative products and processes which will enable the agricultural industry to adapt. As found in this research project, which courses of innovative action are available and taken is the result of an interaction between a number of parties and interest groups which hold diverse, and sometimes conflicting, values and beliefs about how agriculture should proceed. It is within this context of rapid and turbulent change that new technological and process innovations are emerging within agriculture.

INNOVATION WITHIN AGRICULTURE

> For the first time in the history of the world, every human being is now subjected to contact with dangerous chemicals, from the moment of conception until death. In the less than two decades of their use, the synthetic pesticides have been so thoroughly distributed throughout the animate and inanimate world that they occur virtually everywhere. (Rachel Carson, 1962)

Triggered by the publication of Rachel Carson's book Silent Spring in 1962, the use of synthetic pesticides (insecticides, herbicides and fungicides) and chemical fertilizers in agricultural production has been one focus of environmental activism in both international and national arenas (Hynes, 1989; Marco, Hollingworth & Durham, 1987; among others). Coupled with other modern farming innovations, the use of chemical pesticides and fertilizers has resulted in unprecedented increases in agricultural yields in Canada and throughout the world (Agricultural Institute of Canada, 1981; Agriculture Canada, 1981; The Conservation Foundation, 1987; U.S. Department of Agriculture, 1981). However, there have been identified a number of human health and environmental problems associated with the use of pesticides (e.g., occupational exposure to toxic chemicals, the persistence of carcinogenic pesticide residues in food products and human tissue, the impact of pesticides on non-target species (fish and wildlife kills) and contamination of water, soil and air ecosystems). Furthermore, the efficacy of pesticides is often compromised by the emergence of new, more pesticide resistant strains of pests which, in turn, has led to a continual search for new pesticide compounds (Castrilli & Vigod, 1987; Conway & Pretty, 1991; Marco, Hollingworth & Durham, 1987; OECD, 1989; among others).

The growing evidence provided by the scientific community and the rising general public awareness of the risks associated with the use of pesticides has led to a strengthening of regulatory legislation in Canada and the United States. It has also led to a resurgence of interest in alternative methods of agricultural production as well as a growing market demand for organic foods (Agricultural Economics Research Council of Canada, 1972; Zakreski, 1989). In congruence with other environmental movements and Environment Canada's (1990) "Green Plan", there has been a growth in the number of organizations (formal and informal) advocating an ecological approach to farming that rejects the use of synthetic chemicals in favour of more biological and cultural means of reaching agricultural production goals.

Research on farmers choosing the organic farming approach (which excludes the use of synthetic chemicals in agricultural production) has revealed that their choice is often motivated by a concern for protecting human and animal health from the potential hazards of pesticides; the desire for lower production inputs; a concern for the environment; and protection of soil resources. Apparently, profit motives do not play a large role in the decision to convert to organic farming practices.(Blobaum, 1983; Conacher & Conacher, 1983; Molder, Negrave & Schoney, 1991; U.S. Department of Agriculture, 1980; among others) Most organic farmers have made this transition after years of practising conventional farming methods. However, as these surveys also reveal, the choice of organic farming has not meant a return to pre-industrial practices but rather represents the choice of a hybrid innovation which integrates a resistance or avoidance of synthetic chemical pesticides with a wide variety of modern technological advances. Thus organic farming is an innovation which, in practice, represents a choice of which technological innovations to accept and which to reject. It is a choice which has an ideological[5] component (ecological concerns), an economic one (production costs and yields, market demand for organic foods), and a psychological component (Lawson, 1982; Mumford, 1982; Tait, 1982).

Additionally, there are a number of technical, practical, institutional and social barriers or obstacles to this course of action such as: the lack of technical information about organic methods (and funds to acquire such knowledge); difficulties in developing marketing distribution networks; negative social pressures (non-supportive opinions of farm neighbours, agribusiness dealers, academic researchers); lack of adequate certification of organic products as such; as well as uncertainty about the impact of organic methods on crop yields, weed problems, etc. (Agricultural Economics Research Council of Canada, 1972; Blobaum, 1983; Hill, 1984; Hill & MacRae, 1990; U.S. Department of Agriculture, 1980).

A parallel development in agricultural innovation has been the emergence of biogenetic engineering technology to replace the synthetic chemical inputs to agricultural production as well as to develop new, more productive strains of crop seeds (Doyle, 1985; Hobbelink, 1991). These technological innovations are actively being promoted within the scientific and industrial communities and by government agencies as a solution to many of the environmental problems created by the excessive usage of agrichemicals (Olson, 1986; Science Council of Canada, 1985; among others). Major scientific breakthroughs which have enabled the commercialization of biogenetic engineering emerged in the late 1980s and it is already being heralded as the future direction of agricultural innovation.

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5 Ideology being a system of beliefs and values.

However, a number of moral, ethical and environmental issues associated with the development of such genetically engineered plants and organisms have been raised recently (Doyle, 1985; Fowle, 1985; Rifkin, 1983; Teich, Levin & Pace, 1985; and others). Critics are especially skeptical about the projected benefits of this new technology. They astutely observe that biogenetic engineering research and development is primarily funded by organizational subsidiaries of the large petrochemical and pharmaceutical firms which control agrichemical production.

In many respects, the process by which biogenetic engineering is emerging as a driving force within the scientific community echoes that of the previous agrichemical revolution. As such, it represents competition for organic farming initiatives in terms of government and industrial funding for agricultural research. Biogenetic engineering technology also offers attractive alternatives to those farmers who are dissatisfied with the conventional agricultural practices (i.e., those that currently rely heavily on agrichemical inputs). The adoption of bioengineered plants and organisms would often be a relatively simple process of substituting one type of crop seed with another (i.e., one that has genetic resistance to pests and/or enhanced production capabilities). One projected benefit is the reduced need for chemical fertilizers and pesticides to achieve desired productivity yields. Unlike organic farming approaches, the adoption of bioengineered products would not require fundamental systemic changes in farming practices such as crop rotations, diversified production systems, new soil and water conserving tillage practices, etc. But as environmentalists and advocates for sustainable agriculture have identified, the resolution of many current environmental problems require not only technological innovations but also radical changes in agricultural practices. They argue that transformations are required, not substitutions within existing environmentally harmful systems.

In summary, the growing distrust of synthetic chemicals has been a major focal point for innovative change within agriculture. The growing scientific evidence about the negative health and environmental effects of synthetic chemicals has made them a controversial (and dangerous) innovation in the eyes of environmentalists and the general public. This in turn has created the impetus for searching out alternative solutions for the control of agricultural pests while maintaining high production yields. Organic farming innovations and biogenetic engineering innovations have proven to be the two most prominent approaches to eliminate the use of chemicals in agricultural production. The former focuses on systemic level changes in agricultural practices and inputs whereas the latter seeks changes at a genetic level within organisms. However, as this discussion has also highlighted, the development and acceptance of these innovations has not been a purely rational process, but rather a process involving conflicting beliefs and values, perceptions, and social interaction.

POLITICS IN THE ORGANIZATIONAL FIELD

The proliferation of studies on innovation has yielded substantial quantitative information on the phenomenon. However, many reviewers of the innovation literature have also called for a redirection of research towards innovation as a process thereby necessitating an emphasis on the qualitative dynamics of innovation. In a critique of the prevailing myth of innovation as a rational goal-directed orderly enterprise, Schon (1967, p. 8) notes that: "In fact, bringing new technology into being is a complex process in which goals are discovered, determined and modified along the way." And indeed, some researchers have focused on innovation as the social process of enacting and implementing a new idea or invention (Becker & Whisler, 1967; Carroll, 1967; Mansfield, 1971; Sayles, 1974; Thompson, 1965; Van de Ven & Pooley, 1992; Wilson, 1966). Furthermore, by questioning, describing and analyzing both the meaning and outcomes of innovation, the process of innovation is framed as a socio-political reality.

Politics is often the inevitable consequence of self-interested contests between and among actors which are engendered by the inherent ambiguity of issues, ideas and things. Rather than view these struggles for ascendancy in a negative light, it is proposed that politics serves both a natural and necessary role in the course of human interaction. Judging political actions and outcomes as good or bad, right or wrong, is to a large extent a function of the perspective, the values and the interests of the evaluator. Politics is the process of influence that takes place continually in organizations. Innovation invariably becomes a political contest because innovation at its core is about ambiguity and is replete with disputes engendered by the differences in perspectives among those touched by an innovation and the likely changes it typically engenders.

A framework of organizational power and politics is used in this dissertation to throw into relief some typically unasked or unnoticed aspects of innovation. For example, what are the effects of the power of existing systems of influence and human agency and action on the course of innovation? Using politics, one can analyze what this means first on the surface level in terms of political tactics; and second, in the deep structure as the socio-historical underpinnings of current orders of surface action -- including politics.

Using an organizational politics perspective to understand innovation as a contested process of change, the following questions become the focus:

- WHY are particular innovations adopted and not others?
- WHY do particular innovations succeed where others fail?
- WHAT affects the rate of adoption for an innovation?
- WHAT are the obstacles to the change inherent to innovation?
- WHAT enhances or promotes innovation?
- WHO determines the course of innovation in organizations and in society? WHO sets the criteria? WHO makes the decisions?

A power and politics perspective also challenges the acknowledged pro-innovation bias found in much of the literature (Knight, 1967; Rogers, 1983; Van de Ven, 1986). There is a need to uncouple the tight linkage of innovation and "progress", the unquestioned assumption of innovation as a good, by delving into the dynamics of the change process at both the observable surface and less observable (but powerful) deep structural levels. The roots of this bias are shown to be not unique to the innovation literature but rather to be based in theories of scientific knowledge and societal change.

RESEARCH QUESTIONS

As earlier set out in this chapter, an integrative field analysis of this nature has yet to be conducted in Canada. The scores of intellectual approaches to understanding the innovation process have generated many hypotheses and variables to be investigated but with relatively little closure. One result is that there remain a wide range and variability of research questions which merit examination in an analysis such as this one. This section outlines the general research questions which have guided this investigation of the innovation process within agriculture. Following a review of the innovation and organizational power and politics literatures, more specific research questions will be presented in Chapter 3.[6]

The conceptual model used in this study to study the innovation process at the individual level is adapted from that of Rogers' (1983, p. 165) model of stages in the innovation-decision process (see Figure INTRO-1). Adopting a holistic research perspective directs one to investigate what Rogers refers to as "prior conditions" in the innovation decision process. Specifically, this requires one to ascertain potential innovation adopters' previous practices, felt needs and problems, prior records of innovativeness, and the norms of the social system within which they are acting. Thus, the researcher needs to gain an understanding of the past and current personal and socio-economic context within which persons are operating.

Therefore, the first research questions to be explored concern the personal background and socio-economic characteristics of individuals practising and/or considering an innovation. Given that Rogers (1983) identifies previous practice as being an important prior condition in the innovation decision making process as well as the identified fundamental differences between conventional and organic farm production methods, it follows that conventional farmers and organic farmers constitute two separate groups of innovation adopters. Specifically,

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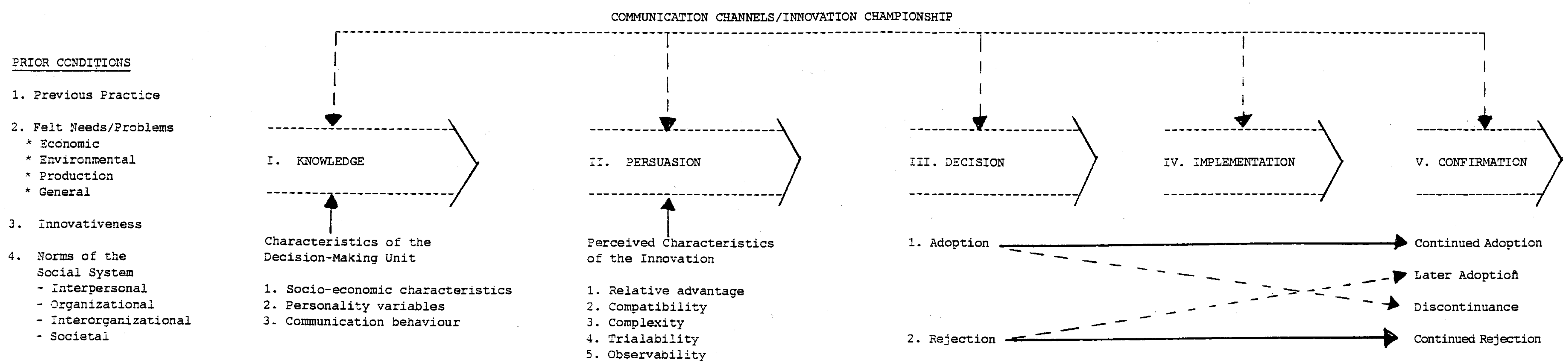
[6] In this introduction of the general research questions, references to the empirical literature are not provided. Direct linkages between research questions and the research literature are provided in Chapter 3.

FIGURE INTRO-1. MODEL OF THE INNOVATION DECISION MAKING PROCESS



Adapted from Rogers (1983, p. 165) "Model of Stages in the Innovation-Decision Process".

conventional farmers are the adopters of synthetic chemical innovations (and nonadopters of organic farming) whereas organic farmers are the adopters of organic farming innovations (and nonadopters of synthetic chemicals). While one may question whether this is an artificial dichotomy (an issue which will be addressed as part of the study), at this juncture, comparisons between farmers grouped according to this criterion are of central interest in this investigation of the innovation process. Therefore, in regards to ascertaining any differences between conventional and organic farmers in terms of demographic and socio-economic characteristics, the following research questions are explored:

> Are organic farmers different from conventional farmers?
>
> > Are they different in terms of age, gender, marital status, level and type of education, past and current employment?
>
> Are organic farms different from conventional farms?
>
> > Are there differences in terms of the farm size, ownership status, types and diversity of farm products, operating expenses, and agricultural labour requirements (family and hired)?
>
> Are organic farmers more innovative than conventional farmers?
>
> > Are there differences in the number and type of new practices or products which have been adopted in farm operations and in marketing? What have been the sources of ideas for innovations which they have implemented?

As one progresses through this model of the innovation decision process, the knowledge stage focuses on the potential adopter's awareness and understanding of the innovation. At this stage, the investigator is directed to consider information sources and the communication behaviours of the potential innovation adopter -- what sources and types of information are being accessed (selective exposure) and how information is being interpreted (selective perception). Given the importance of information and communication channels at all stages of the innovation decision making process, the following questions are explored:

> Are organic and conventional farmers different in terms of their communication behaviour?
>
> > Are there differences between organic and conventional farmers in terms of the number and type of information sources accessed and utilized in general? in regards to organic farming? in regards to biogenetic engineering technology?

> Are there differences in terms of how they rank different information sources in terms of relevance, understandability and trustworthiness?

The knowledge stage is followed by the persuasion stage during which persons form either negative or positive evaluations of an innovation based on an evaluation of its perceived characteristics (eg., relative advantage, compatibility, complexity, trialability, and observability). If an innovation is judged to be advantageous, it follows that it will be adopted. If judged in a less positive or negative light, then the opportunity for change will be foregone. During the subsequent implementation stage, the innovation adopter is engaged in integrating and adapting the innovation into existing practices. Based on the evidence of actual experience, he/she may choose to continue, re-invent or discontinue use of the innovative product or practice. However, innovation adopters do not often operate in isolation and those who previously chose not to adopt an innovation may, on the basis of the experience of others, choose either to continue to reject the innovation or to adopt it at a later stage in the innovation's life cycle. Adding further complexity to this model of the innovation process is the influence of information from external communication channels at each stage. The next set of questions directs one to consider perceptions and evaluations of organic farming and synthetic agrichemical innovations.

> Are there differences between organic and conventional farmers in how they perceive and evaluate organic farming? What are organic farmers' motivations for choosing this method of agricultural production?

> Are there differences between organic and conventional farmers in how they perceive and evaluate the use of synthetic agrichemicals?

Given the debate concerning the environmental sustainability of each set of innovations, the relationship between farmers' current perceptions and evaluations of organic farming and of synthetic agrichemicals and their values and beliefs regarding the natural environment is also of interest.

> Are there differences between organic and conventional farmers in terms of their values and beliefs regarding the natural environment?

> What is the relationship between organic and conventional farmers' attitudes towards organic farming, synthetic agrichemicals and the natural environment?

Since biogenetic engineering technology is still primarily in the development phase with very few products available for adoption, an investigation of potential adopters' perceptions and evaluations is possible. Given the controversy surrounding biogenetic engineering technology, one issue of special interest is the influence of different information sources on attitude formation (assessment of potential benefits, costs and risks) and intentions to use in advance of practical knowledge and experience with an innovation.

> Are there differences between organic and conventional farmers in how they perceive biogenetic engineering technology in agriculture?
>
> > Are there differences in their perceptions of the potential benefits and the potential costs and risks of biogenetic engineering technology?
> >
> > Are there differences in their evaluation of the perceived attributes of biogenetically engineered agricultural products?
>
> What is the influence of various information sources on farmers' attitudes towards and stated intentions to use bioengineered products?
>
> To what extent is a farmer's willingness to try out biogenetically engineered agricultural innovations related to his/her socioeconomic characteristics, agricultural production experience, and assessment of a set of innovations' projected benefits, costs and risks?

While many of these questions attend to the individual level in the innovation decision making process, there are several which involve the influence of actors and organizations at organizational and industry levels. For example, questions regarding the influence of information and communication channels on individuals' knowledge, perceptions, evaluations and adoption (past, current and projected) of the three sets of innovations have been identified. As proposed by Simpson, Wilson and Jackson (1992, p. 241), farm organizations and farm media channels are not only sources of information for farm operations but are "agencies of occupational community". Therefore, to fully understand the innovation process at the individual level, one needs to also investigate what happens at the collective level of farm organizations and at the intersection between individual and collective action. It is at this point that an organizational politics perspective is of value in understanding the political dynamics of the innovation process and the role of innovation champions in guiding an innovation to fruition. However before addressing these issues, there is a need to ascertain the strength and nature of the linkages between individual farmers and different farm organizations.

> Are organic and conventional farmers different in terms of the number and types of farm organizations they belong to?
>
> Are organic and conventional farmers different in terms of their motivations for belonging to farm organizations?
>
> Are organic and conventional farmers different in terms of their memberships in organizations outside of agriculture?

The next stage in this inquiry into organizational action involves case study analyses of the purposes and operation of individual farm organizations in B.C. Through interviews with farm organization members and leaders and the analysis of publications a more fine-grained understanding of the roles which different types of farm organizations play for their members (information, education, advocacy, and so forth), the roles of leaders in farm organizations, and the organizational politics of organizations within the B.C. agriculture sector. By focusing on the collective level, there is also an opportunity to study the incidence, development and implementation of social innovations within and amongst farm organizations. If one accepts the premise that an organization is a collective reflection of its members, then another purpose in conducting such case studies is to determine whether and if so how, farm organizations which conventional farmers belong to are different from those which organic farmers belong to. Therefore, the following questions regarding farm organizations in B.C. agriculture are addressed.

> What are the history, mission and objectives, organizational structure and processes and activities of different types of farm organizations?
>
> What roles do different types of farm organizations serve for their members?
>
> What roles do leaders play in different types of farm organizations?
>
> What is the incidence and nature of social innovations in different types of farm organizations?

> Are there differences in the incidence and types of social innovations occurring in support of biogenetic engineering technology, organic farming and conventional agriculture?

Of particular interest in this study are the actions (political and otherwise) taken by farm organizations to champion and/or challenge the three identified sets of agricultural innovations at both organizational and interorganizational levels. By including the organizational level in this study of innovation processes, one can then explore a series of questions concerning the incidence and operation of individual versus organizational innovation championship; the operation of collaborative versus competitive power and politics; the interplay between social innovations and technological innovations.

> Are there differences in the innovation championship of organic farming innovations and biogenetic engineering technology innovations?
>
> To what degree does the championship of organic farming and biogenetic engineering technology involve collaborative and/or competitive organizational politics?

What this model of the innovation process highlights is the fact that innovation is not the result of a simple linear decision making process but rather is a complex, dynamic and interactive process subject to individual, organizational and societal level influences. It is a process of human action and technical and social change which does not happen in isolation of others or its context. Thus while in some respects innovation and change is a rational process, it is often subject to and part of an interplay of individual, organizational and societal power and politics. As such, the process by which an innovation is introduced, evaluated and adopted can be (and often is) infused with individual and organizational political action.

RESEARCH APPROACH

One challenge for a researcher seeking to understand a phenomenon which is a holistic and dynamic process with both objective and subjective elements is tapping into each of these facets in an integrative manner. Research has often been likened to being a gradual puzzle solving process (Kuhn, 1970). How best can a researcher solve this puzzle of the innovation process? While much about the innovation process has been learned through cross-sectional survey research, there is growing recognition in the field that more integrative, longitudinal and inter-disciplinary research approaches are now needed (Buttel, Larson & Gillespie, 1990; Rogers, 1983; Van de Ven & Poole, 1990; and others). The holistic research design of this study of an organizational field seeks to meet this challenge in a number of ways.

First, rather than focusing on an innovation as an ahistorical and impersonal phenomenon, information is sought out concerning the historical and personal contexts of those who are both current and potential adopters and nonadopters of an agricultural innovation. This gives the researcher conceptual leverage to understanding what distinguishes one human actor from the other in terms of prior experiences, motivations, beliefs, attitudes, values and behaviours. Second, rather than focusing on an innovation as an isolated entity, a holistic approach recognizes that the innovation decision making process is one that involves comparisons amongst past, present and future alternative courses of action.

In this research study, information from both those who utilize synthetic agrichemicals and those who practice organic farming was obtained to investigate their perceptions of and experience with each set of innovations as well as their perceptions and evaluations of future biogenetically engineered innovations. In addition, the role of information from individuals, organizations and the media in shaping perspectives and evaluations is investigated. These data allow for comparisons between adopters and nonadopters of two sets of innovations and projections concerning the probability of the adoption and/or continuation of these innovations. Such a research design also permits an evaluation of the interaction between subjective (personal beliefs and values) and objective (experiences, behaviours, practices) factors in the evaluation of these three different types of innovations.

Another prescription for a holistic research project on the innovation process is that human action does not occur in isolation but rather at four levels -- individual, organizational, interorganizational and societal. What occurs at the individual level has implications for action at collective levels, and vice versa. Following from this, information was also sought regarding the goals, operation and leadership of farm organizations within B.C. agriculture. These are presented as cases of both individual farm organizations and cases of interorganizational networks of organizations within the agricultural sector. In this way, knowledge was gained regarding organizational action in support of and/or in opposition to identified challenges and problems. Given that human interaction around contentious issues often involves the exercise of power as politics in organizational settings, information regarding this aspect of organizations was also obtained. In the case of the organic farming organizations in B.C., the introduction of government legislation to regulate their production practices provided an opportunity to explore the dynamics of organizational politics over a three year period (1989-1993).

In summary, the design of this research project promises to yield much in the way of understanding the innovation process as a subjective and objective dynamic process occurring at and between individual and collective levels. Information from multiple sources (obtained through interviews, survey questionnaires, organizational documents, media reports) were analyzed to triangulate on the phenomena of interest. However, despite efforts to tap into all facets of the innovation process there are practical limits to any one research study. For example, a truly holistic study would include <u>all</u> actors (individual, organizational and societal) and would gather equally detailed information from each. Choosing to limit the boundary of investigation to those operating within one province and then sampling within the B.C. agricultural sector as well as investigating certain research questions in more detail than others are obvious challenges to a holistic research agenda. On the other hand, one distinctive feature of this field analysis is the investigation of multiple research questions originating in three academic disciplines -- innovation diffusion, organization theory and rural sociology. While each discipline offers a different perspective on the innovation process, a more integrative understanding of a complex multi-level multi-faceted dynamic process is facilitated by this research approach.

ORGANIZATION OF THE DISSERTATION

The remainder of the dissertation is organized into six sections. Section I is entitled "The Political Process of Innovation". The first chapter provides a review of the empirical literature on innovation and organizational power and politics. The second chapter reviews the history, nature and politics of innovations in agriculture (natural, synthetic chemical, biogenetic engineering technology, sustainable agriculture). The third chapter in Section I outlines the general and special research questions which were investigated in this research project.

Section II details the research approach and methodology utilized in this research project. The following information is provided: (1) subject identification and selection; (2) methods of data collection; (3) interview and questionnaire instruments; (4) coding of qualitative interview data; and (5) questionnaire development. Section II concludes with a discussion of the limitations of survey research conducted by a single interviewer.

Data analysis and results are reported in Sections III, IV and V. Section III is entitled "The Individual Decision Making Process" and reports data regarding the personal context and innovativeness of farmers (Chapter 4) and communication channels, perception and beliefs of farmers in regards to organic farming and agrichemical innovations (Chapter 5).

Analysis of the agricultural organizational field is the focus of Section IV. The primary foci of Chapter 6 are case study analyses of the operation and politics of conventional and organic farm organizations and conventional interorganizational networks in B.C. agriculture. Chapter 7 reports on the interorganizational field of organic agriculture in the province. This chapter reports and analyzes the organizational politics which occurred during the development of an innovative system to regulate the production and marketing of organic food products. Section IV's concluding chapter summarizes the findings of the earlier two chapters on the organizational field as well as a discussion of respondents' perceptions of government's role in agriculture and future challenges for farm organizations in B.C.

Section V turns to biogenetic engineering technology as a future source of innovations in agriculture. Given the newness of this technology, an integrative analysis at the individual level of the farmer as potential end-user was conducted. Analyses of farmers' knowledge, perceptions of benefits and costs/risks, and intentions to use bioengineered agricultural products are supplemented by a discussion of views concerning government's regulatory role regarding agricultural production inputs.

The final section in this dissertation (Section VI) provides a brief summary of findings to the study's research questions and their implications for theories about the innovation process, organizational politics, and organization theory. Future research directions are also identified.

SECTION I. THE POLITICAL PROCESS OF INNOVATION

The purpose of this Section I is to establish the framework of the research project into the political process of innovation in B.C. agriculture. This is done by first reviewing the existing empirical literature on the arenas of interest and then utilizing these findings to inform a series of research questions which this investigation seeks to answer. Chapter 1 presents a review of the empirical literatures on the innovation process and on organizational power and politics. Chapter 2 provides a parallel analysis of innovation and organizational politics as each relates specifically to developments in the agricultural sector. This involves first, a description of each set of agricultural innovations (synthetic agrichemicals, biogenetic engineering technology, and organic farming) which are focused on in this study; second, the historical development of each set of innovations; and third, a discussion of the identified issues and organizational politics surrounding each set of innovations. Chapter 3 concludes this section with the identification of the general and specific research questions which will be addressed in this research study.

CHAPTER 1. A REVIEW OF THE INNOVATION AND ORGANIZATIONAL POWER AND POLITICS LITERATURES

A review of the theoretical and empirical literatures on the innovation process and on organizational power and politics is presented in Chapter 1. Part A presents a summary of empirical findings regarding innovations and the innovation process. The following topics will be addressed: the stages of innovation; attributes of an innovation; the radical-incremental dimension of innovation; communication of innovations; innovation champions; interrelationships between technological and social innovations; and types of organizations studied in the innovation literature.

The organizational power and politics literature is the focus of Part B of this chapter. First, the theoretical framework of organizational power and politics utilized in this research project is developed. Empirical findings regarding surface politics, the relative merits of collaborative and competitive political tactics and deep structural power and politics are then presented. The chapter concludes with a discussion of the political nature of innovation, the villains of innovation, and distortions of innovation as scientific progress.

PART A. THE INNOVATION LITERATURE

> Innovation is the generation, acceptance, and implementation of new ideas, processes, products, or services. (Kanter, 1983, p. 20).
>
> An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. (Rogers, 1983, p. 11)

Derived from the Latin word innovare, innovation means to renew. Such a renewal can be through the introduction of something which is either objectively (in terms of time or place) or subjectively perceived to be new. Daft (1983) points out that innovation can take place in the arenas of technology (new techniques for making products or services), product (modifications of existing products or development of new product lines), administration (changes in organizational structure, goals, information and other systems) or people (changes in leadership ability, communication, problem solving skills and so forth).

At a fundamental level, innovation represents change in what is done and how it is done. A common theme within the literature is the perception of innovation as a necessary, desirable and attainable commodity for society, organizations and individuals (Hayes & Abernathy, 1980; Kanter, 1983; Peters, 1987). This stated desirability for innovation has provided the impetus for a wealth of academic research on the incidence and promotion of technological and social change.

Within the organizational behaviour domain, innovation research has been the subject of several noteworthy reviews by Daft (1982), Kanter (1988), Kimberly (1980), Roberts (1988), Utterback (1974), and others. In this chapter, a synthesis of these and other studies will be provided on those aspects of innovation which have the greatest relevance to innovation within agriculture. These include: (1) the identified stages of innovation; (2) the impact of an innovation's attributes on the innovation adoption decision; (3) the degree to which an innovation is perceived to represent radical or incremental changes to the status quo; (4) the role of communication (content, modes and channels) in the innovation decision making and implementation process; (5) the role of human agents as champions of an innovation; and (6) the issue of generalizability of this knowledge to the agricultural sector due to the types of organizations which have been studied.

Stages of Innovation

Two stages in the innovation process are now accepted as pivotal: (1) Initiation (information gathering, conceptualizing and planning for adoption); and (2) Implementation (putting an innovation into use) (Rogers, 1983; Zaltman, Duncan & Holbek, 1973).[1] Although each stage has different objectives and activities, it has been generally recognized that often times it is not a set

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[1] Alternatively, Pierce and Delbecq (1977) present a three stage model of innovation within the organizational context: (1) Initiation of an idea or proposal; (2) Adoption; and (3) Implementation.

linear progression through sequential stages. Instead it is an elastic, often recursive progression which is highly dependent on the characteristics or nature of the innovation (product vs. social; radical vs. incremental change to the existing status quo; complexity of adoption and implementation); organizational (structural characteristics, communication patterns, life cycle) and environmental (product life cycle, market competition) contextual variables.

Attributes of an Innovation

The innovation adoption/rejection decision for organizations and individuals has been shown to be influenced by: the projected costs/benefits and risks/uncertainties associated with an innovation (financial and social); the perceived advantage of an innovation relative to other alternatives; and the faculties, intentions, commitment and/or resources of those proposing the change and those adopting it. Altogether, innovation engenders a complex array of interrelated objective and subjective forces promoting both the acceptance and rejection of the changes which it represents.

These observations have led to the development of contingency models of the process of innovation. Rogers' (1983) review of the innovation diffusion literature in agriculture and education concluded that there are four primary perceived innovation attributes which have a significant impact on their adoption or rejection.

(a) Perceived relative advantage (economic and social) that an innovation offers the adopter (positive relationship with innovation adoption). Economic advantages include time savings; saving of discomfort; rate of cost recovery; profitability; initial and continuing costs. Social advantages include enhanced power and status within the relevant community while a negative factor would be exclusion or ridicule.

(b) Perceived compatibility with existing sociocultural values and beliefs, felt needs and past experiences with innovation adoption (positive relationship).

(c) Complexity in terms of difficulty in understanding and/or utilizing the innovation (negative relationship).

(d) Trialability -- the extent to which an adopter can experiment with the innovation on a limited basis (positive relationship).

(e) Observability or visibility of results (positive relationship).

Although these attributes appear as independent characteristics, their impact on the innovation adoption decision is one resulting from an interaction effect with wide variability in the weight accorded each depending on the innovation at issue (Rogers, 1983; Zaltman et al., 1973). Further, the interaction is mediated by the individual innovation adopter's perception (which may or may not be realistic) of these attributes. Thus, the innovation adoption decision can be regarded as the outcome of social influences as well as technological information.

The Radical-Incremental Dimension of Innovation

The degree of innovation radicalness is primarily a function of the perception of newness by the adopting unit or organization (Nord & Tucker, 1987). Although the majority of innovations are incremental, for long term organizational success there is a need to intersperse radical innovations within a continuous stream of incremental changes (Fernelius & Waldo, 1980; Freeman, 1982, 1992; Gobeli & Brown, 1987; Knight, 1967; Marquis, 1972; Wilson, 1966).

The perception of radicalness has implications for the way an innovation is introduced and managed within an organization (Page & Dyer, 1989). The implementation of radical innovations requires unique strategies and/or structures which often necessitate greater top management support and centralized decision making to overcome resistance to change. In contrast, the management of incremental changes relies more often on traditional market growth strategies and complex decentralized structural arrangements.(Ettlie, Bridges & O'Keefe, 1984)[2] The challenge for management is to determine how to implement radical change (with its greater positive impact on sales, market shares, and ROI) while maintaining the flow of incremental changes.

Communication of Innovations

The role of information acquisition, channelling and utilization has proven to be instrumental to the process of technological innovation (Damanpour, 1991; Ebadi & Utterback, 1984; Freeman, 1992; Goldhar, Bragaw & Schwartz, 1976; Rickards, 1991). The importance of communication in the innovation process cannot be underestimated. As Utterback (1974) asserts, 60% to 80% of all important innovations are in response to market demands and needs rather than to an awareness of new solutions.

Both the mode of communication and the content of information within those communication channels are important in the innovation process. Sociometric analyses of communication networks in R&D settings show that the most meaningful mode of communication for innovation purposes is the informal and oral variety (Becker, 1970; Tushman, 1977; Tushman & Katz, 1980; Utterback, 1974). This mode of communication, with its high degree of information richness and equivocality, is instrumental to the practice of political behaviour (Daft & Lengel, 1984).

In his review of agricultural innovation diffusion studies, Rogers (1983) concludes that the efficacy of a communication channel in promoting an innovation varies depending on which stage of the innovation decision process is focused on. Mass media channels (e.g., radio, television, newspapers) are relatively more important during the initial awareness-knowledge stages of the innovation decision process. Interpersonal channels (face-to-face contact, telephone conversations, personal letters) are more important during the adoption persuasion stage. It follows that early adopters of an innovation rely more heavily on and have a greater exposure (in terms of both variety and volume) to external sources of information about an innovation.

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[2] It should be noted that Nord and Tucker (1987) dispute this conclusion and assert that successful implementation for both types of innovation requires centralized and assertive direction.

The flow of information about innovations also appears to be influenced by existing cultural and social groupings (i.e., individuals seek or are more receptive to the advice of those who hold similar values and belief systems). For example, Rogers concludes that interpersonal innovation diffusion networks are mostly homophilous. Rogers (1983, p. 310) defines homophily as "the degree to which pairs of individuals who interact are similar in certain attributes, like beliefs, education, and social status." Thus, the communication of innovations may be restricted by pre-existing social arrangements thereby creating socially defined barriers to widespread diffusion.

Innovation Champions

Thus far, the innovation process has been discussed more in terms of technical or objective factors. But what is the role and contribution of human agents in effecting innovative change? In addition to the inventors who create an innovation, many emerge as product and management champions, in essence the early adopters and promoters of an innovation.

A product champion has been defined as: "A member of an organization who creates, defines or adopts an idea for a new technological innovation and who is willing to risk his or her position or prestige to make possible the innovations' successful implementation" (Maidique, 1980, p. 64). For example, product champions are widely recognized as being essential for the success of this specific type of innovation (Cox, 1976; Daft & Bradshaw, 1980; Galbraith, 1982; Kanter, 1988; Pinchot, 1985; Schon, 1963). Indeed, there appears to be little difficulty in identifying individuals who are champions. Their contributions are highly visible and widely recognized by all involved in the innovation process (Howell & Higgins, 1988, 1990; Smith, McKeon et al., 1984).

Innovators and innovation champions are often described in terms analogous to those used to describe heroes. Innovators are venturesome, eager to try new ideas, knowledgeable, creative. They are risk takers with a healthy irreverence for the status quo. Innovators also have generally higher socio-economic status, have varied experiences, more cosmopoliteness and a high need to achieve

(Amabile, 1988; Galbraith, 1982; Howell & Higgins, 1988; Rogers, 1983; Woolley, 1992). The individual cognitive characteristics of innovators have also been closely studied. Innovators are documented as being rational, intelligent and able to deal with abstractness. Descriptions of the personality characteristics of product champions include their greater propensity to be self-confident risk takers who have a low need for clarity coupled with a persuasive tenacity (Cox, 1976; Howell & Higgins, 1988, 1990; Keller & Holland, 1978, 1983).

Thus innovators are uniquely qualified individuals who have proven to be able to be operate within the ambiguity inherent to innovative change. Furthermore, it is on the dimension of interpersonal skills that product champions are particularly proficient. Not only do they exhibit a willingness to work with others (Keller & Holland, 1978, 1983), they are also politically astute (Chakrabarti, 1974; Mohr, 1969; Schon, 1967). Innovators are not ones content to operate in isolation but rather use their imagination to visualize new possibilities and proactively guide the innovation idea to fruition (Kingston, 1977). Their ability to develop lateral support (coalitions, consensus) within and outside organizations have often proven to be critical to innovation success.

There is a fundamental duality in the innovator/champion role as he/she is often placed between the creative inventor and the applied world, for as Schumpeter observed in 1906:

> It is not the knowledge that matters but the successful solution of the task sui generis of putting an untried method into practice...Successful innovation...is a feat not of intellect, but of will. It is a special case of the social phenomenon of leadership. (as cited in Kingston, 1977, p. 23)

This leadership component is one confirmed by Howell and Higgins (1988) in their study of product champions and non-champions. They found product champions to be rated higher than non-champions on transformational leadership behaviours (charisma, inspiration, individualized consideration and intellectual stimulation) as well as on contingent reward transactional type behaviour.

How then does a product champion rally commitment to his/her cause when there is an absence of substantive hierarchical power? Studies of the communicative patterns of product championship indicate that innovation pioneers and early adopters hold positions of centrality in sociometric networks (discussion, advice and information, friendship) of influence (Becker, 1970). Individual centrality in communication networks is another significant source of intraorganizational power and influence (Astley & Sachdeva, 1984; Brass, 1984; Hickson, Hinings et al., 1971). Thus innovators appear to be particularly adept at utilizing this source of power to their advantage. Therefore, it is not surprising that product champions have been found to rely most often on high communicative type strategies such as coalition formation and reasoning (Howell & Higgins, 1988).

Another critical role in the innovation process involves the management or executive champion of new products or directions. The development of senior management champions as facilitators of innovation rates highest in importance according to a number of authors (Nayak & Ketteringham, 1986; Peters, 1987; Pinchot, 1985). Empirical research by others (Blau & McKinley, 1979; Hage & Dewar, 1973; Kelley, 1976) confirms the critical importance of managerial elite support in innovation implementation.

The role of the management champion is somewhat different from the product champion. Management champions serve to buffer the innovation process and the activities of the product champion from outside interference as well as procuring the needed time and resources for product development. Although the most effective management champion is the CEO (by virtue of his/her greater degree of hierarchical power), he/she can also be a suitably powerful member of the top management team. The role of the top executive sponsor has been shown to be a critical one in facilitating and ensuring the success of an innovation (Blau & McKinley, 1979; Nutt, 1986). Unlike in the traditional bureaucratic sense of order giving, the most beneficial results occur when he/she acts at a level of altering expectations to motivate or prompt change. With the commitment of the top executive, the course of implementation may be smoother in that formal hierarchical power can be used to access the needed resources for development, especially since the lack of resources are often the primary cause of failure identified in many studies of innovation (Delbecq & Mills, 1985).

Whereas much of the organizational literature on innovation focuses on individuals, the management championship role can also be seen to operate on a collective level within organizations and society. Identification of such champions may be problematic to the extent that there may be an absence of formal linkages. Instead, the observer must look for an alliance or congruence of self-interests amongst the various individual parties. Societal interest groups can influence the acceptance of one innovation over competing alternatives through the dedication of research and development funds, dissemination of information through the mass media or by lobbying of government agencies for supportive legislation or regulatory policy interpretations (either individually or through affiliated associations). Through these and other actions, the preferred course receives preferential treatment while those judged to be less "suitable" (or beneficial) are denied the necessary resources for survival or visibility to gain supporters. While the presence of collective support for an innovation does not obviate the need for spokespersons, under these conditions the nature of the championship role is an organizational rather than individualized dynamic. Thus, it is expected that the presence of organizational or interest group support would reduce the need for individual champions while the absence of such support would require the presence of dedicated individuals to champion an innovation.

The Interrelationship between Technological Innovations and Social Innovations

As illustrated by the case study analyses conducted by Frost and Egri (1991), a good idea or product is often not enough to guarantee its successful implementation and diffusion within and outside an organization. The innovation champion must often develop social innovations which complement and support the changes which he/she proposes. Social innovations involve new processes and working arrangements and relationships between people within organizations or between organizations. Basically, they involve changes in the way people relate to, work with, and communicate with each other. The key role of social innovations is to counteract any resistance to change (intentional or not) generated by the those who benefit from or prefer existing arrangements.

A systems approach to innovation directs one to examine interlocking technical systems, scientific systems, economic systems, political systems and organizational systems (Hughes, 1983). Thus, there is convincing evidence that product innovation is a process involving both technological and social change (Elliott, 1988; Hughes, 1983; Jelinek & Schoonhoven, 1990; Mackenzie & Wajcman, 1985; Van de Ven & Poole, 1989, 1990; Wolfe, 1988). Furthermore, there is evidence that innovating in organizations is essentially a trial and error learning process at both individual and organizational levels (Van de Ven & Pooley, 1990).

Types of Organizations Studied

Much of the work on innovation in the organizational behaviour literature deals with the observed problems and challenges of guiding an innovative idea to reality within complex organizations. Further, there has been a decided preference for studying innovation within R&D laboratories (Jelinek, 1979; Jelinek & Schoonhoven, 1990; Tushman, 1977; Tushman & Katz, 1980); educational institutions (Daft, 1978); and hospitals (Kimberly & Evanisko, 1981). This choice of organizations has led to research focusing on managerial issues (organizational structures and processes such as matrix organizations, skunkworks, project teams, etc.) surrounding the generation, development and implementation of innovation; the impact of communication and information networks on innovations (gatekeepers of information); specialized roles in the innovation process (product and management champions).

What has been relatively neglected by this course of research? First, the study of the process of innovation within the "simple" type of organization such as small businesses and the family farms operating in the agricultural sector.[3]

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[3] For example, are there parallels between farm organizations and the simple "entrepreneurial" organizations researched by Mintzberg (1979, 1989)? On the surface, both types of organizations appear to share a number of common features in terms of: structure (simple, informal and flexible operations under the personal control of one individual); and context (operating within simple, dynamic and competitive environments in a crisis mode). While the centralized decision making of the farm organization may facilitate quick adaptive responses to strategic and operating issues, as Mintzberg also identified, this creates a vulnerability in terms of reliance on one individual.

This is somewhat ironic when one considers that the initial research on innovation adoption and diffusion focused on changes in agricultural practices and technology (Rogers, 1983). Many current research questions and issues can, in fact, be traced back to these initial studies, for example, the role of information and communication networks on the innovation adoption decision, and the influence of opinion leaders in sociometric networks on the acceptance/rejection of an innovation.

Unfortunately, despite this linkage to the roots of innovation research, academic territoriality appears to be such that innovation in the agricultural domain is most often conducted by rural sociologists and agricultural economists while organizational scientists focus elsewhere. However, Rogers (1983, p. 38) observed in his summary of innovation diffusion research that despite this intellectual parallelism, both streams have "uncovered remarkably similar findings". Indeed, there is relatively little evidence that rural sociologists and agricultural economists have incorporated recent theoretical and conceptual developments within the organization theory or organizational behaviour disciplines (e.g., organizational culture, organizational politics, population ecology, institutional theory, etc.). Concurrently, researchers within the organizational sciences have rarely examined or tested the validity of findings gleaned from other economic sectors on the process of innovation within the agricultural sector. One intent of this research project is to attempt to bridge this gap created by these parallel streams of research on innovation by taking a more unified and inter-disciplinary viewpoint in the interests of what Rogers (1983) terms to be "intellectual convergence".

PART B. THE ORGANIZATIONAL POWER AND POLITICS LITERATURE

> Politics, n. A strife of interest masquerading as a contest of principles.
> -- Ambrose Bierce, The Devil's Dictionary (1881-1911)

There are two fundamental activities of organization from an organizational politics perspective. First, there are the contests among interdependent actors operating from different perspectives/frames of reference and motivated by different self interests and preferences to control resources, to determine the means/ends of doing organizational work (Baldridge, 1971; Cyert & March, 1963; Pfeffer, 1981). Second, there are the struggles for collaboration among actors in the performance of organizational work when the means/ends for getting it done are unclear and/or subject to dispute (Barnard, 1938; Pfeffer, 1981; Thompson, 1967; Wilkinson, 1983). Power plays a major role in the way organizational processes and outcomes emerge when either or both of these sets of conditions are in place (Frost, 1987).

In this framework, power is defined as potential, as the capacity to get others to do things they might otherwise not want to do and/or to resist others' efforts to get one to do what they want one to do (Dahl, 1957). Politics is defined as enacted power, as goal-directed action that is first of all self interested and that would be resisted if detected by others with different self interests (Frost, 1987; Porter, Allen & Angle, 1981). Politics is a neutral process but how it is used and who is judging affects whether it is assessed as either positive or negative.

Political action involves opportunity (current and imbedded), orientation (will and skill) and intention (goals). Power and politics operate on an individual level (e.g., needs and abilities), organizational level (e.g., strategic contingencies) and societal level (e.g., sociohistorical influences). However, the play of politics involves the use of power both on the surface and in the deep structure of organizations. As such, there is a basic duality in that power may be overt and direct and/or covert and subtle (Frost, 1987).

There are a number of theoretical models which offer triadic levels or dimensions of power and politics within the sociological literature. Lukes

(1974) proposed a three dimensional framework of power which extended Bacharch and Baratz's (1970) "two faces" of power model. Whitt (1979) identified three models of power and Clegg (1989) proposed a framework using the image of three "circuits" of power. More recently, Bradshaw-Camball and Murray (1991) demonstrated the utility of multiple perspectives (functionalist, interpretive and radical) in understanding the processes of organizational politics.

Lukes' (1974) framework provides a three dimensional view on power and politics. The one-dimensional view of power focuses on gaining a unitary consensus through the exercise of authority and coordination. It generally operates at the surface of social interaction (behaviours and decision making) dealing with observable conflicts which can be either avoided or resolved. The conceptual basis for this dimension of power can be traced back to Dahl (1957) (whose work in turn, can be traced back to the Hobbesian agency model of power) which focuses on the causal conception and influence of power.

The two-dimensional view of power incorporates the first dimension and adds a more pluralist view. Here power is conceived of as: "a set of predominant values, beliefs, rituals, and institutional procedures ("rules of the game") that operate systematically and consistently to the benefit of certain persons and groups at the expense of others. Those who benefit are placed in a preferred position to defend and promote their vested interests "through the mobilization of bias which ensures that crucial issues often do not emerge for public debate" (Bachrach & Baratz, 1970, pp. 43-44). This two-dimensional view focuses on how power serves to systematically distort communication and which can be accessed through an evaluation of the interpretive understanding of intentional action, non-decisions and potential issues (as per Habermas, 1972; Mumby, 1987).

The three-dimensional view of power which incorporates the first and second dimension introduces the concepts of hegemony and contradiction in the struggle for domination over the underlying assumptions which comprise an ideology (Lukes, 1974). Fundamental to this view is the neo-Marxist concept of hegemony where those in elite positions in social systems (intellectual, moral and philosophical leaders) are able to exert their influence to guide and control the fundamental outlook for a whole society (see Bocock, 1986; Clegg, 1989; Gramsci, 1971). This perspective incorporates the radical-humanism concept of the latent conflict between expressed preferences of social actors and their "real interests" (Burrell & Morgan, 1979).[4]

In his analysis of various approaches to organizational power and politics, Whitt (1979) determined there to be three models of power -- pluralistic, power elite, and class dialectical. Whitt tested these models as alternative explanations in his study of public transportation issues in California (i.e., Proposition 18 and Proposition 5) in which he found support for the class dialectical model of power. The research hypotheses proposed under each model provide a useful framework for comparative analysis of any important political issue (See Table 1-1). For example, if a pluralistic model is correct, one would expect to find behavioral evidence of competition among various interest groups; that interest and alliances would be shifting continuously; and that political outcomes would not favour one group consistently over time. In contrast, if a power elite model were operational, then the analysis would reveal a congruence of interests and efforts among institutional elites with outcomes consistently in the favour of the elite group. And finally, if the class dialectical model were correct, there would be evidence of class conflict (divergent interests, observable actions; structural crises) with outcomes tending to favour the dominant class interest.

The most recent work by Clegg (1989) focuses on power as a relational construct involving agencies and events of interest to those agencies within three circuits of power. For Clegg, power is both the medium and the outcome of political interaction. While Clegg asserts that his theoretical framework is distinctive, there are a number of direct parallels to the models proposed by Lukes (1974) and by Whitt (1979). For example, the operation of Clegg's "agency" circuit level closely resembles that of Lukes' one-dimensional view of power and

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[4] However Benton (1981) argues that Lukes' radical view of power posits a "paradox of emancipation" in that there is a practical problem of determining objectively what a group's <u>real</u> interests are when its consciousness has been systematically distorted and manipulated.

Whitt's pluralistic model; the "social integration" circuit level parallels Lukes' two-dimensional view of power and Whitt's institutional elite model; and the "system integration" circuit level parallels Lukes' three-dimensional view and Whitt's class-dialectic model. However, Clegg differs from both theorists in his explanation of how these power circuits operate. Namely, Clegg uses the contributions of institutional theorists (such as DiMaggio & Powell, 1983; Meyer & Rowan, 1977; Scott, 1987; Zucker, 1987; among others) to explain how social integration is achieved, becomes entrenched and self-perpetuating through isomorphic rules of practice. Clegg also draws from the population ecology

TABLE 1-1. CHARACTERISTICS OF WHITT'S MODELS OF POWER

(Source: J. A. Whitt (1979) p.83)

	Pluralistic	Elite	Class-Dialectic
Basic units of analysis	Interest groups	Institutional elites	Social institutions; social classes
Essential processes	Interest group competition	Hierarchical dominance by elites	Imperatives of social institutions; class combination and conflict
Basis of group power (resources)	Many bases: organizational, governmental, economic, social, personal	Institutional position, common social background, convergent interests	Class position; degree of class consciousness and organization
Distribution of power	Dispersed among competing, heterogenous groups	Concentrated in relatively homogenous elites	Held by dominant class, but potentially available to subordinate classes
Limits and stability of groups' power	Unstable: limited by democratic value consensus, shifting strength among organizational interests and by cross-cutting allegiances	Stable, no identifiable limits to elite domination	Historically contingent; generally stable, but limited by class conflict and contradictions within and among social institutions
Conception of role of the state	State is a broker, able to preserve some autonomy by balancing competing interests	State has little, if any, autonomy; captive of elite interests	State serves interests of dominant class, but requires a degree of autonomy from segments of dominant class in order to act to preserve basis of class hegemony

perspective (Aldrich, 1979; Hannan & Freeman, 1984) in his explanation of how competitive pressures (endogenous and exogenous environmental contingencies) serve to create new opportunities for changing the configurations of the first two circuits of power. In these ways, Clegg is able to go beyond Lukes' focus on intrapsychic processes (people's 'state of mind' or consciousness as the determinant and determiner of power) to link intention with the exercise of power as a phenomenon of social relations. Thus, for an analysis of power,

> "..what is required is a consideration of the relational field of force in which power is configured and in which one aspect of this configuration is the social relations in which agency is constituted." (Clegg, 1989, p. 207)

As such, power can be produced, reproduced and resisted in social relations at individual, organizational and societal levels.

This review of sociological theories of power and politics leads one to consider that any research on this topic needs to encompass multiple (and interacting) levels of analysis. One level would focus on the observable facets of political action (Lukes' one-dimensional view; Whitt's pluralistic model; and Clegg's first circuit of episodic power relations and agency). In the next section of this chapter, this level will be the focus of descriptions of the competitive political tactics and strategies which take place as surface level power and politics involved in the acquisition/expansion of power, maintenance of existing power bases, and control of resources and outcomes. A second level would focus on the intermediate objective/subjective facets of political action (Lukes' two-dimensional view; Whitt's power elite model; Clegg's second circuit of power of rules of practice and social integration). Within this review, this facet of organizational politics will be attended to in the discussion of the role of political tactics which serve to manipulate communication and to manage or resist changes. And finally, a third level of analysis addresses the politics of ideological influence and control among sectional interests (Lukes' three-dimensional view; Whitt's class dialectical model; Clegg's third circuit level of domination and system integration). This level is directly attended to in the political processes of naturalization, neutralization, legitimation and socialization within the deep structure of organizations and society.

Surface Power and Politics

The exercise of surface power and its attendant strategies and tactics are more readily accessible and have been the subject of much of the academic focus. As demonstrated by Mintzberg (1983), Crozier and Friedberg (1980) and Frost (1987), it is useful to examine organizational politics in terms of the metaphor of games -- as strategic, tactical maneuvers between and among actors where the rules of the games themselves can be revised for definition and redefinition as the game playing process is initiated and unfolds. Political games involve attempts at manipulation and influence for outcomes which actors intend to benefit themselves and/or to benefit other actors in the game. Political games can be played out at the surface and/or in the deep structure of organizations. Surface political games can also be played out in four arenas: that of individuals, of intraorganizational groups, between and among organizations, and between and among societal interest groups.

Individual games focus on gaining, maintaining and withholding the context or frame of reference in organizations which serve the player's self interest (Culbert & McDonough, 1985). Political games can be used singly or in combination with others (Yukl, Falbe & Youn, 1993). Some involve the acquisition or expansion of power within the organization (making it, mentoring, sponsorship, empire building, upward influence) while other individual games such as lording, rule citing and appeals for higher authority support are used to guard against any further encroachment of existing power bases (Kanter, 1983). The scope of individual influence strategies is wide. Manipulative communicative strategies include: ingratiation or impression management, labelling, reasoning, manipulative persuasion, and assertiveness. Additionally, individual actors may employ political strategies of gatekeeping, managing sanctions, covering up and networking. A number of authors have noted that the choice of political strategies is often a function of an individual's self-confidence, experience, skills, objectives and the intended direction of influence (Frost, 1987;

TABLE 1-2. ORGANIZATIONAL POWER AND POLITICS

(Source: Frost & Egri, 1991)

INTERESTS	Primary (Secondary)	NATURE OF CONFLICT	PRIMARY CONTROL EMPHASIS	POLITICAL GAMES
Unitary	1st Face	Temporary--can be avoided or resolved	Gaining/Maintaining Withholding Context	Acquisition/expansion of power: -making it, mentoring, sponsorship, upward influence, empire building. Maintenance of existing power bases: -lording, rule citing, appeals to higher authority for support.
Pluralist	1st Face (2nd face) (3rd face)	Restricted Conflicts	Controlling resources, outcomes/ managing territories/ managing, resisting change	Manipulative communication: -impression management, labelling, reasoning, assertiveness, gatekeeping manipulative persuasion, covering up, networking. Controlling resources/outcomes: -Competitive Control: budgeting, expertise, line vs. staff, rival camps, making out. -Collaborative Control: negotiation, bargaining, coalition building, strategic candidates (developing champions), building consensus, framing perspectives. Managing/resisting change: -controlling decision premises & agendas, selective use of objective criteria.
Radical-Critical	(1st Face) 2nd Face 3rd Face	Repressed Conflict (Structural contradictions)	Ideological Control for gaining/preserving sectional interests	Naturalization Neutralization Legitimation Socialization

Kipnis, Schmidt & Wilkinson, 1980; Pfeffer, 1992). Studies of upward influence tacticsrelate a decided preference for rational informational persuasion (overtly manipulative) over less rational and sanction based strategies (Ansari & Kapoor, 1987; Mowday, 1978; Porter, Allen & Angle, 1981; Schilit & Locke, 1982; Yukl, Falbe & Youn, 1993). These findings can be interpreted either as a reflection of the relative limitations imposed on those lower in the organizational hierarchy (therefore not realistically having access to sanction based strategies) or as a reflection of the dominant influence of the organizational paradigm founded on the fundamental premise of "rationality" (as detailed by R. Brown, 1978) which limits the scope of envisioned action.

Intraorganizational games revolving around strategic contingencies can be either competitive or collaborative between individuals and/or groups. Competitive intraorganizational games emphasize the control of organizational resources and outcomes (budgeting, expertise); the management of organizational territory (line vs. staff, rival camps, making out); and/or the management of resistance to change of the status quo (whistle blowing, insurgency/countersurgency, Young Turks). Political activities engaged in such games are likely to include negotiation, bargaining, coalition building, controlling decision premises and agendas, the selective use of objective criteria to support arguments, and so forth (Frost, 1987; Mintzberg, 1983). Competitive games are most likely to emerge under conditions of resource scarcity (Roberts, 1986).

In contrast, collaborative intraorganizational games often focus on the identification and promotion of strategic candidates to either promote or oppose projects or proposals to alter organizational activities. This set of games employ political tactics of developing champions, building consensus or support, and framing perspectives to influence actors in the organization's dominant coalition. (Frost, 1987) Comparative research on intraorganizational competitive versus cooperative innovation implementation strategies indicate that expert persuasion and highly participative strategies are highly successful (Nutt, 1986). Falbe and Yukl (1992) found in their study that "soft" collaborative influence tactics were generally more effective than "hard" competitive tactics. The underlying thrust of the collaborative approach is considered to be preferred but one which incurs high process costs and creates logistical problems.

Organizations or societal interest groups can operate politically in a similar manner as do groups within organizations. The focus of interorganizational politics is also on the control of resources, the expansion and protection of territory and the management of change. The playing of interorganizational games can also be either collaborative or competitive. At this level, political processes can assume a second face to include "defining, establishing and challenging the rules of the game as well as competition over meaning that involves actors with interpretive frames more different from one another than is likely to be in use for intraorganizational games" (Frost, 1987, p. 41). In addition to previously identified strategies, political action at this level can involve developing legislative politics and procedures, establishing legal contracts, and creating interlocking boards of directors.

The Relative Merits of Collaborative and Competitive Political Tactics

One of the intents of the collaborative political approach is to build consensus around a common frame of reference. To do so, it is necessary to promote the rational exchange of information and the development of communication networks in order that reasoned and rational discussions of the issues can be engendered. Many build on the concept of effecting double loop learning as a way of effecting a change in world view or perspective (Argyris & Schon, 1978).

However, one acknowledged prerequisite of collaborative action entails openness in terms of detailed disclosure and explanation of the basis, intent and logical foundation of one's intended outcome. Entering into a dialogue between parties requires a certain degree of trust (Kipnis, Schmidt & Wilkinson, 1980). There also needs to be established a spirit of cooperation in searching for a consensus which is acceptable to the majority.

Research on interorganizational systems shows that when there are parties which have voluntary co-dependent relationships, collaborative and participative approaches are required for successful operation.(L.D. Brown, 1983; Cummings, 1984; Gray, 1989; Perrucci & Potter, 1986; Trist, 1983) The key to these arrangements is the presence of an overriding goal or objective which can only be achieved through joint means.

However, collaborative tactics often take a longer period of time to effect. Further, outcomes are more uncertain when dealing with satisfying the diverse needs and objectives of multiple parties. Venturing into new territory with fewer markers for conduct involves a fair degree of trial and error with one outcome being that compromise, or less than optimal, outcomes may result. Collaborative tactics also require an attitude of commitment to the process and to an overarching goal by all parties involved. In this respect, interorganizational collaborative arrangements have proven to be fragile alliances largely dependent on the continued presence of committed individuals. A less often recognized requirement of this approach is the need for individuals who are especially politically astute and skilful in collaborative modalities. They are a unique breed who learn their skill through experience rather than formal education.

Alternatively, there are a number of coercive, competitive strategies which can be used in the process of innovation. As the modus operandi of a competitive society, there is no shortage of experienced and skilled gamespersons willing to use these tactics.

The dynamics of competitive strategies result in a number of consequences for those involved. First, competitive tactics may serve to limit or distort communication between affected parties. There is also a tendency for competitive tactics to be results oriented rather than means oriented. Competitive tactics often transform the political contest into a zero sum game of winners and losers thereby reinforcing adversarial relationships--an outcome which may be inappropriate when dealing with issues in which wide commitment is required for the long term success of an innovation. Further, for those advocates of fundamental social change, competitive tactics can be self-defeating in that they can serve to maintain the status quo in power relationships. As the old adage goes, "those who have the gold make the rules", and independent and voluntary special interest groups seeking to effect changes from outside the system are usually at an economic disadvantage in playing these political games.

In practice, skilled political gamespersons have proven to be adept in using either type of strategy depending on the unique requirements of the situation at hand. Astute political gamesmanship requires an awareness of which games are available to oneself and others, the relative advantages and disadvantages of alternative political games (both in the short and long terms), and a sense of timing in their use which maximizes the chances for success.

Deep Structural Power and Politics

Power is also in the deep structure of organizations where, as a covert form, it is so deeply imbedded in the structure that it informs the interpretive frames and the cognitive maps of organizational members (see Chomsky, 1988). Often, these are the implicitly understood "rules of the game" which influence the way people are to behave, materials to be used and resources to be deployed.[5] Deep structure politics is primarily concerned with the power of conception, "the systematic distortion of communication so as to maintain and enhance power relations that favour one social reality over other possible alternatives that favour some interest groups at the expense of others." (Frost, 1988, p. 42). For these reasons, deep structure power is very difficult to

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[5] There are a number of parallels between the process of institutionalization and the operation of power and politics within the deep structure. However, much of the focus of institutional theorists (such as DiMaggio & Powell, 1983; Meyer & Rowan, 1977; Scott, 1987; Zucker, 1987; among others) to date has been on understanding the institutional forces for conformity in terms of organizational structural arrangements. As identified by Oliver (1990), criticisms of institutional theory have focused on the failure of the theory to go beyond assumptions of organizational passivity. Only recently have the ideas of strategic influence, self interests and the exercise of influence been focused on as a way of understanding how these forces are shaped and evolve. As yet there have not been any substantive empirical tests by institutional theorists focusing on this latest extension of the theory. Given that the concepts of purposive human agency and self interests have been more fully incorporated and tested within the organizational power and politics theoretical framework, this research project will utilize this perspective more directly while recognizing that institutional theoretical concepts may be useful later in interpreting a number of research findings.

identify without a careful tracing of the sociohistorical origins of these frames, and the rules of the current organizational game (Conrad, 1983; Ranson, Hinings & Greenwood, 1980).

There are a number of deep structure games which are based on the systematic distortion of perceived reality. Four of these games are naturalization, neutralization, legitimation and socialization. An interest group may engage in the game of naturalization which treats existing forms and privileges as inviolate therefore not subject to discussion or change (Deetz, 1985). For example, in the case of technological change such as machine tool automation, it serves organizational management's interests that it be thought of as "natural" that management make these critical conversion decisions independent of those lower in the organizational hierarchy (see Noble, 1984; Wilkinson, 1983). Even though such decisions will result in significant changes to the nature of the everyday working environment of those individuals.

Neutralization is the process by which "value positions become hidden and value laden activities are treated as if they were valueless. A singular position is universalized as a position shared by everyone, thus becoming one of fact rather than choice" (Deetz, 1985). As Brown (1978) and Culbert and McDonough (1985) assert, powerful groups in organizations often utilize the rhetoric of rationality to control the rules of relevance thereby controlling both the definition and content of a dominant organizational reality.

A third strategy is legitimation through which "higher order explanatory devices" are invoked to justify the actions and decisions of a self-interested power elite. (Deetz, 1985). Allusions to sacrifice and loyalty, etc., serve to maintain the compliance of lower power players while cloaking the real motivation and goals of the powerful. This particular game is evident in studies of intimidation rituals concerning whistleblowers (O'Day, 1974). The whistleblower or reformer not only raises a moral challenge to the ethical nature of upper management decisions, but as a self-appointed change agent he/she also challenges the deep structure power relations of hierarchical authority. The organizational response to such action is often to focus on establishing the illegitimacy of the whistleblower as a party to the decision making process.

Finally, the strategy of socialization serves to direct and shape the behaviours, attitudes, values and interpretive schemes of some players to the benefit of others (Frost, 1987; Van Maanen & Schein, 1979). This strategy builds on Parsons' (1967) theory of socialization which contends that people are socialized actors within a normative order which guides all social conduct. In this game, those in control have a power advantage to structure the context and content of the learning experience of new members in a group, organization or society.

In many instances, these political strategies are used as defensive measures to preserve the prevailing distribution of power. In concert, they operate to institutionalize existing power relations in a self-perpetuating manner (Burawoy, 1979; Pfeffer, 1981). However, deep structure power relationships are not static and can be used in a proactive way to facilitate change. In that current deep structure power is the derivation of past political activity, the outcomes of current political activity form the foundation of future deep structure power relations.

The Political Nature of Innovation

The introduction of an innovation or change often induces and becomes the focus of political activity in modern society and its organizations (Bijker, Hughes & Pinch, 1984; Hughes, 1983; Kimberly, 1980; Mackenzie & Wajcman, 1985; Morgan, 1986). In that innovation at its core is about ambiguity and is replete with disputes between human actors caused by differences in perspectives among those touched by an innovation and the likely changes it typically engenders, innovation often becomes a political process.

The organizational politics perspective facilitates the examination of process questions about innovation not only in terms of the observable political games played between and among interested and affected parties (Kipnis, Schmidt & Wilkinson, 1980; Mintzberg, 1983; Porter, Allen & Angle, 1981) but also in terms of understanding the socio-historical foundations, the deep structure, of the political contests themselves (Frost, 1987). There has been relatively less research attention given to the play of power in the deep structure which is, essentially, the power of conception -- the shaping of values, attitudes and assumptions which guide behaviour in social systems (Astley & Sachdeva, 1984; Deetz, 1985; Lukes, 1974).

Within this maelstrom of organizational politics, innovation often becomes a focal point of activity. Attempts at innovation or change highlight or emphasize the political dimension of organization, the contests and struggles around means and ends for satisfying needs and accomplishing organizational work. For as Niccolo Machiavelli asserted in The Prince,

> The innovator makes enemies of all those who prospered under the old order, and only lukewarm support is forthcoming from those who would prosper under the new...because men are generally incredulous, never really trusting new things unless they have tested them by experience. (as cited by Rogers & Shoemaker, 1971, p. 174)

Machiavelli's observation is echoed by Kimberly (1980, p. 93) who observes that in modern organizations, "... any particular innovation intrudes on a previously negotiated set of agreements about how these interests and priorities are to be accommodated." How then, does an innovation emerge and survive whatever conflict it engenders? Under what conditions and when does organizational politics flourish in the innovation process?

Empirical research indicates that political gamesmanship is most likely to be positively correlated with the level of innovation originality (Pelz, 1983; Pelz & Munson, 1982) and perceived risk and complexity (Fidler & Johnson, 1984). Perhaps the most vulnerable time of the innovation process is during the implementation stage when the dysfunctional nature of organizational politics is most often highlighted. It is responsible for, among other things, unnecessary delays, excessive conflict, compromised outcomes, and sometimes, ultimate failure (Corwin, 1972; Delbecq & Mills, 1985; Guth & Macmillan, 1986; Nelkin, 1984; Pelz & Munson, 1982; Yin, 1977). Studies of innovative changes in the public arena concerning the passage and implementation of legislation of social and technological innovations depict similar outcomes in the interorganizational domain (Bardach, 1977; Hughes, 1983; Pressman & Wildavsky, 1973; Reppy, 1984).

The success or failure of an innovation can also be influenced by the selection and sequencing of collaborative and competitive political strategies. One way to reduce the possibility of incurring resistance to change would be to frame such changes as incremental rather than radical. There is a need to increase the incentives for all those who have a vested interest in maintaining the status quo to envision and subscribe to a proposed innovation. Overall, this approach is one of a series of small wins which are incremental steps towards a larger more radical shift in world view -- a process similar to that of the small tremors and shifts which signal and precede an earthquake. Such small wins (Weick, 1984) can, over time, create a critical mass triggering a crisis for radical change. The question then becomes how can such a progression be set up? It is not a natural process, but one which is political and requires the intervention of people.

From historical accounts of social change such as Kemal's modernization of Turkey during the 1920s, there is evidence to support the contention that the most effective and efficient way to effect fundamental reforms is to use a combination of Fabian and Blitzkrieg change strategies (Huntington, 1972; Jones, 1972). The Fabian strategy is to first separate and isolate one issue or arena for attention and then to use radical and coercive means (i.e., Blitzkrieg) for fundamental reforms. And from research on organizational change (Stace & Dunphy, 1989), there is corroborating evidence that to effect a radical transformation which involves a frame change, the most effective way is to first use competitive, coercive tactics to generate a crisis in order to create a readiness for change which allows for new ways of doing things. Then collaborative strategies are used as part of the process of implementing this new frame or mode of operation.

Innovation often involves changing relationships and prior ways of doing things. Pinchot (1985) uses the analogy of the "immune system" to describe the reaction of existing systems (the deep structure) to any proposed change. The immune system detects anything that is not part of the status quo and surrounds it. If the new "invader" is deemed to be a threat, then the immune system works to destroy it. The degree of perceived threat determines the magnitude of the forces used in the battle.

On the other hand, if the new entity or innovation is viewed as having positive benefits or is supportive of the status quo, then the existing order serves to assimilate it. The critical issue is on the perception of the new entity or innovation in relationship to the status quo. However, there is still the matter of managing the political process of influencing others to adopt the proposed change.

What then are the relative merits of small wins vs. revolutionary change strategies in the process of innovation? The degree to which an innovation is perceived to be an incremental or radical change to existing modes of operation impacts on the duration and nature of the implementation stage of an innovation. Incremental changes are more easily and quickly adopted whereas radical changes foment greater adjustments thereby lengthening the implementation stage.

Alternatively, reasoning and rationality have proven to be weak tools when battling interest groups which view an innovation as a threat to their deep structural advantage (see Frost & Egri, 1991). Competitive control strategies are by nature adversarial and may be counterproductive in that they convert the contest into a short term zero-sum game. Also when there are few formal sources of power available to those advocating change, they may have a limited ability to engage in competitive strategies.

In summary, when a proposed innovation is congruent with the organizational and societal deep structure, political activity remains primarily on the surface, is benign or at a low level. Consequently, the probability of the acceptance and diffusion of such an innovation is enhanced with the support of the deep structure. Or alternatively, a proposed innovation which threatens power relationships at the deep structure level evokes the full breadth and depth of opposing political forces, strategies and tactics. Consequently, the probability of acceptance and diffusion of such an innovation is significantly reduced.

The Villains of Innovation

Working within the conventional view of the innovation process, the acknowledged villains of innovation are those who oppose the proposed changes. One can consider individuals as embodiments of a larger cultural or corporate ethic of resistance to change. The interplay of political maneuvering within the organizational context can be viewed as a struggle between change and the status quo. Those who resist change are seeking to preserve and protect privileges and benefits derived from existing arrangements (Bright, 1964). Thus, any innovation which cannot be framed as serving to enhance their self-interests would be viewed as a threat to be resisted.

A psychological approach would assert that resistance to change is simply a symptom of the human need for stability, continuity and conformity (Schon, 1967). Anything which threatens this fragile state of equilibrium is therefore viewed as suspect.

At an organizational level, the same argument also holds true for social groups, however on a larger scale. Rather than talking of threats to personal welfare, the rationalization of resistance to change is in terms of protecting professional and functional territories, minimizing the disruptive influence of change on existing systems, minimizing the financial risks necessitated by change. Given that costs are relatively known while benefits are at best future projections, the reluctance to engage in "risky" ventures is a strong impediment to change.

Thus, we are encouraged to view those who oppose innovation as the villains, the nonbelievers who do not see the potential benefits (to individuals, organizations and society) of innovative change and whose motives are felt to be self-interested and narrow. Their responses and action are cast as irrational barriers to the ultimate good which the innovation promises. It is a scenario informed by a technological paradigm founded on the following principles (Fujimoto, 1978, pp. 172-173):

Principle 1. Pro-Innovation Bias: "any knowledge that can be applied should be applied. To hold back is to hold back progress."

Principle 2. The Technological Fix: "any problem created by technology can be solved by technology."

Principle 3. Elitism: only a select group or stratum of people (experts) should be permitted to "handle" technology.

For example, the principles of the technological fix and elitism have both been addressed by Perrow (1984) in his study of accidents in high-risk technologies (e.g., nuclear industry, petrochemical plants, among others). Perrow details how the technological fix has led to a knee-jerk type reaction of designing systems to fix systems thereby compounding the complexity and propensity for failures of sometimes catastrophic proportions. The propensity for systems failure is further compounded by the dominance of a technological elite (scientists, engineers) whose over-reliance on mathematical models and narrow risk-benefit analysis has led to an over-circumscribed (and potentially dangerous) approach to technological development. Schumacher (1973) has also challenged economic cost benefit analysis as being fragmentary and incomplete in that it relates only to the surface of society without delving into the natural and social facts that lie behind them.

However, what if one were to search beneath the surface of this technological paradigm to discover its bases of power? What if we were to examine innovation as it is currently constructed in light of the deep structure games on which it is founded? In other words, if we assume that the current attitudes and beliefs about innovation have political origins, then we can see how the unquestioning evaluation of innovation as "good" may itself be a social or paradigmatic construction resulting from prior deep structure political games. It is with this in mind that we focus on the key principles of the pro-innovation bias, the technological fix, and elitism which support the currently dominant technological paradigm of innovation.

Distortions of Innovation as Scientific Progress

The positive valuation of innovation in and of itself has been noted by a number of other authors (Downs & Mohr, 1976; Kimberly, 1987; Knight, 1967; Rogers, 1983; Schon, 1967; Van de Ven, 1986). This underlies the prescriptions of many to enhance the generation of new ideas, products and processes (Kanter, 1988; Quinn, 1979, 1985) and to facilitate the development, implementation and diffusion of innovations (Rogers, 1983).

The pro-innovation bias which permeates the empirical literature on innovation in organizations and in society is one which equates newness with goodness in an unquestioning way. We are encouraged to promote innovation for its own sake. We are challenged to find more and faster ways by which to guide an innovative idea to fruition. And finally, in the name of "progress", we are entreated to strike down those barriers to change.

However, as historical accounts reveal, this interpretive frame has not been the only conceptualization of scientific progress in Western civilization. During the "Enlightenment" period of the early 19th Century, there was another agenda for progress. As Leo Marx relates, the transition from earlier beliefs to current ones has the vestiges of political action.

> The initial Enlightenment belief in progress perceived science and technology to be in the service of liberation from political oppression. Over time that conception was transformed, or partly supplanted, by the more familiar view that innovations in science-based technologies are in themselves a sufficient and reliable basis for progress. The distinction, then, turns on the apparent loss of interest in, or unwillingness to name, the social ends for which the scientific and technological instruments of power are to be used. (Marx, 1987, p. 71)

Toynbee (1972) relates how the founders of the Royal Society in mid-1800s England, recoiling from the turbulent religious controversies of earlier times, set about to establish a scientific doctrine which would be separate from "traditional Christian intolerance and animosity." To do so, they promoted a factual, rather than religious, study of nature but one which was in itself grounded in theological philosophy.[6] Thus this new scientific doctrine promoted the dominance of man over nature and others and the subjugation of the forces of nature for the service of mankind.

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[6] As Toynbee (1972, p. 142) elaborates: "...in combatting intolerance and violence, the pioneers of the "Enlightenment" were not challenging the Christian doctrine about the relations between God, man, and nature.

This doctrine is enunciated in one sentence within one verse in the Bible. "Be fruitful and multiply and replenish the Earth and subdue it" (Genesis, i, 28)."

Despite the lofty intentions of the founders of "Enlightenment", sociological observers of innovation have noted how technology has not been used for socially neutral ends but instead, reflects the human needs and interests of those involved (Benson & Lloyd, 1983; Bernal, 1939; de Bresson, 1987; Schon, 1967). The process of innovation within this definition of "scientific progress" has proven not to be a neutral one of incremental evolution in the Darwinian sense. Adopting a philosophy of technological determinism denies the critical human role of social choice in innovation.

This technological paradigm has proven to be a resilient one in promoting an illusion that science is separate from and above secular interests. For individuals working within this paradigm, it offers refuge from the disturbing questions about the social effects of their discoveries and inventions. And the study of innovation has revealed a continued subscription to these technocratic principles of scientific progress. For example, the pre-occupation with numerical indices of the number of innovations, rates of diffusion, and proportions of adoption underlie the premise of growth -- more is better and quick action is preferred over inaction (Kimberly, 1987; Rogers, 1983). The language of mathematics carries with it the vehicle for legitimation of research results. Within this approach: "The talk about resistance to innovation tends to come from within the framework of official approval of innovation. It suggests, moreover, that the resistance is somewhat mechanical (inertia, foot-dragging, sand-in-the-gears) and can be removed by mechanical means (motivation, lubrication)." (Schon, 1967, p. 56) Thus the study of innovation can easily fall into the "trap" of concentrating solely on the surface of activity without delving into the underlying forces and interest groups who structure the course of innovative activity.

Another "trap" is a disregard for those phenomena that are less amenable to objective scrutiny and quantitative analyses. As observed by Huxley (1946, p. 35): "Confronted by the data of experience, men of science begin by leaving out of account all those aspects of the facts which do not lend themselves to measurement and to explanation in terms of antecedent causes rather than of purpose, intention, and values." In other words, the principles of the technological paradigm of innovation (pro-innovation bias, technological fix and elitism) create the attribution of villain for anyone(e) who resists and/or questions a proposed change.

Summary

This brief review of the literature and organizational power and politics literatures lays out a framework for understanding innovation both as an often contested technological and social process of change. It is this multi-faceted and interactive perspective on innovation which guides the presentation and discussion of the course of innovation within agriculture. It is with a critical perspective on the technological paradigm of innovation that we now turn to a discussion of innovation and organizational politics within the agricultural sector.

In the next chapter, a description and historical review of the emergence and acceptance of agrichemical, biogenetic engineering and organic farming innovations is presented. One focus will be to utilize the organizational power and politics framework as a way of understanding the organizational political dynamics which influenced these developments. One purpose is to conduct a preliminary case analysis of the available literature in order to identify questions and issues which, within the context of this research proposal, merit further investigation.

CHAPTER 2. THE POLITICS OF INNOVATIONS IN AGRICULTURE

A review of the development of agricultural innovations, in general and in respect to synthetic chemicals, biogenetic engineering technology and organic farming is presented in this chapter. Part A presents a historical overview of innovation in agriculture with a discussion of the social construction of agricultural pests. This is followed by Part B which details the emergence, diffusion and effects of natural and synthetic chemicals and related conventional agricultural practices designed to eliminate and control agricultural pests. Part C details the rise of biogenetic engineering as the most recent entrant into the agricultural arena which in many respects, is a variation and extension of the conventional chemical approach to pest control. And finally, Part D of this chapter traces the course of initiatives which seek to redesign agriculture according to ecological principles. It is an approach which also involves a reconceptualization of pests as indicators or symptoms of unsustainable systems rather than as isolated enemies to be controlled and eliminated (Hill, 1985).

The structure of Parts B, C and D will be to first delineate the historical development of each alternative by identifying key technological discoveries and their impact on agricultural practices, both technical and social. A brief discussion of the identified issues and organizational politics which have surrounded each set of innovations is also presented.

PART A. HISTORICAL OVERVIEW

In his review of major technological change in U.S. agriculture over the last 200 years, Canter (1986) identified the following stages in the adoption of agricultural production technology.

Hand Power (pre-1865)

> Primary innovations: hand-powered implements (ploughs, reapers) and more efficient farming methods (farming practices, mixed fertilizers).

Horse Power (1865 - 1914)

Primary innovations: horse drawn machines and cultivators; new farming practices

Mechanical Power (1915 - 1945)

Primary innovations: internal combustion engine tractors; discovery of chemical fertilizers, pesticides, hybrid corn varieties and improved breeds of livestock.

Science Power (1945 - Present)

Primary innovations: discoveries due to genetic, chemical and mechanical engineering research such as chemical fertilizers and pesticides, adoption of improved crop varieties, irrigation technology, new farming equipment, etc.

To date, the driving force within the science power stage has been chemistry and it promises to continue to play a key role in future technological innovations in agriculture. However, with the emergence of biogenetic engineering technology in the 1980s, many are now forecasting that the primary future innovations will come from the biological and genetic sciences (Naisbitt & Aburdene, 1990; Rifkin, 1983). Thus, it appears that the nature of technological innovation in agriculture is currently at a major transition point.

In terms of agricultural productivity, each technological transition point has heralded increases in production yield rates with the greatest increases being witnessed in the period since World War II. In the United States, the average rate of change in total factor productivity (TFP)[1] in farming from 1948 to 1979 has been 3.5% which compares favourably with the 2.2% increase in TFP for manufacturing during the same time period. However closer examination of these statistics reveal a declining trend in farming TFP, i.e., the 1948-53 TFP rate

[1] Total Factor Productivity is calculated as the ratio of real gross product to total real gross factor input. It provides a measure of changes in productive efficiency by indicating the net saving in use of factor inputs per unit of output overtime.(Kendrick, 1983)

of change was 5.5% whereas it was only 2.1% in the 1973-79 time period.[2] In terms of labour productivity, within the farming there has been a 4.9% positive rate of change in output per unit of labour from 1948-79. Again, there appears to have been a gradual declining trend with a 6.8% increase during the 1948-53 time period to the 1973-79 rate of change of 3.6% in output per unit of labour. However, compared with other U.S. industries, the farming industry has consistently scored higher in increases in output per unit of labour in all time periods (Kendrick, 1983). Overall then, labour efficiency since 1940 has increased significantly in that the labour required to farm one acre of land declined 75% while farm output per acre has doubled with the net result being that farm labour is now eight times as productive than in 1940 (National Research Council, 1989). Some forecasts indicate a future levelling off of growth rates due to a number of social and resource constraints, e.g., loss of farmland due to urban sprawl; reduction of energy supplies and rising energy prices; cost of irrigation due to rising water prices; and influence of conservation and environmental improvement policies (Canter, 1986).

These technological developments in the United States closely mirror those experienced in the Canadian agricultural sector (Statistics Canada, 1989). While the nature of the cause and effect relationship is subject to debate, corresponding changes of more social, cultural and economic natures have accompanied the widespread adoption of these technological innovations. In effect, these technological innovations have spurred a number of social innovations in the way agricultural production is practised. The intensified crop production practices which rely heavily on fossil fuel and electricity inputs (to power the new specialized farm machinery and to produce petrochemical based fertilizers and pesticides) have necessitated large increases in the capital requirements for farming. Whereas farmers were previously able to replenish their crop seed stock from prior years' crop surplus, the emergence and adoption of hybrid seed strains (which have significantly higher yields but are

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[2] It should be noted that all U.S. industry groups have experienced a similar decline in TFP rates of change. For example, manufacturing TFP only increased .3% in the 1973-79 time period. (Kendrick, 1983).

not self-regenerating) has resulted in an increased reliance on commercial seed companies for this input to production (Doyle, 1985; Suzuki & Knudtson, 1988).

Another development in the agricultural sector has been the increased product specialization of farming heralding the replacement of diversified farms with those focusing on the production of monocultured crops. This transition is the net result of a number of factors. First, chemical pesticide and fertilizer application is easier in a monoculture crop environment. Second, capital investment in expensive specialized cultivating and harvesting equipment can be more quickly recovered when used repeatedly on a large scale. Further, there have been government policy incentives which encourage the large scale production of certain selected crops as witnessed by the government grain subsidy programmes in the Prairie provinces. (Auer, 1989)

To take an alternative or critical approach to evaluating these developments, one need only look at the vulnerabilities created by this course. One outcome of the increased mechanization of farming has been the selection of produce which can endure mechanical harvesting. Thus we see the emphasis on the development of food varieties for qualities of hardiness, appearance and uniform maturity dates rather than for taste or nutritional value. (Hightower, 1976)

Another outcome of capital-intensive production methods has been the emphasis on obtaining increasingly higher yields from the same area of land. In order to rationalize the cost of the machinery (and repay loans secured to purchase equipment), farmers have turned to synthetic chemical fertilizers and pesticides to enhance crop production. The dominance of monoculture and continuous crop production (the planting of large tracts of land with single crop plant species repeatedly) aggravates pest problems by creating a favourable environment for specialized insect and weed populations (Pimentel, 1986). The practice of increasing crop density by planting seeds closer together may increase the productivity yield per acre but at the same time increase the concentration of food for undesired insect pests and plant diseases.

Fundamental to this shift has been the development of strains of crops which will meet the primary criteria of high yields. As learned in the "Green

Revolution" (Johnson, 1972) though, these elite "superseeds" can fulfil their promise only if coupled with intensive irrigation and massive chemical inputs (Doyle, 1985; Merrill, 1976; among others). One result has been a dramatic increase in yields but at the potential price of the creating a barren earth for future generations through depletion of the topsoil,[3] dependence on non-renewable petroleum resources as inputs to production, and declining net farm income due to increased costs of production (Commoner, 1978; Gillingham, 1978). Another outcome has been the increased genetic vulnerability to natural pests and diseases which has resulted from the development of only limited strains of seeds (Kloppenburg & Kleinman, 1987). This outcome was most clearly demonstrated in the 1970-71 Southern Corn Leaf Blight epidemic in which a new strain of fungus had found a "genetic window" to threaten 43% of the U.S. corn acreage which had been seeded with six inbred seed lines (Doyle, 1985).

The selective development of crop seed varieties for their productivity potential is often a trade-off with selection for pest resistance. New crop introductions often lack a natural resistance to native insects and plant diseases thus creating an additional vulnerability to pest losses. Further compounding the problem is the greater genetic variability and adaptability of insects (compared to plants) to counteract any evolving plant resistance to pests.

One view of agricultural innovation would focus on the surface results of increased volumes to meet the needs of a growing population. However, searching below and behind these developments with a focus on the power dynamics of innovation, one gains a less neutral perspective. In close accompaniment with the increased vertical integration of producers and distributors of food in the hands of corporations rather than independent farmers has been the large scale entry of chemical companies (traditional suppliers of the chemical inputs to farm

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[3] As Gillingham reports (1978, p. 93), given the continuation of current agricultural practices: "By the year 2000, twenty-five percent of all the energy consumed in the world in 1973 will be required just to produce nitrogen fertilizer. Soil depletion in the form of microbial life, nitrate and salt accumulation and loss of organic matter and plant nutrients are other factors which often accompany present practices."

production) into biotechnology and agricultural genetics research.

The Social Construction of Agricultural Pests

> The control of pests has been desired throughout more than 10,000 years of farming because pests have always competed for food. (Marco, Hollingworth & Durham, 1987, p. 192)

> The word 'pest' refers to a wide range of plant and animal species that annoy us, endanger our health, attack our cherished possessions, or rob us of food and fibre...pests are noxious, obnoxious, and larcenous... (van den Bosch, 1978, p. 57)

As these quotes indicate, pests are economically, not biologically defined. The negative attribution of "pest" to an insect, weed or disease is usually a function of time, place and human values. Consider, for example, the common dandelion. For the North American home owner, a dandelion growing in a lawn is viewed as a weed to be eliminated. Alternatively, for aficionados of dandelion wine or coffee, a dandelion is a resource to be harvested for human consumption, not a pest to be destroyed. Through this simple analogy, we see how the definition of pest is one that is culturally and socially defined -- what is one person's pest may be another's valued resource. The same holds true for pests in the agricultural sector.

The "problem" of agricultural pests has fuelled efforts within three alternative groups of innovations which have the most relevance to current and future issues surrounding agricultural pests and will be the primary focus of the remainder of this proposal.

PART B. NATURAL AND SYNTHETIC CHEMICAL INNOVATIONS IN AGRICULTURE

In early history, the primary technological skills utilized to eliminate weeds were to plough and till the land to remove unwanted seeds and plants. Crops were sequentially rotated on a parcel of land in order to prevent the buildup of populations of unwanted insect and plant life. The use of chemical compounds to battle insects can be traced back to 2500 B.C.E. when the Sumerians used sulphur compounds in agriculture. Evidence of the use of both inorganic (mercury, arsenic, oil) and biological pesticides is found in the writings of Greek and Roman writers such as Homer, Aristotle, Cato. Developments in chemical and biological control of pests can be traced back to as early as 1200 B.C.E. in China.

The advent of the European Renaissance in the 18th and 19th Century brought a new approach to agriculture and pest control which built on the scientific experimental method (Gips, 1987; Green, 1976). The main active ingredients used in these early experiments were arsenic, antimony, selenium, sulphur, thallium, zinc, copper and various oils. In France, copper sulphate was found to prevent wheat bunt disease in 1807. The subsequent combination of copper sulphate with hydrated lime yielded the "Bordeaux mixture" to battle a fungicide on grape plants. In 1867, U.S. farmers used "Paris Green", an arsenical poison, to kill Colorado beetles in cultivated potato lands. The first selective herbicide was discovered by a French vine-grower, Bonnet who in 1897 applied a solution of copper sulphate to his crop and noted that although the charlock weed was killed, the oats were unaffected. In the U.S. in 1901, a North Dakota farmer found that ferrous sulphate was useful for controlling broad-leaved weeds in cereal crops. (Green, 1976)

While early experiments focused on the use of inorganic compounds, the major discovery and development of synthetic organic chemicals was due to advances in organic chemistry in the modern pharmaceutical industry during the 1930s. Although the organochlorine DDT was discovered in 1874, it remained "on the shelf" until Dr. Paul Mueller discovered its insecticidal properties in 1938 (Mueller received a Nobel prize in 1948 for this discovery). Ironically, the outbreak of WWII accelerated research on a wide variety of pesticides (DDT and other organochlorines insecticides, organophosphorous insecticides, and selective herbicides) -- not for the purpose of battling insects, but as part of a military arsenal for chemical warfare. The WWII war effort also contributed to the production of synthetic nitrogen and ammonia fertilizers. As reported by Fryer (1986, p. 33), the U.S. government assisted in the construction of 10 ammonia plants during 1941-1946 and established special tax writeoffs in 1951 which led to the construction of 17 additional facilities.

These newfound chemicals formed the basis of the agrichemical industry whose products served to transform agricultural practices throughout the world. The widespread commercial acceptance and diffusion of synthetic organic chemicals as pesticides (insecticides, herbicides, fungicides) and fertilizers has been one of the major hallmarks of what is now regarded as scientific agriculture.[4] The extent to which these compounds have been accepted is illustrated by current references to their use as part of "conventional" agriculture.

Scientific research on these chemicals has been an especially prolific one. As of 1983, there were 35,000 pesticide products (with 600 different active ingredients) on sale throughout the world (Ekstrom & Akerblom, 1990). The U.S. pesticide market is the largest in the world, consuming 34% of all pesticides produced with 1980 retail sales value of $5.8 Billion (A.L. Young, 1986). Currently, an average of 20% of total agricultural input costs is due to expenditures for pesticides. There are variations though, in pesticide input costs by type of crop. USDA estimates of 1986 variable and fixed costs for major crops show that for corn, 55% of variable costs (34% of total costs) were for fertilizers and pesticides (compared to 9% of variable costs for fuel and 14% for seeds). Comparable statistics for wheat show that 40% of variable costs (23% of total costs) were for fertilizers and pesticides with 4% of variable costs for

[4] The application of pesticides in U.S. agriculture has intensified significantly over the years. Between 1964 and 1982 there was a 170% increase in the total pounds of active pesticide ingredients applied on farmland while total acreage under cultivation remained relatively constant. For some crops, such as corn, the increase in herbicide usage has been even more dramatic. In 1971, 1.7 lbs. of active pesticide ingredients were applied per acre whereas by 1982, 3.1 lbs. per acre were applied. (National Research Council, 1989)

fuel and 13% for seeds.(National Research Council, 1989).

Canada also ranks high on the list of consumers of these products. After adjustment by the Statistics Canada price list, total pesticides sales in Canada increased fourfold from $57.3 million to $243 million from 1971 to 1981. Approximately half of these sales were to the agricultural sector (Castrilli & Vigod, 1987). In 1985, Canada used a total of 39,259 tonnes of active chemical ingredients (insecticides = 3172 tonnes; fungicides = 2823 tonnes; herbicides = 30,181 tonnes; other = 3083 tonnes). (Organisation for Economic Co-operation and Development (OECD), 1989) While there had been a steady increasing trend in the use of commercial fertilizer and herbicides in Canada (for both number of farms and farm acres from 1971 to 1986, the use of both have declined in the past five years.(Statistics Canada, 1992a) In Canada, 59% of farms used commercial (synthetic chemical) fertilizers in 1991, down from 66% of farms in 1986. The total area of crops fertilized in Canada also dropped from 70% in 1986 to 64% in 1991 but it is still much higher than the 25% of crop area fertilized in 1971. In terms of herbicide usage, 49.4% of Canadian farms used herbicides on weeds and brush, down from 59% of farms in 1986. The total farmland area treated with herbicides also dropped from 55% in 1986 to 52% in 1991 but again, the treated area remains much higher than the 1971 level of 22% of farmland. Crop expenditures for fertilizers, agricultural chemicals and seeds constituted 12.2% of total Canadian farm business expenses ($20.3 Billion) in 1991 (Statistics Canada, 1992b). Given that the average total farm business expense per farm in 1991 was $72,488, this represents an annual outlay of $8844 for these inputs to production.[5]

Given these large expenditures for synthetic pesticides, what are the expected benefits to be derived from their use? David Pimentel (1986), professor of entomology at Cornell University, estimates that 37% of U.S. crops are lost annually to pests (13% to insects; 12% to pathogens, and 12% to weeds).

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[5] Within B.C. agriculture, however, expenditures for fertilizers, agricultural chemicals and seed only represented 7.1% of total farm business expenses in 1991. Based on an average total farm business expense of $58,618, this translates into an annual expense of $4162 for these inputs to production (Statistics Canada, 1992b).

Calculated on the basis of harvested crop value, this represents an economic loss due to pest damage of U.S. $50 Billion per year. Estimates by the Entomological Society of Canada show that over a 20 year period (1960-1980) there is a $3.40 return in apple yields and a $6.20 return in potato yields for each dollar spent on pest control (largely pesticides) (Fairbairn, 1984, p. 5). The Canadian Agricultural Chemicals Association (now the Crop Protection Institute) estimates that if a total ban on all agrichemicals was enacted, there would be an immediate yield reduction of 50% and increase of 200-300% in consumer food prices (as cited by Fairbairn, 1984, p. 57).

However, Pimentel and others point out that these economic calculations do not include the external costs to the environment -- the negative environmental externalities associated with the extensive use of synthetic chemicals (pesticides and fertilizers) in agricultural production. A list of documented environmental impacts of these inputs is quite extensive (derived from Carson, 1962; Conway & Pretty, 1991; Gips, 1987; Hynes, 1989; Metcalf, 1986; OECD, 1989; Pimentel, 1986; The Conservation Foundation, 1987; van den Bosch, 1978; and others).

(1) Effects on the Human Population

a. Increase in harmful pesticide residues in crops and food products for human consumption.(Davies & Doon, 1987; Maddy, Edmiston & Richmond, 1990; Metcalf, 1986; National Research Council, 1987; Pimentel, 1986)

b. Pesticide poisonings of farmworkers -- fatalities and illnesses (cancer, neurological disorders, etc.) resulting from acute and chronic exposure to synthetic chemical pesticides and fertilizers. (Conway & Pretty, 1991; Hynes, 1989; Maddy et al., 1990; National Research Council, 1989; Pimentel, 1986; Suderman, 1993)

c. Occupational exposure in pesticide production resulting in worker fatalities and illnesses.(Brown, 1987)

d. Industrial accidents in pesticide production causing fatalities and illnesses amongst production workers and those living in the vicinity of production facilities (eg., Union Carbide factory accident in Bhopal, India).(Weir, 1987)

(2) Effects on Natural Wildlife.

a. Decline of natural soil organisms and habitats due to metabolic, reproductive, genetic and behavioral changes caused by exposure to chemical pesticide residues.(Conway & Pretty, 1991; Hill, 1977)

b. Destruction of natural wildlife due to acute (poisoning) and chronic (reproduction productions, mutations) exposure.(Carson, 1962; Castrilli & Vigod, 1987; Conway & Pretty, 1991; Hall, 1987).

(3) Effect on other farm products and resources.

a. Livestock destruction and contamination.(Conway & Pretty, 1991; Fox, 1986)

b. Unintended crop destruction by pesticides due to pesticide drift onto sensitive crops.(Castrilli & Vigod, 1987; Fairbairn, 1984; Pimentel, 1986)

c. Compaction and erosion of soil.(Conway & Pretty, 1991; Senate of Canada, 1984)

(4) Effects on Water Resources.

a. Contamination of groundwater supplies by nitrates and pesticides. (Carsel & Smith, 1987; Conway & Pretty, 1991; MacQueen, 1990; National Research Council, 1989; OECD, 1989; The Conservation Foundation, 1987)

b. Eutrophication and oxygenation of surface and coastal waters.(Nimmo, Coppage, Pickering & Hansen, 1987)

(5) Effects on Insect Populations (the "Pesticide Treadmill").

(Conway & Pretty, 1991; Metcalf, 1986; National Research Council, 1989; Pimentel, 1986; van den Bosch, 1978).

a. Destruction of pollinators (e.g., bees).

b. Suppression of target pest populations.

c. Selection of insecticide resistant pests.

d. Destruction of natural enemies through direct suppression, reduction of host or prey population, and contamination of food supply.

e. Promotion of pest resurgences and secondary pests caused by the disturbance of the natural ecological balance.

(6) Effect on the General Environment.

a. General ecotoxicity which is aggravated by pesticides which are highly persistent and bioaccumulative.(Conway & Pretty, 1991; Metcalf, 1986)

b. Soil and water contamination from landfill disposal sites. (Castrilli & Vigod, 1987)

The growing accumulation of scientific data on the negative side-effects of agrichemicals has not gone unnoticed by the public. It has fuelled public and government action to regulate and reduce their production and usage.

The Organizational Politics of Agrichemicals

The growth in the usage of chemicals to combat pests has been fraught with political battles within government, within the academic community and within the agricultural community. In his book, The Pesticide Conspiracy, van den Bosch presents numerous accounts of such politics from his personal experience as an entomologist (he was Chairman of the University of California, Berkeley's Division of Biological Control) and primary advocate of Integrated Pest Management (IPM). What is most interesting is that van den Bosch was an advocate not of eliminating the usage of these chemical compounds, but rather for their usage on an as and when needed basis. IPM programmes propose an integrated approach to pest management which draws on the scientific knowledge of chemical, biological and cultural controls.[6] However despite the proven merits based on traditional scientific research of this integrated approach (National Research Council, 1989; van den Bosch, 1978; and others), IPM has yet to achieve widespread acceptance and diffusion within the agricultural community. Why is this so?

Van den Bosch (1978) asserts that the source of this resistance can be traced to what he terms to be the "Pro-Pesticide Mafia" which has infiltrated the academic community and government agencies. He presents evidence showing how the integrity of academic research has been compromised in the land grant universities and government agricultural experimental stations through their dependence on agrichemical research funds. He is no less critical of the government agencies which have responsibility to regulate and control the usage of dangerous pesticides. In one telling incident, van den Bosch recounts how public officials and agrichemical companies colluded to suppress information about a dangerous pesticide from a farmworkers union (UFWOC) in California (van den Bosch, 1978, pp. 73-79).

Van den Bosch also asserts that the government agencies set up to regulate the use of agrichemicals have been co-opted by the pesticide industry. The USDA relies heavily on the input of the agrichemical researchers in their recommendations for agricultural production. Despite the initial intentions of the EPA to be an independent arbiter for environmental protection, van den Bosch recounts how this agency was attacked following their banning of DDT and now has no real ability to serve as a watchdog.

Van den Bosch is not alone in his critique of the role of academia and government in supporting agricultural practices which rely heavily on chemical inputs. Altieri (1987), Berry (1976) and Hightower (1976) are extremely critical

[6] However IPM is not without its critics. For example, Hill (1985) challenges the ecological merits of IPM in that it promotes a continuation of curative solutions rather than preventative ones to pest control. The net effect is that the achievement of long term sustainable agricultural systems which are not environmentally destructive is compromised.

of the U.S. land grant complex (colleges of agriculture, agricultural experimental stations and state extension services) which focus their research on technology, integrated food processing and economic efficiency to the exclusion of the needs of the rural community and the consumer. Young (1986) reports that U.S. government funding of pesticide research in 1984 totalled $208.2 Million (1436 scientist manyears) while private industry expenditures in this area totalled $432 Million (2701 scientist manyears). Of the government funded research, $74.5 Million was allocated to improved means of nonpesticidal control and $56.4 directed towards fundamental biology. Toxicology related research totalled $399 Million in 1985.

While Canada has yet to witness the emergence of similar whistleblowers on the agrichemical industry (perhaps due to the fact that the majority of pesticides are produced and tested in the U.S.), agricultural research in Canada appears to be similarly biased towards supporting conventional agricultural practices (MacRae, Hill, Henning & Mehuys, 1989; McEwen & Milligan, 1991). Further, the dynamics of agricultural research in Canada appears to differ somewhat from that in the U.S. in that only 15% of agricultural research in Canada is done in private industry with 35% being conducted in universities. Much of the research is done in cooperation with federal and provincial government agencies with the private industry component of university research ranging from 1% to 8% of these budgets (Klein & Furtan, 1985).

Pest control research appears to be an endangered discipline in Canada. Fairbairn (1984) notes that there has been a decline in the number of federal department entomologists from more than 200 in 1970 to less than 140 in 1981. Further, there are only 1800 professional scientists conducting agricultural research in Canada, of which 900 are federal employees, 300 are provincial or university based and 300 are in private industry. One implication of this decline in agricultural and entomological scientists is that Canadian industry and government regulatory agencies will become increasingly dependent on the work of the U.S. research complex with all of its identified problems.

Where the organizational politics surrounding agrichemicals has been most intense and visible has been in regards to the revision of existing government regulations concerning pesticides. In Canada, pesticides and their usage are regulated under the Pest Control Products Act (Agriculture Canada), the Food and Drugs Act (Health and Welfare Canada) and the Environmental Control Act (Environment Canada). In order to gain registration of a new product, the submitting company must provide technical data including: "draft label; product chemistry; toxicology; metabolism studies; food, feed and tobacco residue studies; and information on environmental chemistry, environmental toxicology, and efficacy" (Castrilli & Vigod, 1987, p. 45). While responsibility for the final decision remains with Agriculture Canada, this data is also reviewed by Health and Welfare Canada (for an assessment of potential health hazards from occupational and bystander exposure as well as residues in food); Environment Canada (for an assessment of potential environmental contamination, impact on wildlife and non-target organisms, etc.); and Fisheries and Oceans Canada (for an assessment of potential impact of the pesticide on fish and other non-target aquatic organisms as well as fish habitats). Evaluations are conducted on both the active ingredient as well as the final product formulation.

One factor which significantly affects the regulatory process within Canada is the close cooperation of Canadian officials with their counterparts in the United States. The review process and standards (e.g., tolerance level calculations) used by Canadian officials closely parallel those in place in the United States. There are relatively few pesticide manufacturers located in Canada, this country is a net importer of pesticides with much of it originating in the United States which is the world's largest producer.[7] Therefore, Canadian officials must rely heavily on the regulatory decisions made in the United States regarding the safety of individual pesticides. Thus, observations

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[7] Corporate concentration within the agrichemical industry is significant with 36 companies controlling over 90% of the world's pesticide production. Of the top 20 agrichemical producers in the world, 10 are headquartered in the United States. The majority of these corporations are either petroleum companies (e.g., Shell, Chevron) or pharmaceutical companies (ICI, Bayer, Ciba-Geigy, Monsanto, Eli Lilly, Sandoz, Dow). (Gips, 1987, pp. 299-300). As Fairbairn (1984) notes, 96% of the active ingredients used in pesticides in Canada are imported.

regarding the U.S. regulatory system have direct relevance to the reliability and validity of the Canadian regulatory process especially when the issue of international harmonization of pesticide regulations under the Canada-U.S. Free Trade Agreement is considered (Wilson, 1992b).

In the United States, the registration and hazard classification of new pesticides is under the jurisdiction of the Environmental Protection Agency whereas the Food and Drug Administration is responsible for the regulation of the sale and use of pesticides. Criticisms of the regulatory process within the U.S. focus on the following issues (Mott & Snyder, 1987):

a. Premature licensing of chemicals for use and established tolerances prior to performance of key health and safety tests. A review by the General Accounting Office of the U.S. Congress found that most of the 50,000 pesticides registered for use today have not been fully tested (Gips, 1987).

b. The almost exclusive reliance of the EPA on pesticide manufacturer conducted health and safety tests. The EPA does not have the resources to conduct such tests and therefore must rely upon and trust the integrity of the scientific data provided to them. Unfortunately, there have been a number of scandals involving inadequate, invalid and fabricated data used to support claims of pesticide safety (van den Bosch, 1978; Doyle, 1985; Hynes, 1989).

   Perhaps the most notorious case involved Industrial Bio-Test Laboratories, Inc., a commercial testing laboratory which was investigated by both U.S. and Canadian agencies in 1977 (Castrilli & Vigod, 1987; Fairbairn, 1984). The joint investigation revealed that 74% of the 801 health studies (which showed minimal or no effect for birth defects, cancer, mutations and reproductive problems) reviewed were found to be invalid thereby placing into question the safety of 40 pesticides. The extent of data falsification is shown by one report in which more rats were listed alive at the end of the test than had been alive at the beginning. Four former IBT executives were subsequently indicted for fraud by a U.S. grand jury in 1981. Note however, that despite this evidence, as of 1983, Canadian officials had only revoked two out of the 10 chemicals which had been registered on the basis of invalid IBT data.

c. EPA tolerance levels for pesticides are based on average food consumption. Some of the tolerance levels are calculated by dividing total U.S. annual production of a commodity by the nation's population, a calculation which does not take into account special dietary habits of the population. Other calculations of tolerance levels are based on average adult consumption of food products. This procedure does not allow for exposure and tolerance differences for infants and children, the elderly or the infirm, or for different regional and ethnic dietary habits.(Wargo, 1987)

d. The FDA has experienced problems in enforcing the residue limits of certain pesticides which are undetected by routine laboratory methods. Further, there have been delays in completing re-evaluations (average 28 days for sample analysis and processing) during which usage of the pesticide continues.

e. General lack of enforcement. A recent government report indicated that 60% of domestic food cases had illegal residues. However, the FDA did not prevent the sale of this food, nor did it penalize growers for using banned substances.

As identified by the Law Reform Commission of Canada (Castrilli & Vigod, 1987), there are a number of gaps in both the Canadian and American regulatory processes. As a result of their review (and noting the interrelationships between the two regulatory systems), the Commission made a number of recommendations which would increase governmental authority to act and provide the opportunity of individual parties to participate in the registration and re-evaluation decision making process.

Perhaps most controversial is the Commission's recommendation that: "The FDA should be amended to require that no detectable residue levels be allowed where a pesticide has been found to be carcinogenic, mutagenic, teratogenic or to produce adverse neurotoxic or reproductive effects in human beings or animals."(Castrilli & Vigod, 1987, p. 127) As will be discussed later, this recommendation is particularly contentious given the controversy surrounding what constitutes "acceptable" levels of risk. Further, if enacted and enforced, such a recommendation would serve to severely restrict acceptance of significant amounts of fruits and vegetables. For example, Mott and Snyder (1987) cite U.S. FDA data which shows that pesticide residues have been detected in 38% of domestic food samples and 64% of imported samples (19,415 samples in total). The types of fruits and vegetables which had the highest pesticide incidence (>40% of samples) included strawberries, peaches, celery, cherries, cucumbers, bell peppers and tomatoes. The least affected (<10%) were onions, cauliflower, watermelon, bananas and corn.

Interestingly, the "zero risk" standard for food additives (including pesticides) has existed in the U.S. Federal Food, Drug and Cosmetic (FDC) Act administered by the EPA since 1958 (National Research Council, 1987). This provision, known as the Delaney Clause, "prohibits a food or feed additive tolerance for any pesticide that is found to cause cancer in humans or animals when the residues of that pesticide <u>concentrate in a processed food or feed</u> above the level allowed in the raw agricultural commodity" (National Research Council, 1987, p. 42). In actual practice, the Delaney Clause has been seldom used due to its limited scope on processed, as opposed to unprocessed, fruit, vegetable and animal products; and to the presence of a "flow through" provision which allows for the risk/benefit tolerance calculations of another section within the FDC Act if a crop has no recognized processed form. If the EPA were to eliminate this inconsistency in standards and apply the zero-risk standard to all processed and raw foods, the impact on pesticide usage would be considerable. For example, food use tolerances for all 53 pesticide active ingredients determined by the EPA to be oncogenic would be revoked. This would affect 44% of fungicides, 17% of herbicides and 19% of insecticides currently registered for use in U.S. agriculture. Ninety-five per cent of all crops would lose current pesticide tolerance standards (representing 25% of all raw and processed food forms with currently approved tolerance levels). The possibility of zero tolerance pesticide residue levels is gaining momentum in the United States where increasingly stricter environmental regulations are being introduced at both federal and state (in particular, California) which will severely restrict the number and types of available pesticides (The Western Producer, 1993, Feb.18).

The Law Reform Commission's recommendations for more stringent regulation of pesticide registration and usage are consistent with those proposed by the OECD (1989) and United Nations agencies (Ekstrom & Akerblom, 1990). Generally, there appears to be a worldwide trend towards government policy initiatives to: enforce and strengthen existing environment regulations; control the production and usage of synthetic pesticides (one suggestion is the taxing of chemical inputs); and encourage the development and use of alternative agricultural practices. One leader in this regard is Great Britain whose Food and Environmental Protection Act (1985) actually expands the powers of government to control pesticide use at the farm level (Carr, 1987).

In June 1989, the Canadian federal government appointed the 12 member Pesticide Registration Review Team (PRRT) to develop recommendations to review the federal system for the regulation of chemical pesticides and to promote more environmentally acceptable approaches to pest management in agriculture and forestry (Pesticide Registration Review, 1990). The PRRT was comprised of representatives from government agencies, industry, consumer associations, health and medical associations, organized labour, and environmentalist organizations. During a very intensive information gathering and consensus building process which involved a cross-Canada series of public hearings, the PRRT issued their final report in December 1990 (Egri & Frost, 1992; Versteeg, 1992a, 1992b). Amongst their recommendations were several significant changes to the existing pesticide regulatory system such as: the creation of an independent Pest Management Regulatory Agency; the establishment of a Pest Management Promotion Office which would promote environmental sustainability through programmes and research focusing on reducing the use of pesticides through the development of alternative means of pest management; the establishment of the Canadian Pest Management Advisory Council, a multi-stakeholder body which would advise the Ministers of Agriculture and Health and Welfare on an ongoing basis; the establishment of an 18 month time limit on government decisions regarding pesticide registration applications. While the federal government has decided not to implement the Review Team's proposals for an independent regulatory agency or the 18-month time limit on pesticide application decisions, it has initiated negotiations with affected stakeholders to implement a number of the Review Team's recommendations. As of the spring of 1993, the government proposal for legislation to revise the pesticide regulatory system is still in the committee stage -- much to the chagrin of those stakeholders who have been involved in the development process. [See Egri & Frost, 1992, for a complete discussion of the PRRT process.]

In British Columbia, the Ministry of the Environment and the Ministry of Agriculture has introduced a Pesticide Applicator Certificate program which is mandatory for those who are contract applicators as well as "anyone purchasing or using "Restricted" use pesticides, as of January, 1992" (B.C. Ministry of the Environment, 1990). Additional farm safety regulations are also being developed in B.C. which would bring farmworkers under the jurisdiction of the Workers' Compensation Board. One feature of the new regulations would be the requirement of protective clothing for all farmworkers who handle pesticides, fertilizers and other agrichemicals. This is scheduled to come into effect in April 1993 and will be mandatory, not voluntary as preferred by the B.C. Federation of Agriculture.(Noonan, 1993; The Western Producer, 1992, June 11)

The overall impact of this growth in government regulation of pesticides may be to create a more hostile environment for the pesticide producers. In an EPA sponsored study on the impact of government legislation on pesticide manufacturer research and development, it was concluded that regulation had resulted in significant increases in both time and costs incurred during pesticide development thereby increasing financial risk for producers, and that innovation was suffering due to the need to allocate more resources to the defense and maintenance of existing product lines. This in turn would lead to a greater emphasis on the development of products which were high volume/profit compounds (e.g., herbicides); products which could be used on major agricultural crops; and a continued decrease in the number of new pesticides introduced into the marketplace. (Schweitzer, 1977)

What these developments in government regulatory policy reflect is the growing public awareness and apprehension surrounding the negative environmental and human health effects of this group of synthetic chemicals. Environmental advocates can point to a number of surveys of Canadian and American consumers which have shown that 60% of Canadians and 96% of Americans regard pesticides as a hazard in food (see MacRae et al., 1988). Scott (1987) cites two polls which indicate that 84% of the U.S. general public favoured tighter restrictions on the use of agricultural chemicals. 65% of the farmers polled (operating and retired) also favoured such restrictions, although as Antle (1991) points out, the farm organization lobbies have consistently opposed tighter pesticide regulations. In the late 1980s, government agencies have proven to be increasingly subject to and responsive to the influence of environmental and consumer advocacy groups. This contrasts sharply with the picture painted by van den Bosch and others of the previous situation where the agrichemical industry exerted the most influence on government decision making. This transition in perspective (which is by no means complete) can be traced to a number of converging factors. First, environmental activist groups have become increasingly sophisticated in their strategies for influencing government policy makers. As Douglas and Wildavsky (1982) assert, these interest groups have been able to tap into recent communication technologies to generate more funds and wider public commitment to their causes. They have established vehicles to more effectively lobby politicians and government officials. They have also been successful in developing political champions for their causes. For example, in the Natural Resources Defense Council (an environmental activist group) sponsored book Pesticide Alert, the preface by Congressman Henry A. Waxman, Chairman of the U.S. House of Representatives' Subcommittee on Health and the Environment is as follows:

> The demand for a safer, more wholesome food supply is also being felt in the halls of Congress and the corridors of those agencies charged with protecting public health, including the Environmental Protection Agency and the Food and Drug Administration. The changes in government regulation of pesticides which are now under discussion are being driven by the expression of concern that you [the American consumer] convey to us. In the battle for safer food, Pesticide Alert is a welcome new weapon to arm consumers for effective citizen action. (in Mott & Snyder, 1987, p. viii)

Perhaps the most extensive interest group advocating non-pesticidal alternatives in agricultural production is the Pesticide Action Network (Gips, 1987). This international grassroots network of 300 nongovernmental organizations was formed in 1982. In 1985, PAN launched a public information campaign about the continued usage of 12 of the world's most hazardous pesticides (including DDT, EDB, PCP, etc.) which although are banned in an average of 12 countries each, continue to be produced and exported to Third World developing countries. In 1986, the Pesticide Action Network held a press conference on World Environment Day in Ottawa at which the "Ottawa Declaration" was released. This declaration was the joint statement of 27 Canadian and American scientists in a call for research on alternative sustainable systems of agriculture and the discontinuation of the production and use of hazardous pesticides. In B.C., there is the B.C. Coalition for Alternatives to Pesticides which promotes the adoption of organic alternatives to pesticides.

In British Columbia, the Ombudsman of British Columbia issued a report in 1988 on the regulation of pesticide use by the provincial government. While primarily a review of the pesticide use permit system for the spraying on publicly owned land (forests, highways, etc.) and water, he noted that although there were only 60 appeals on the over 700 pesticide use permits granted in B.C. in 1986,

> "It is important to note that the individuals who appeal the granting of pesticide use permits, and who complain to the Ombudsman include members of public interest groups, unions, medical associations, Indian bands, ratepayer associations, municipal and regional district elected officials - in all representing thousands of British Columbians who are concerned about the adverse effects of pesticide use."(Ombudsman of B.C., 1988, p. 18)

As the Ombudsman noted in his concluding remarks, public involvement and consultation in the government decision making process concerning pesticide use "will guarantee that individual health and safety concerns as well as good environmental management will be taken into account" (Ombudsman of B.C., 1988, p. 65).

Risk as a Social Construction

> That choice depends upon the alternatives, values, and beliefs that are considered. As a result, there is no single, all-purpose number that expresses "acceptable risk" for a society.
>
> Values and uncertainties are an integral part of every acceptable-risk problem. As a result, there are no value-free processes for choosing between risky alternatives. The search for an "objective method" is doomed to failure and may blind the searchers to the value-laden assumptions they are making...
>
> Not only does each approach fail to give a definitive answer, but it is predisposed to representing particular interests and recommending particular solutions. Hence, choice of a method is a political decision with a distinct message about who should rule and what should matter. (Fischhoff, Lichtenstein & Slovic, as cited by Douglas & Wildavsky, 1982, p. 4)

Douglas and Wildavsky (1982) argue that risk is a collective construct created by social forces therefore it is essentially a political and social issue between groups holding different sets of interests, values and beliefs. They offer little hope for the achievement of agreement over appropriate methods to assess risks, the acceptance of public processes designed to achieve this goal much less agreement on acceptable levels of risk. They further assert that no value free decisions can be made in matters of life and death, that there is no such thing as scientific neutrality when dealing with social beliefs about pollution.

Douglas and Wildavsky present a useful typology of the four problems of risk. The nature of a technology is conceptualized along two dimensions: knowledge (certain vs. uncertain) and consent (complete vs. incomplete). Perceptions of risk escalate with the degree of uncertainty associated with a technology and the extent to which consent amongst parties for a technology's introduction and/or application is incomplete. Much of the debate surrounding pesticides centres on what is the level of "acceptable risk." Agrichemical

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TABLE 2-1. PROBLEMS OF RISK

(Source: M. Douglas & A. Wildavsky (1982) Risk and Culture)

CONSENT	KNOWLEDGE: Certain	KNOWLEDGE: Uncertain
Complete	Problem: Technical Solution: Calculation	Problem: Information Solution: Research
Incomplete	Problem: (dis)Agreement Solution: Coercion or Discussion	Problem: Knowledge & Consent Solution: ?

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spokespersons assert that all pesticides are safe if used properly. Opponents charge that no level of pesticide residue in the environment or food products is acceptable or safe. Compounding the problem is the recognition by toxicologists themselves that toxicology is partly a science and partly an art (Wilkinson, 1987). There is uncertainty about the true relationship of cause and effect of chemicals on environmental, animal and human health. Most of the toxicology studies are conducted on rats but there are questions as to the generalizability of these test results to other animal species (including humans) given differences in metabolisms (National Research Council, 1980).

There is also a lack of scientific data about the different effects of acute versus chronic exposure to these chemicals and the epidemiological effects of their presence in the environment (Davies & Doon, 1987). And at a most fundamental level, there is the question of whether synthetic chemicals are fundamentally different from naturally occurring ones. For example, in an Agricultural Institute of Canada funded study, Fairbairn (1984, p. 54) makes the following statement which is indicative of the agrichemical industry position on this highly contested issue: "Any substance is poisonous in excessive amounts, even water. A spoonful of the most common Canadian pesticide, 2,4-D, is no more deadly than seven spoonfuls of ordinary table salt. And 2,4-D is actually less poisonous than an equal amount of caffeine. Some pesticides are more poisonous than 2,4-D, while others are much less dangerous." Fairbairn goes on to relate how if table salt were subjected to the same toxicological requirements as agricultural chemicals, it would also be a restricted substance.

Thus using Douglas and Wildavsky's typology, it becomes evident that the controversy surrounding pesticide usage at the level of societal interest groups (agrichemical industry versus environmental advocacy groups) is a problem of <u>both</u> knowledge and consent. The scientific community has yet to discover the definitive answers to the issues of what effect pesticidal chemicals have on humans and the environment. Much remains to be learned about the chemical reactions which they induce once released. The perception of risk is further exacerbated to the extent that these risks are perceived to be irreversible given their persistence in the environment. Whereas the prevailing opinion in the past was that the future will hold better solutions for current problems (thus making them potentially reversible), this ethic is being supplanted by the environmentalist inspired concept of "sustainability" which builds on the idea that "we have not inherited the Earth from our fathers, we are borrowing it from our children" (Brown, 1981).

In terms of consent, the environmentalist viewpoint contests the idea that the general public has voluntarily consented to be exposed to pesticide chemicals in the food they eat and the water they drink. As the usage of pesticides has become more widespread, the opportunity to avoid ingesting these chemicals has declined thus restricting the public's ability to choose to be exposed. Given that the chemical residues on food products and in water supplies is often undetectable to the human senses, these risks are hidden.

For the farmers and farmworkers who experience occupational exposure to pesticide chemicals there is a greater degree of control to the extent that they perceive themselves to have a choice regarding whether or not to use these inputs as part of the agricultural production process. For those farmers who accept that the current governmental regulations are adequate to guarantee their safety and accept the experimental data provided by the agrichemical producers which show that pesticides are the best way to minimize crop losses due to pests, the solution of any experienced pesticide problems lies in additional research. However, for those farmers who are more critical or reject the validity of these assertions, the perceptions of risk associated with the use of pesticides may be aggravated to the extent that they search out alternative methods of pest control.

A number of research studies have sought to delineate the nature of the relationship between a farmer's risk assessment of pesticides and their subsequent behaviour. In the U.K., Tait has conducted a number of studies to test her model about the relationship between attitudes, normative influences and behaviour of pest control decision makers. Tait's model was derived from Azjen and Fishbein's expectancy-value model of behaviour. In two studies (Tait, 1982, 1977), she found that the decision to use a pesticide is based more on the individual farmer's beliefs about the side-effects of these chemicals on people and the environment rather than on the actual pest problems being experienced. In one study which compared two groups of farmers (allocated on the basis of intention to use vs. not to use dieldrin and aldrin, and to use average levels or less that average levels of DDT and DSM), Tait (1982) found that farmers' expressed negative attitudes as to the personal health and environmental risks associated with pesticides in general did not correlate with actual pesticide usage. However, Tait did find support for the Fishbein-Azjen model in opinion and behaviour regarding the use of DDT. This was in spite of a large scale government-sponsored publicity campaign about the harmful environmental effects of organochlorine insecticides (DDT, dieldrin and aldrin, Demeton-S-methyl). In fact, 43 out of the 83 farmers surveyed indicated that these chemicals were not harmful. She did find, however, that farmers' opinions about the financial risks associated with not using pesticides most accurately predicted their subsequent usage.

Another survey of farmers revealed that insecticide and fungicide use varied more between farmers than between crops on the same farm thereby leading to the conclusion that pesticide usage decision may be one of a standard operating procedure (Tait, 1977). This conclusion was supported in Mumford's (1982) study of the use of pesticides by farmers in New Zealand and the U.K. He found that different crops on the same farm tended to be treated similarly, i.e., if herbicides were used, then it was more likely that pesticides and fungicides were also used. He also found a positive relationship between chemical use and the overestimation of perceived losses posed by pests to each crop. The internal consistency in individual estimates of pest losses due to weeds, insects and disease, irrespective of the crop in question, indicated that these farmers held a generalized perception of pests which did not differentiate between their relative threats.

Carr (1987) compared the beliefs about pesticide use held by U.K. farmers and local conservationist groups. She found that farmers held a mixed set of beliefs. On the one hand, they felt that pesticides were beneficial in terms of ensuring high yields, battling pests, disease and weeds and that current pesticides are carefully tested chemicals. On the other hand, farmers shared the following beliefs with the sampled conservationists that pesticides: can provoke worse strains of pests and diseases; harmed beneficial insects; left toxic residues in soil, water and crops; created an over-dependence on chemicals; as well as having adverse effects on human health.

As these research findings indicate, the farmer's pest control decision is often one involving trade-offs. Whereas these farmers were generally aware of the negative environmental and health effects of pesticides, their decisions to use pesticides were primarily motivated by financial concerns. Farmers who were financially risk averse (to the extent that they overestimated potential crop losses to pests) tended to use pesticides more as a preventive standard operating procedure. There is an apparent contradiction in the findings of Tait (1982) and Carr (1987) in terms of the degree to which the U.K. farmers trusted government sources of information about pesticide hazards. Whereas the majority of farmers surveyed by Tait apparently discounted government warnings about the hazardous side-effects of organochlorine pesticides, Carr's sample of farmers apparently hold a high degree of faith in the government system of pesticide regulation.

One indicator that the farmers surveyed were in a relative state of flux is the apparent high variability of negative attitudes on the environmental and personal risks associated with pesticide usage in that there was considerable descensus within the groups studied on this dimension. Further incongruities between attitudes and behaviours is revealed by the lack of support for the Ajzen-Fishbein model which proposes that one's values are a major determinant of subsequent behaviours. As Tait found, this relationship primarily holds for the dimension of financial survival rather than physical survival with personal and environmental health concerns being overridden by a concern for economic viability. In reality, what it may be revealing is a state of denial and dissonance within the farmer which can be aggravated as more information about the negative health effects of these substances is received. On a more fundamental level, this behaviour represents an acceptance of quantity over quality (in terms of absence of chemical contamination) as a valued social good in agriculture.

Summary

In the preceding discussion we see how agrichemicals have increasingly become identified as the environmental villains in both the public and government views. It has been a transformation primarily fuelled by the accumulation of technical information as to the effect of chemicals on human and environmental safety. However, it has not been a rational process of change but rather a political one between those interest groups which derive pecuniary benefits from their continued usage and those who subscribe to an environmentalist agenda.

The battle continues -- agrichemicals continue to be used in ever increasing amounts and new ones are being introduced into the marketplace. But the arena has become an increasingly hostile one for agrichemical producers thereby providing an incentive to seek out alternative solutions to pest control. The solutions which have been gaining increasing prominence and support are those created by biogenetic engineering research which is based on biological control or resistance at a genetic level rather than external chemical control. But what will become evident in the next section is that the process by which biogenetic engineering technology is being developed and implemented is basically a political one.

PART C. BIOGENETIC ENGINEERING TECHNOLOGY INNOVATIONS IN AGRICULTURE

Many futurists (Naisbitt & Aburdene, 1990; Rifkin, 1983) have declared that we are now entering the Age of Biology and that the premier technological innovation of the present and the future is biogenetic engineering on living organisms. This technological innovation has far reaching implications in a diverse number of arenas such as: (a) computer technology in the development of organic computers which use E. coli bacteria to make a biochip which will be faster and more efficient that current microchips; (b) medicine in the development of artificial blood and artificial vaccines to combat AIDS infection; (c) combatting environmental pollution in the development of organisms that "eat" oil spills, organisms that transform toxic chemical wastes into useful or benign substances, organisms for sewage waste treatment, etc.; and (d) agriculture where it is being used for the development of new plants and biological organisms to replace hazardous chemical fertilizers and pesticides in agricultural production and to develop new crop seeds with enhanced yield productivity as the basis for the new green revolution. (Fowle, 1985; Olson, 1986; Rifkin, 1983)

Within the agricultural sector, biogenetic engineering has become a particularly contentious innovation even though it is a technology which builds on biogenetic solutions as a way to replace chemical solutions to perceived environmental problems and hazards. Biogenetic engineering technology (gene-splicing through recombinant DNA techniques; cloning; cell fusion; cell and tissue cultures) is being used to accelerate the natural processes of mutation and selection of plant crops as well as the development of new micro-organisms to combat the natural hazards of agriculture (pests, weeds, and climate conditions).

Biotechnology is a very new technological innovation. As shown in Table 2-2, the emergence of biotechnology as a commercially viable alternative has been gathering momentum since 1973 when the first gene was cloned in a microorganism. Significant technological breakthroughs in the genetic manipulation of living organisms have come to the fore during the 1980s. In 1983, the first plant gene was expressed in a plant of a different species and

TABLE 2-2 . MAJOR EVENTS IN BIOTECHNOLOGY.

(Adapted from J. Sylvan Katz (1989) Plant Biotechnology in Canada: Prospects for the 1990's. Saskatoon, SASK: Plant Biotechnology Institute, National Research Council)

1953. Discovery of the double helix DNA structure of the chromosome by Watson and Crick.

1973. First gene cloned in a microorganism.

1974. First expression of a gene cloned from a different species in bacteria.

1975. First Hybridoma created.

1976. First firm to exploit recombinant DNA founded -- Genentech, USA.

1980. Micro-organisms can be patented in the USA.

1981. First monoclonal antibody diagnostic kit approved for use in USA.

1982. First RNA animal vaccine approved in Europe.
First RNA pharmaceutical product (human insulin) approved for use in USA and UK.

1983. First plant gene expressed in a plant of a different species.

1987. First virus resistant plant (tomato) -- Monsanto, USA.

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in 1987, the first virus resistant plant (tomato) was developed by Monsanto in the United States (Katz, 1989).

Much of the research in plant biotechnology has focused on the development of: seeds for disease resistance, herbicide resistance, nitrogen-fixation, pest resistance, stress resistance, protein improvement; plant diagnostics; and new plants used as foods and feed. The major player in this research is the United States where 276 biotechnology companies are operating. Europe has 125 biotechnology companies and Canada has 27 such companies. The stakes are high for those proponents of the merits of biotechnology. In addition to the projected increases in food production, the sales of biotechnology products in agriculture were U.S. $25 million in 1987 with estimates of $525 million by 1992 and $1,700 million by 1997. (Katz, 1989)

Biogenetic Engineering Technology in Canada

> Biotechnology in Canada is in a dynamic state of investment in new technology, new manufacturing facilities and new markets. Optimism pervades the sector. Challenges abound. With strategies based on innovation and partnership, Canada's biotechnology companies are poised to take their place among the pioneers in international markets. (National Research Council Canada et al., 1989a, p. 1)

As this statement reveals, biotechnology is being actively promoted by industry and government as the technology of the future within Canada. Total biotechnology sales in Canada reached $660 million in 1988. Rapid expansion of the industry is forecasted with an annual growth rate of 46% resulting in: a projected doubling of the workforce to 10,000; a doubling of investment in manufacturing facilities (to over $1 billion); and a forecasted quadrupling of sales to $4.6 billion by 1992.[8] This forecast was overly optimistic in that the Canadian biotechnology industry was only $2 Billion in 1992 (Tower, 1993). A survey of 84 Canadian biotechnology companies (38% of the total of 220 companies in Canada)[9] revealed that this sample had 4078 products in development of which 23% were at the production stage (an industry-wide estimate was over 10,000 products). Canadian biotechnology companies hold an average of 2.5 patents per company (with an additional two patents pending). Seed companies dominate this industry with 76% of all biotechnology products.(National Research Council of Canada et al., 1989) Indicating the rapid growth of the industry, by 1992 there were 290 Canadian firms involved in biotechnology (one-third of which were in the agriculture and food sector). (Heald, 1992)

Given the relative absence of university-industry research alliances in Canada (as compared to the U.S.), the federal government has become an active player in the promotion of biotechnology research and development (OECD, 1987; National Research Council of Canada, 1989). A 1981 Task Force on Biotechnology

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[8] These National Research Council statistics differ from those of the Canadian Ministry of State for Science and Technology as cited by Katz (1989, p. 10) who reports a 1988 total of 174 biotechnology organizations in Canada with 1523 biotechnology R&D persons and expenditures of $163.5 Million.

[9] Conducted jointly by Ernst & Young, Industry, Science and Technology Canada, National Research Council Canada and Winter House Scientific Publications Inc.

to the Minister of State for Science and Technology (Canada, Minister of State for Science and Technology, 1981) concluded that the potential of biotechnology to generate significant economic benefits as well as enabling less polluting alternatives in agricultural production warranted government support. They recommended that the federal government actively promote biotechnology research by: establishing a 10 year National Biotechnology Development Plan (with annual expenditures rising from $33 Million to $50 Million); increasing tax writeoffs of industrial R & D expenditures for biotechnology (from 100% to 150%); allocating specific NSERC research funds for biotechnology; and by supporting Bill C-32, the Plant Breeders' Rights Act (later reintroduced in 1990 as Bill C-15). These recommendations formed the foundation of the Canadian federal government's biotechnology strategy (adopted in 1983) which is organized and administered by the National Research Council and the National Biotechnology Advisory Committee. To enhance cooperative industry/government/university research, the NRC established a new biotechnology programme under the Programme for Industry/Laboratory Projects (PILP) in 1983. The federal government has also established R&D networks in priority areas (including plant strain development and nitrogen fixation) to promote communication among researchers (although the lack of funds may constrain the extent to which this will actually stimulated research).(OECD, 1987)

By 1985/86, an estimated $31,881,000 was spent with plant biotechnology (plant development and forestry) comprising 43.6% of that total. Across Canada, there are nine publicly funded biotechnology centres. NSERC awarded 68 strategic grants ($4.7 million) for biotechnology research of which 24% was awarded for plant biotechnology projects. An inventory of biotechnology research by the Canadian Agricultural Research Council (1990) showed that a total of 360 biotechnology research projects (to 437 research facilities) had been funded in 1989. Of the total number of research facilities receiving grants, 35% were Agriculture Canada, only 0.2% were provincial Ministries of Agriculture, 46% were universities and colleges, and 16% were private research laboratories. In terms of the types of projects being funded, 20% concerned crop production, 13% plant health, 10% animal production, 12% animal health, 14% microbial associations, 20% biological control, and 11% for food and other research.

The National Research Council Canada funded questionnaire and interview survey of members of the biotechnology research community provides the most recent information as to what researchers perceive to be the key issues (Katz, 1989). They were unanimous in their concern about the current lack of patent protection for new plant varieties developed in Canada and supported the enactment of the Plant Breeders' Rights Act in 1990. They also expressed concern about the need for long term funding and the difficulty of hiring highly skilled scientific and technical personnel to meet the human resource needs of a rapidly expanding industry. The regulation of the research and release of genetically-engineered plants and organisms was also a prominent issue. While survey respondents generally felt that regulatory decisions should be based on the characteristics and effects of the products of this research rather than the process by which they are developed, this group recognized that there were significant environmental, moral and ethical issues to be addressed concerning the release of genetically engineered plants and organisms. The study recommends the establishment of mechanisms (such as a cross-sectional advisory committee) to "formulate, scrutinize, defend and champion policies and ideas which may affect the community's direction and well-being" (Katz, 1989, p. 92). A review of OECD member countries echoed many of these concerns about the state of biotechnology research and development in Canada (OECD, 1988). In comparison to other countries, Canada has a "fragmented and incoherent" research effort hampered by a lack of resources, conflicting aims of federal and provincial agencies as well as a general lack of strategic coordination between industrial development and university and government research. They state that although current research on biotechnology in agriculture is generally of high quality, the efforts of the more than 100 small research groups amount to isolated and scattered efforts full of gaps and holes.

The protection of plant breeders' rights through the extension of patent legislation is seen as critical to biotechnology research in that biotechnology researchers view this as essential to recovering their economic investment. While there are identified practical difficulties in establishing the appropriate procedures to patent life forms, the establishment of such legislation in the United States and Europe exerted pressure on the Canadian government to enact complementary legislation (Canadian Agricultural Research Council, 1987). However as identified by Doyle (1985) and by Godden (1987), other consequence of plant breeders' rights legislation may include: increased corporate concentration (vertical and horizontal) in the plant breeding and seed industries; a reduction of the diversity of commercial seeds which are available thereby reducing the biological gene pool; among others. All of these are forecast to result in increased costs for these inputs to agricultural production which may or may not be offset by increased production yields. Despite these concerns, it was reported in March 1992, that 12 crop species were to gain protection under Canada's Plant Breeders' Rights Act (Country Life in B.C., 1992, March). Furthermore, Agriculture Canada announced in January 1993 that a regulatory framework for biotechnology was being developed and should significantly reduce the cost and length of time for government approvals of new products.

The Long Term Consequences of Biotechnology in Agriculture

It appears that the agricultural sector is currently undergoing a significant transition from the Age of Chemicals to a new Age of Biology with biogenetic engineering at the forefront. This represents a paradigm shift within agricultural research and production which is evidenced by the governmental legitimation and promotion of food products and agricultural production methods which reject the use of chemical additives and favour genetically engineering products. The impact of declining societal support for the Chemical Age is also evident in the strategic realignment of agrichemical organizations which have been entering the biotechnology arena in a major way through the funding of biotechnology research in private and university institutions; the purchase of independent seed companies (which would be the primary distributors of the products of bioengineered seeds); the successful lobbying of governments in Canada and the U.S. for extensions of patent law to include living organisms (thereby granting ownership over the products of this technology).(Hobbelink, 1991; Kenney, 1986)

But what are predicted to be the long term impacts of biotechnology on agriculture? First, biotechnology may lead to improvements and modifications in traditional agricultural production. It has the potential to boost agricultural productivity in a world experiencing problems of agricultural commodity surpluses. It will also create shifts in traditional uses of land such that a wider range of crops may be grown in different climates. It is predicted that the labour, land, energy and water savings generated by biotechnologically engineered products will accelerate the current trend towards fewer and larger farms. Larger farms may benefit more than smaller ones due to their greater resources to acquire and apply new biotechnologies. Although biotechnology has the potential to hasten the phasing out of synthetic agrichemicals, this benefit may be mitigated by current trends to use genetic engineering to develop crop seeds which are herbicide resistant or require chemical additives to meet their potential. Thus, environmental safety objectives may be compromised in practice.(OECD, 1988)

The predicted environmental effects of biotechnology in agriculture are even more contentious. On the one hand, environmentalists are particularly concerned over the dangers of releasing genetically engineering organisms into the natural environment (Doyle, 1985, 1988; Hatch & Kuchler, 1989; Kenney, 1989; McGarity, 1985; Parry & Miksche, 1988; Peridis & Newell, 1992). On the other hand, researchers assert that biotechnology is simply an extension of current conventional breeding practices, that fears of bioengineered "monsters" are exaggerated and that this research is necessary for scientific progress (Heald, 1993; Shein, 1991b). As identified by Jean Hollebone of Agricultural Canada's Pesticide Directorate, the greatest controversy is over biogenetic research to breed pesticide tolerant crops and the prospect of chemical company monopolies over major crops (Shein, 1991b). Transgenics, genetic engineering which involves cross-species genetic transfers (eg., transfer of a human gene to beef cattle to obtain a leaner beef; introducing a fish gene into potato and tobacco plants to enhance frost protection) raises several ethical issues which have yet to be addressed to the satisfaction of either environmentalists or the general public (Munro, 1990; The Vancouver Sun, 1990, June 16).

The Organizational Politics of Biogenetic Engineering Technology in Agriculture

There has developed a political contest between two groups with different interests and perspectives on how and why this technological innovation should be developed and used in the production of food. It represents a contest between two interest groups aligned on ideological grounds -- one subscribing to the currently predominant technological paradigm, the other adopting an environmental and systemic view of the world. What is particularly interesting is that biogenetic engineering technology has quickly attained a level of political visibility which is normally accorded a more mature technology (Yoxen & Hyde, 1986).

The first interest group in this political contest is primarily comprised of those with a financial stake in biogenetic engineering (see Hedin et al., 1988; USDA, 1987). They include agribusiness interests and biochemical and medical scientists. This group generally holds a free market, laissez-faire perspective on scientific research and technological innovation as being neutral, value free and not subject to negotiation or regulation.

The second interest group includes environmental activist groups and environmental and ecological scientists (such as Rifkin, 1983; Doyle, 1985; Suzuki & Knudtson, 1988). They hold a more negative view of the ethics of biogenetic engineering. They also question the capability of humankind and the natural environment to prevent or deal with potential ecological disasters resulting from the release of manmade organisms into the environment. For these actors, the debate is one of fundamental human values as related by Jeremy Rifkin, one of the foremost critics of biotechnology:

> Two futures beckon us. We can choose to engineer the life of the planet, creating a second nature in our image, or we can choose to participate with the rest of the living kingdom. Two futures, two choices. An engineering approach to the age of biology or an ecological approach. The battle between bioengineering and ecology is a battle of values. Our choice, in the final analysis, depends on what we value most in life. (Rifkin, 1983, p. 252)

As framed by Rifkin, there are no easy or final answers about how biogenetic engineering technology should proceed. These can be uncomfortable issues for those who subscribe to the technological paradigm which views the emergence of this new technology as being synonymous with scientific progress. However, the challenges to this paradigm from environmentalists are emerging as potent forces in guiding the course of these innovations. There is developing a fundamental contest over the basic assumption that mastery over Nature is possible and to the benefit of humankind versus the environmentalist perspective which asserts the need for control over biotechnology. There is also a contest developing within the scientific community itself with microbiologists focusing on the projected benefits to be reaped from their scientific discoveries and environmental scientists focusing on the potential and as yet unknown risks associated with introducing man-made organisms into the environment (Fowle, 1985; Hatch & Kuchler, 1989; Molnar & Kinnucan, 1989; Schneider, 1986; Teich et al., 1985

This ideological contest has surfaced in a number of observable political contests over the generation, implementation, distribution and regulation of the agricultural products of this technological innovation. Four incidents are presented to show how this has played out so far. The first focuses on acts of sabotage, in particular, on the controversial field testing of a biogenetically engineered microbial organism to combat frost damage on fruits and vegetables in California. The second addresses the deep structural issues involved with the extension of U.S. and Canadian patent legislation to include living organisms. The third focuses on the direction which biogenetic engineering research efforts have taken to date. And the fourth addresses governmental regulation of the products of biogenetic engineering. As yet, Canadian researchers have not conducted much research on these types of issues, therefore much of the information on which this analysis is based is from accounts from the United

States where the public debate over biotechnology has been significantly more prevalent.

(1) <u>Sabotage -- Field Testing of Frost Resistant Bacteria on Fruits and Vegetables.</u>

Fear of the unknown consequences have resulted in situations where environmental groups have sabotaged field test plots as witnessed in the Netherlands where an environmentalist group cut down a test field of maize that had been genetically altered for pesticide resistance, causing $1 million in damages (Hirschler, 1992) and have threatened to organize a boycott of bioengineered tomatoes in the United States (Rensberger, 1993). They have also taken legal action to stop biogenetic field trials such as in the California test of microbial organisms to protect against frost damage on strawberries (Betz, 1988).

Research on this frost resistant bacteria was jointly funded by the U.S. federal government, the University of California, Berkeley, and the Advanced Genetics Sciences corporation (Betz, 1988; Doyle, 1985; Krimsky, 1985; Schneider, 1986). In 1984, the Environmental Protection Agency and the National Institutes of Health issued field testing permits based on reviews of experimental data provided by Berkeley scientists and Advanced Genetics Sciences. No independent tests were conducted. This is one example of networking as a positive organizational political strategy in developing linkages with key decision makers. However, one should also consider who is excluded from the circle of influence. These were the parties who subsequently engaged in the political tactic of whistleblowing which is defined as going public with previously private or privileged information.

EPA approval of the field tests was temporarily rescinded when a group of local community and environmental activist groups filed lawsuits against the EPA, Advanced Genetics and the university. They first challenged the ethics of the release of manmade organisms into the natural environment. Second, they challenged the validity of the review processes of both the EPA and the National

Institutes of Health.

Their criticisms of the review process were given more weight when an internal whistleblower emerged on the scene. A young scientist employed on the project provided information (through a lawyer in order to protect his anonymity) to the environmental groups that detailed how: (a) some of the experimental data had been manipulated; and (b) that Advanced Genetics had conducted field tests of the bacteria before the EPA permit had been issued. Both charges were confirmed by an EPA investigation and Advanced Genetics was fined $20,000. After three months of negotiation with the company, the EPA dropped the data falsification charge and reduced the fine. And following the review of additional test data, the necessary permits were obtained and field testing resumed in 1987.

(2) The Politics of Biogenetic Engineering Research

The trend towards large corporate ownership in agricultural biotechnology research promises to continue given the acquisition of small start-up biotechnology research companies and of previously independent, small-scale seed companies by multinational petrochemical and pharmaceutical organizations (Doyle, 1985; Kenney, 1986; Olson, 1986).[10] This is one example of the organizational political game of protection and expansion of territory -- a survival strategy necessitated by a growing public concern over the negative environmental effects of chemical inputs in agricultural production (resulting in increasingly more expensive chemical waste management requirements, the potential for lawsuits); the high cost of petroleum resource inputs; and the increased competition and overcapacity in the chemical industry.

But opponents of biogenetic engineering raise a number of questions regarding the direction being taken by the current scientific research community in industrial and university laboratories. Whose interests are being served

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[10] A survey of OECD countries revealed that major multinational chemical and pharmaceutical companies have bought 60 seed producing companies during the 15 year period prior to 1987 (OECD, 1987). In Canada, Ciba-Geigy, Sandoz and Pfizer have bought seed companies (Science Council of Canada, 1985).

when, according to Wall Street Journal estimates, the corporate sector provides more than $1 Billion a year to universities and experimental stations for agricultural research in the U.S.? Rather than pursue traditional scientific research objectives, the incentive is now there to use the genetic engineering of crop seeds to complement other corporate products. For example, integrated firms are now developing herbicide resistant crops so that farmers may use more of a herbicide to combat weeds (Benbrook & Moses, 1986). Another trend that is emerging is the development of seeds which are resistant only to selected herbicides (thereby reducing the utility of competitors' herbicides) (Doyle, 1985). Thus with genetic engineering, a wider range and more chemicals can be utilized.

Canada is not immune to these developments for a number of reasons. There is very little independent research conducted in Canada's 21 seed companies (a total of only 96 person years in 1985). The lack of funds and high costs of biotechnology research combined with a dependence on U.S. parent firms for research data serve to increase Canadian industry's dependence on their American counterparts. (Science Council of Canada, 1985)

These trends may indeed lead to enhanced agricultural productivity but one can question whether it is at the expense of reducing agriculture's dependence on non-renewable resources or reducing agricultural chemical contamination of soil and water resources. Biotechnology may also make farmers increasingly dependent on institutional seed companies given the emphasis on "seed/chemical packages" (Altieri, 1987).

Further, how neutral can academic research be when scientists are so dependent on private sources for their livelihoods? Kenney (1986, p. 4) cites one survey which revealed that 345 academic scientists were involved in the 20% sample of all publicly held biotechnology companies in the United States. In a report of the Canada-OECD Joint Workshop on National Policies and Priorities in Biotechnology held in 1987, there was found to be general support for improved industry-university links but it is recognized as a strategy with a number of potential risks.

> "However, the proliferation of industry/university research agreements has raised concern regarding the possible implications for fundamental research. A tendency in some countries to bias support towards industrially relevant research in the universities at the expense of fundamental research, to allow industrial research support to gradually supplant government support, or to limit free dissemination of scientific knowledge, could in the long run undermine the fundamental research base on which future progress in biotechnology depends." (Field, 1988, p. 13)

These research linkages can take many forms with the most predominant being direct corporate contributions, contract research, patents, privately funded research centres, long term contracts, university controlled companies to exploit research, and private companies set up to secure patent rights for resale (Kenney, 1986).

While some may assert that these developments are only a continuation of a past tradition of university faculty consulting for government, nonprofit agencies and corporations, others identify a number of less desirable impacts of this development on the conduct of scientific research in universities (Curry & Kenney, 1990; Kenney, 1986). For example, close corporate linkages have sometimes stifled the free flow of information about scientific discoveries. To protect patent rights and corporate secrecy requirements, scientists with private industry contracts must often "clear" conference presentations and academic journal submissions with their corporate partners (Olson, 1986). But perhaps the most alarming impact of these close financial linkages is the potential for ethical conflicts of interest. Within university biotechnology research laboratories, there have been increases in the use of students and university equipment for private research projects; the transfer of patentable inventions from the university to private laboratories; and the deliberate suppression of research results (Curry & Kenney, 1990; Kenney, 1986; Olson, 1986).

Attempts to develop a set of principles on how universities and industry biotechnology arrangements should be conducted have not been successful. One attempt to do so was the 1982 Pajaro Dunes Conference at which five university presidents (MIT, Harvard, Caltech, University of California and Stanford) and their guests (university administrators, faculty members and corporate representatives) were unable to reach consensus on these conflict of interest problems. The resulting 10 page statement proved to be very general and bland,

and was not binding on the participants.(Kenney, 1986)

It appears that the process of cooptation of the academic scientific community is well under way in biogenetic engineering research. What is perhaps most striking are the parallels between these developments and those surrounding the conduct of academic research on synthetic agrichemicals. To the extent that a large number of university researchers are being influenced to cater to the needs and interests of their corporate funding sponsors, they may be compromising their societal role as independent scientists engaged in basic research and as unbiased investigators of scientific issues.

(3) The Ideological Politics of Private Ownership and Government Regulation Legislative Politics for Ownership over living organisms.

There is a political contest surrounding the ownership of living organisms through the extension of patent legislation. There is a logical consistency in the position of proponents of biogenetic engineering that private ownership should be extended to include organic matter and thus should not be subject to special and onerous government regulatory requirements. Both of these positions reflect Western society's free economic market principles which have served industrial interests well in the past and given the outcomes of both political contests, continue to do so.

Scientific research and agribusiness interests have argued repeatedly for an extension of patent legislation over the living organisms which are the products of biogenetic engineering. They argue that patent systems serve to "promote technical, economic and social progress" by providing private industry with incentives to invest in research and development. Further, they argue that there is a need for international consistency in patent legislation in order to minimize any unfair advantage in the international marketplace.(Beier & Straus, 1985)

Opponents have argued against such privatization of living organisms (Doyle, 1985; Rifkin, 1983). They point to the moral and ethical implications associated with such ownership, contending that the fine line between ownership of lower level organisms and higher forms can then be easily breached. They also contend that this development will result in an additional transfer of power to industrial interests at the expense of the social and economic well-being and security of the general population. Opponents are especially critical of the effect of such legislation to change the status of organisms (such as plant varieties) from public goods to commercial property for exploitation.

The first known patent for a micro-organism was awarded by the U.S. Patent and Trademark Office in 1873 to Louis Pasteur and others for a "yeast free from organic germs of disease, as an article of manufacture" (Beier & Straus, 1985, p. 25). This was followed by patents for an antitoxic serum in 1877, a bacteria vaccine in 1904, and others. 1930 saw the passage of the U.S. Plant Patent Act which protected asexually reproduced plants and later widened the scope of patent protection to include sexually reproduced plants (excluding six common vegetables) in 1970. The Plant Variety Protection Act was subsequently amended in 1980 to cover these previously excluded plants.(Doyle, 1985, 1988; Milbrath, 1989)

For biogenetic engineering, the landmark decision of the U.S. Supreme Court in 1980 (Diamond vs. Chakrabarty) opened the way for the patenting of animate organisms resulting from human intervention (Beier & Straus, 1985). In Canada, the landmark case involved Abitibi Paper Company which successfully obtained a patent for a biogenetically engineered microbial culture system. This case established that micro-organisms were patentable if they were the products of invention and not just discoveries of naturally occurring organisms.(Crespi, 1985)

The economic rewards of these changes in patent legislation for U.S. industry have been significant. Since it has now become corporately profitable to control the outcomes of biogenetic engineering, there has been a surge in acquisitions of previously independent and small-scale seed companies by large petrochemical firms (producers of synthetic fertilizers and pesticides) who have diversified into biogenetic engineering (Doyle, 1985). In the first five years since the 1980 amendments to the Plant Variety Act were instituted, over half of all U.S. patents have been awarded to the subsidiaries of 15 corporations. In terms of seed patents for agriculture, in the first five years after the amendments, over half of the 1200 seed patents were awarded to the subsidiaries of 15 corporations. Over half of all biotechnology patents are held by 10 corporations.

The Canadian counterpart (Bill C-15, The Plant Breeders' Rights Act) of the 1980 U.S. Plant Variety Protection Act was first introduced in 1980 (as Bill C-32) was enacted in 1990. Pressure for such legislation was not limited to solely North American sources, there are 17 other countries with similar laws. As of 1985, every major western agricultural nation except Canada had ratified the International Convention for the Protection of New Varieties of Plants. Supporters of the Plant Breeders' Rights Act can point to the positive experience of other nations with similar legislation such as the increased variety of plants and heightened R & D activity which has followed. Furthermore, farmers surveyed in these countries have expressed little dissatisfaction with such policies (Science Council of Canada, 1985). But the introduction of Bill C-15 has not been without its critics. Many of the same concerns about increasing centralized corporate control over agricultural inputs, reduced genetic diversity in crop seeds and the direction of agricultural research have been voiced by individuals such as Vic Althouse, MP, the agriculture critic for the NDP (as cited by Stainsby, 1990) and Sharon Rempel, an agronomist and advocate for sustainable agriculture (personal communication).

(4) Government Regulation of the Products of Biogenetic Engineering.

Yet another political contest has been over government regulation of the distribution and use of biogenetic engineering products. In the U.S., the biogenetic industry has been lobbying for regulation to continue under current agencies using existing review processes. Others who hold a more ecological perspective assert that the nature of the products of biogenetic engineering mandate new assessment and monitoring procedures (Andow, Levin & Harwell, 1985; Doyle, 1988; McGarity, 1985). This latter group argues that new regulatory processes are required to screen out potentially adverse consequences of the introduction of biological organisms into the environment, to develop contingency plans for undesirable side effects, to provide for long term monitoring of the fate, transport and effects after release, and to plan for spatial and temporal limits for containment. Unlike other regulatory targets (chemicals, for example), new biological introductions have a greater capacity to geographically disperse and proliferate and to develop unforeseen (and potentially harmful) traits after release. They argue that this greater degree of movement, uncertainty and unpredictability and greater potential for unintended environmental consequences is sufficient to warrant new regulatory schemes.

On the other hand, the industry view is that biogenetic engineering offers significant positive economic and technological benefits which may be compromised if additional, more onerous regulatory procedures were implemented (Hardy, 1985; Rathmann, 1985; Teich et al., 1985). They also point to the positive safety record to date under existing procedures.

But the level of public controversy surrounding biogenetic engineering technology has forced legislators to address these regulatory issues from the technology's inception. In his analysis of the socio-historical context over the deliberate release of biogenetically engineered organisms into the environment in the United States, Krimsky (1985) notes that the primary responsibility has rested with the National Institutes of Health's Recombination DNA Advisory Committee (RAC). Although the NIH only has formal authority over government funded research, its guidelines are generally accepted throughout the scientific community.[11] Issued in 1974, the initial focus of RAC's guidelines was to develop containment requirements by limiting the volume of such entities.

However this approach did not allay public fears about the potentially harmful side-effects of the technology. In 1977, on learning of Harvard University's plans for a containment laboratory for genetic research, the city of Cambridge, Massachusetts passed an ordinance for a moratorium on recombinant DNA (rDNA) research. This in turn prompted a number of other communities and

[11] The voluntary compliance of industry with NIH guidelines is particularly important given that 90% of the experiments involving recombinant DNA are exempt (Olson, 1986).

states to take similar actions and to pressure Congress for regulatory legislation. While the bill failed in Congress, the NIH's RAC responded to public pressure by amending its charter to increase the size of the committee (from 16 to 25) and to mandate that one-third of committee members be individuals with expertise and interest in public health and environmental issues. This led to a number of policy changes within the NIH which included the introduction of the voluntary compliance program with the provision that industry proposals could be held in camera.

Subsequent appointments to the RAC by the Reagan administration (with their agenda of regulatory minimalism) served to change the focus of the committee. One result was the replacement of critical public and scientific members with representatives of biotechnology firms and those actively involved in the promotion of biogenetic engineering research (Goldberg, 1985; Krimsky, 1985). Subsequent RAC policy decisions targeted the promotion of biotechnology research by dispensing with the earlier list of prohibitions for large-scale rDNA activities; eliminating the requirements of firms to submit data on the disposal of biogenetic research wastes; and replacing the prohibition against the field testing of biogenetically engineered organisms with a multi-tiered review process.

While the debate over biogenetic engineering technology has been noteworthy in its level of political visibility, in general, official governmental policies have reflected the view that there is no major difference between rDNA derived plants and those developed through traditional cross-breeding techniques. Therefore, it follows that no new legislation should be enacted and regulation should continue under the auspices of existing agencies (FDA, EPA, USDA, NSF and NIH).(Olson, 1986; Rogul, 1985) For example, a U.S. National Academy of Sciences' panel was set up to develop the framework for evaluating the environmental risks posed by genetically engineered organisms is comprised of molecular biologists, medical scientists and industrial biotechnologists. Environmental scientists and ecologists were excluded. The panel's subsequent report in September 1989 concluded that organisms produced by genetic engineering techniques are fundamentally no different from those produced by conventional cross-breeding and are "not inherently dangerous" (The Vancouver Sun, 1989, Sept. 30). Therefore, it follows that no new or special regulatory precautions need be undertaken. It is noteworthy that this position is consistent with that of the biogenetic engineering industry.

These developments are examples of two surface political tactics of managing/resisting change through control of decision premises and agendas and the selective use of objective criteria. Control of the decision premises and agendas through the selection of panel members and the selection of existing criteria for hazard evaluation rather than any new ones (as asserted by opponents of the current course of biogenetic engineering). This latest incident is also indicative of the deep structural political game of naturalization that existing procedures are adequate, that the products of biogenetic engineering pose no new or unique hazards requiring special (and to some, onerous) regulatory requirements. The contest is framed as one of control versus faith in the free market and survival of the fittest that seems to be or is encouraged as natural and neutral in meeting the needs of society. However, underlying this premise is that such an ideological premise also serves to reinforce the power of those who are in power.

Taken together with the expansion of patent legislation to include living organisms, we can also see the play of the deep structure game of neutralization in action. In this political game of ideological conception, a set of values which favours one set of actors is treated as neutral, value free and not subject to negotiation. Both of these incidents are supportive of the free market economic principles of Western society. With the privatization of living organisms through patent legislation, it is consistent that additional government regulation and intervention in the production and distribution of the products of biogenetic engineering would also be resisted.

Summary

What can be learned about technological innovation from these accounts about biogenetic engineering? First, technological innovation is not neutral -- it inevitably becomes a political process not only in the way it is developed but also in the way it is implemented in reality. Second, this case demonstrates the capability of those societal interest groups which have a stake in maintaining the current status quo in terms of power relationships and the autonomy which comes from being in control to resist challenges from independent outsiders.

Third, as illustrated in the battle of the field tests, we see how adversarial tactics have not yielded significant results in terms of stopping current directions. Fourth, we see how powerful collaborative political strategies such as networking and building coalitions of support amongst major decision makers within industry, the scientific community and government can be when dealing with controversial technological innovations. There are social innovations in that industrial concerns have made inroads into the production of knowledge within scientific laboratories; they have developed new organizational forms by diversifying into previously unrelated arenas; they have been creative in developing close organizational linkages throughout all levels of the food production chain. As proposed by Peridis and Newell (1992), the biotechnology industry should pursue collaborative strategies further to reduce negative public perceptions and government actions.

On the surface, it may appear that the Age of Chemicals in agriculture is indeed coming to an end -- that the battle instigated by Rachel Carson in her book, The Silent Spring, is being won by those advocating an ecological approach to the treatment of our natural environment. The groundswell of public support for the environmental perspective which labels chemicals as the villains appears to have become an integral part of our societal ideology.

The net effect may be the demise of chemical solutions and its replacement by biological and genetic solutions to economic and environmental problems. However, one may question whether we are only witnessing a surface change in the replacement of one discredited technological innovation by another -- that there has been no fundamental change either in the way we evaluate innovations and scientific progress or in the major players involved in this process of change. Biotechnology (as was chemistry in its early years) is being touted as the potential technological panacea for many of the problems in agricultural production. It is predicted that not only will this technological innovation result in increases to agricultural production through the development of new superseeds (similar to the ill-fated Green Revolution) but it will also give humankind new weapons to battle nature's natural hazards such as pests, weeds and weather. Rather than battling these problems externally through the application of chemical agents, the battle will now be won through the manipulation of the internal genetic code of plants and organisms. In many ways this represents a transition from remedial solutions to preventative ones.

However, critics of biotechnology are less optimistic about the predicted bounty which will result from these developments and instead highlight the potential risks associated with biotechnology (Doyle, 1985; Rifkin, 1983; Suzuki & Knudtson, 1988). Fuelled by a distrust of the interests and forces which are promoting biotechnology, they predict that abuses of the environment will continue. They point out that those interests which were so instrumental in the promotion and entrenchment of a chemical approach to agricultural production are the same ones now promoting biotechnological alternatives. At a fundamental level, they are challenging the underlying ideological philosophy which promotes a mechanistic approach to achieve "mastery over nature."

The controversy surrounding biogenetic engineering has become a contest over diametrically opposed viewpoints of nature and different risk perceptions for the present and for the future. It is a political contest at a deep structural level which pits the established scientific community against outside interest groups. Thus we see the proliferation of deep structure games such as legitimation played out when biological scientists reject the assertions of those lacking the "proper" scientific credentials to understand their experimental results. We see the operation of the game of naturalization with the established scientific community seeking to maintain their traditional role in the evaluation and introduction of this new technology against those who would challenge their assumptions and results. We also see the process of neutralization in that biogenetic discoveries are presented as solely the outcome of an unbiased quest for knowledge and progress when, indeed, there is a close alignment with the economic benefits to be derived for the institutions which fund biological research. This latter development of increased corporate sponsorship of basic research in universities and "independent" research laboratories has itself led to a debate over the ownership, dissemination and repression of research results--abuses have occurred in the past thus contributing to the public's distrust of the neutrality of science (Doyle, 1985).

PART D. THE ECOLOGICAL ALTERNATIVE: THE RISE OF THE SUSTAINABLE AGRICULTURE MOVEMENT

> Sustainable agriculture is a philosophy and system of farming. It has its roots in a set of values that reflect a state of empowerment, of awareness of ecological and social realities, and of one's ability to take effective action. It involves design and management procedures that work with natural processes to conserve all resources, promote agroecosystem resilience and self-regulation, and minimize waste and environmental impact, while maintaining or improving farm profitability. (MacRae, Hill, Mehuys & Henning, 1990, p. 156)

> A sustainable agriculture is ecologically sound, economically viable, socially just and humane. (Gips, 1987, p. 70)

There is a diversity along a continuum of sustainable agriculture approaches with subtle variations in philosophies, goals and constraints. In general, though, sustainable agriculture emphasizes the need for enhancing soil health and rejects the use of synthetic chemical pesticides in favour of cultural and biological controls. It is a holistic approach which recognizes the interdependent and systemic nature of plant and animal life. Agricultural systems based on these principles generally hold the following characteristics: local self reliance; functional diversity, self-regulation and resilience; flexibility; and evolutionary potential (Hill, 1989).

Under the umbrella of sustainable agriculture, five of the most prominent approaches include: organic farming; ecoagriculture; regenerative or low-input sustainable agriculture; bio-dynamic agriculture; and natural agriculture.(see Oelhaf, 1978; Gips, 1987)

(1) Organic Farming

> Organic farming can be defined as a production system which avoids or largely excludes the use of synthetic fertilizers, pesticides, growth regulators, and livestock feed additions. To the maximum extent feasible, organic farming systems rely upon crop rotations, crop residues, animal manures, legumes, green manures, off-farm organic wastes, mechanical cultivation, mineral-bearing rocks, and aspects of biological pest control to maintain soil productivity and tilth, to supply plant nutrients, and to control insects, weeds and other pests. (U.S. Department of Agriculture, 1980, p. 9)

Modern organic or biological farming standards originated in England with the work of Sir Albert Howard in the 1930s and was continued by Lady Eve Balfour and the Soil Association of England which was founded in 1946 (Lampkin, 1990). Later, organic farming as an organized movement would be introduced to North America by J.I. Rodale among others. The primary focus of organic farming is on enhancing soil fertility through the use of naturally derived materials (composted organic material, leguminous crops, etc.) rather than synthetic or manmade ones. Under the organic system, the use of pesticides and synthetic chemical fertilizers is prohibited. Cultural practices such as crop rotations, intercropping, companion planting, cover crops and green manures are used to control for weeds and pests and to provide soil and plant nutrients.

The organic approach is perhaps the most widely accepted one in North America and is often used as the basic operating definition of government certification programmes. It has also become the foundation of the International Federation of Organic Agriculture Movements formed in Switzerland in 1976. It is estimated that 1% to 2% of the farm population in Canada and the United States are currently operating as organic farm producers (Hill, 1989; USDA, 1980).

(2) Ecoagriculture

Ecoagriculture, or ecological agriculture, builds on the growing concern amongst the general population about environmental pollution caused by the use of synthetic inputs in agriculture. It is a framework for agriculture which incorporates environmental, ecological and socio-economic variables in the production process (Altieri, 1987; Commoner, 1990; MacRae, Hill, Henning & Mehuys, 1989; Merrill, 1983). Ecoagriculture advocates often target agribusiness interests as the main villains who conspire to promote the excessive use of toxic pesticides in agricultural production. Ecoagriculture advocates assert that there is an urgent need for a reconceptualization of agricultural production as only one part of an interdependent holistic environmental, social and cultural system.

(3) Regenerative or Low-Input Sustainable Agriculture

A recent offshoot of organic farming is regenerative agriculture or low-input sustainable agriculture (LISA). Regenerative (meaning to renew or restore) agriculture holds a less stringent definition of "organic" and allows for the use of reduced levels of pesticides and fertilizers to achieve a minimal reliance on non-renewable resources (Gips, 1987). This approach to agriculture focuses on developing systems which maximize the resource efficiency of external inputs. This operating principle extends to the use of fertilizers, energy (human and fossil fuel) and chemicals in order to reduce costs and environmental impacts. The goals of energy conservation and the development of alternative renewable energy sources is actively supported by the USDA which in 1980 adopted the policy goal of energy self-sufficiency in agricultural production by 1990 (Blobaum, 1981). As such, regenerative agriculture represents an approach which combines both organic and conventional agricultural practices thereby potentially appealing to a broader audience.

(4) Bio-Dynamic Agriculture

Bio-dynamic agriculture is the oldest organized alternative agriculture discipline in the world. Inspired by Austrian philosopher Rudolph Steiner's (1974) eight lectures on agriculture in the 1920s, bio-dynamics (meaning "life force") advocates an approach which integrates spiritual and aesthetic values in agriculture.

> The bio-dynamic approach is based on an understanding, out of anthroposophy, of the interrelationships of living organisms and the processes that make up the ecological system, embracing forces working within plants, the soil and from the surrounding universe...The methods can be applied by anyone who is interested. Over and above their actual application they open for the spirit in man new possibilities of achieving a clear and conscious relationships to the world of forces appearing in living organisms. In turn the daily work is given more of a meaning and an aim. Thus a positive contribution is also made toward alleviating the social and human problems of our time. (Bio-dynamic conference literature cited by Koepf, Pettersson & Schaumann, 1976, p. 31)

As such, bio-dynamic farming is an all encompassing approach which promotes the idea that the individual farm is a self-sufficient ecosystem in which the farmer has a personal relationship with the soil, plants and animals.(Koepf, 1989;

Koepf, Pettersson & Schaumann, 1976; Kolisko & Kolisko, 1978; Tompkins & Bird, 1989) There is a strong theological component in the bio-dynamic approach which stresses the need for unity with cosmic and terrestrial forces. In contrast to organic farming, plant and animal derived "preparations" are used (in a manner similar to homeopathic medicine) in order to stimulate life in plants and animals. Another unique feature of bio-dynamic agriculture is the scheduling of planting and harvesting times in accordance with astrological signs and lunar rhythms (or cycles). Although a small segment of the North American organic farming movement[12], bio-dynamic agriculture has become a significant force in Europe through its farmer-researcher network and international marketing organization.

(5) Natural Agriculture (Mahayana)

The main proponent of natural agriculture is Japanese farmer Masanobu Fukuoka (1985) who proposes the principles of no tillage, no fertilizer, no pesticides, no weeding and no pruning. Fukuoka calls for an ecological approach to farming which is in unity and total harmony with the natural environment. He rejects the use of scientific methods and mechanization (including several of the prevailing practices of organic farming) on the basis that they disrupt the natural holistic order and impose an ultimately destructive one based on man's values, needs and desires. Although it has yet to gain a foothold in Western agriculture, Fukuoka's approach has proven to be a provocative one in its integration of Buddhist philosophy with agricultural practices.

As a way of organizing these philosophies, MacRae et al. (1990) have developed a continuum of modern approaches to agriculture along the dimension of low to high sustainability (see Table 2-3). Within the sustainable agriculture movement in North America, the principles of organic farming and ecoagriculture

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[12] The identification of organic farming as a "movement" is consistent throughout the sustainable agriculture literature. This would appear to be an appropriate term given Oberschall's (1993, p. 2) definition that: "Social movements are large-scale, collective efforts to bring about or resist changes that bear on the lives of many."

have gained the most prominence and acceptance. Given the predominance of organic farming within the North American sustainable agriculture movement, this term will be used henceforth to represent the spectrum of sustainable agriculture approaches. However, the distinction between organic and bio-dynamic farmers will be followed in the reporting of data analysis results.

TABLE 2-3. SPECTRUM OF SCHOOLS OF THOUGHT IN AGRICULTURE FROM LOW TO HIGH SUSTAINABILITY
(Source: MacRae, Hill, Mehuys & Henning, 1990, p. 158)

School of thought	Sustainability	Characterized by
	LOW	
Conventional (monoculture)		External solutions to internal problems, detachment, compensatory control, unawareness, disempowerment
(minimum tillage, chemical banding)		Efficiency
Low-input sustainable agriculture LeMaire-Boucher Ecoagriculture		Substitution of benign inputs
Organic		Benign design and Biological management
Regenerative		
Biodynamic		
Permaculture Bioregionalism Natural		Internal solutions to internal problems; Integration, balance, awareness, responsive to feedback; complex, indirect, long term, bioecological, local approaches to global problems
	HIGH	

But perhaps what most distinguishes organic or sustainable agriculture from conventional agricultural approaches is best summed up by poet-farmer Wendell Berry (1976, p. 15):

> The mentality of organic agriculture is not a technological mentality -- though it does concern itself with technology. It does not merely ask what is the easiest and cheapest and quickest way to reach an immediate aim. It is, rather, a complex and radical attitude toward the problem of our relationship to the earth. It is concerned with the long-term questions of what humans need from the earth and what duties and devotions humans owe the earth in return for the satisfaction of their needs. It understands that the terms of a lasting agriculture are not human terms, that the final terms are nature's, that an agriculture -- and for that matter, a culture -- that holds in ignorance or contempt the truths and the mysteries of nature is doomed to failure, for it is out of control.

Organic Farmers

Who are organic farmers? First, organic farmers appear to be the most radicalized element within the agricultural community in terms of being critical of agricultural chemicals. By definition (philosophical and legislative), organic food products are those developed without synthetic chemical inputs or additives. Certification standards for organic food specifically detail permitted, regulated and prohibited agricultural inputs and practices. [See Table 2-4 for a partial list of certification standards developed by the Organic Foods Production Association of North America.]

Organic farmers are a select group within the current farming community -- Hill (1989) estimates that there are 2000 practising or converting organic farmers in Quebec with approximately 2000 in the rest of Canada. A U.S. Department of Agriculture (1980) survey estimated that there were 20,000 to 40,000 organic farmers in the United States (1% to 2% of all farmers).

In Canada, market demand for organic food products has been steadily increasing with estimates regarding their share of the food retail market ranging from 0.3% (Hill, 1989) to 3% (Saskatchewan Department of Agriculture and Food, 1990). Equally variable are future estimates of the Canadian organic market which range from 2% of total retail food sales (over $1 Billion) by 1998 (Hill & MacRae, 1990) to 10% of the food market by the year 2000 and a 25% share by 2010 (Saskatchewan Dept. of Agriculture, 1990). There were 500 to 600 wholesale and retail companies selling organic products in 1989 (Hill, 1989) with the majority of organic food being sold through direct marketing systems such as farmers markets and through health food stores (Hill & MacRae, 1990). In a consumer survey conducted in 1988 for Agriculture Canada it was revealed that 25% of urban Canadians were interested in purchasing organic fruits and vegetables and were willing to pay a 25% price premium (Baseline Market Research, 1988). A 1989 Quebec survey revealed that 32% of Quebeckers have purchased organic foods and that most consumers were willing to pay premiums of 10% to 26% over conventional food products. However, as Henning, Thomassin and Baker (1990) found in their survey of 80 organic producers in Quebec, prices and premiums for organic products are highly unstable and unreliable. Although organic farmers are a relatively small contingent within the farming community, predictions are that their numbers will increase as a result of customer demand (demand exceeds current supply) and the predicted shortage (and attendant rise in price) of petrochemical agricultural additives. (Hill & MacRae, 1990) In many respects, organic farmers may be the precursors of the future.

In terms of basic demographic variables, farmers choosing to use organic methods of production do not differ substantially from those who use conventional methods. Blobaum's (1983) survey of organic farmers in the U.S. Mid-West showed that their average age was 50 -- not significantly less than the national average of 52. The majority (70%) of organic farmers were full-time operators of their farms, unlike the regional average of 30%. Other surveys of organic farmers have shown that organic farmers are "progressive" commercial operators with above-average education, larger farms, etc. (Lockeretz et al., 1984; Lockeretz & Wernick, 1980). A recent survey of 69 organic farmers in Saskatchewan found that organic farmers had on average 10.7 years of education with 35% of husbands and 56% of wives on organic farms having post-secondary education (Molder, Negrave & Schoney, 1991). Organic farming operations are not limited by scale -- there are both very large and small operations (USDA, 1980).

TABLE 2-4. EXAMPLES OF OFPANA CERTIFICATION STANDARDS IN SELECTED AREAS OF FARM MANAGEMENT AND FOOD PRODUCTION
(Source: MacRae, Hill, Mehuys & Henning, 1990, p.179)

Permitted	Regulated	Prohibited
Weed Control		
Cultivation; crop rotation mulches, mowing; flame and electric weeding; biodynamic preparations	Plastic mulch; colored newsprint mulch	Synthetically compounded or petroleum-distillate herbicides; synthetic growth regulators
Manure Management		
Composted manure; aerated slurry; raw manure before green manure	Raw manure, except as noted; sewage sludge depending on analysis	Any contaminated organic waste materials
Nitrogen Sources		
Green manures; N-fixing crops; composted materials; N-fixing organisms	Vegetable, blood, animal, fish by-products, depending on source; sodium nitrate as temporary measure	Potassium and calcium nitrate; anhydrous ammonia; urea; ammonium nitrate; ammonium phosphate; any contaminated organic waste
Phosphorus Sources		
Rock phosphate; bone meal; guano	Organophos (soap phosphates); bone slag	Superphosphates; orth-phosphoric acid; other excessively soluble or acidifying materials
Potassium Sources		
Wood ashes, rock dusts; K-rich organic material; sulfate of potash magnesia; natural potassium sulphate; kainite	None presently listed	Potassium chloride; synthetically derived potassium sulphate
Animal Housing and Health Care		
Organic feed, spacious housing; Homeopathy, herbal remedies; probiotic supplements; non-toxic pest controls such as diatomaceous earth	Emergency medications; vaccinations; rotenone for warbles	Routine medications; synthetic pesticides
Processing Methods		
Bacterial cultures; organic plant extracts, herbs, spices, sweeteners; sea salt and brine; freezing, drying, vacuum packing, heat processing	Wood smoking; aluminum containers and utensils	Synthetic preservatives, coloring, flavoring, texturizing, or other additives; excessive sweetener or salt; ingredients with nitrites, nitrates, sulphites, heavy metals

Organic farmers have been identified to be innovators in their own right. There are no easy prescriptions for farming organically beyond the initial rejection of chemical inputs into the production process. One of the premier criticisms of agricultural research put forward by advocates of alternative sustainable and organic agricultural methods is the scarcity of research projects (and funds) which test the relative merits of their proposals in comparison to those of conventional practices which use chemicals (McEwen & Milligan, 1991). As research in the U.S. and Canada has shown, the practice of organic farming is not a return to pre-Chemical Age practices but rather the on-site development of sophisticated organic systems which integrate pre-conventional methods with modern knowledge and technologies (MacRae et al., 1990; Hill, 1984; Lampkin, 1990; USDA, 1980). Due to the relative lack of information and advice on organic farming as well as the specificity required for the adaptation of farming techniques to local conditions, many organic farmers are required to become experimental researchers. (Altieri et al., 1983; MacRae et al., 1990)

What is of particular interest is the rationale and reasons why these persons have chosen to convert to organic farming. What or who has influenced this decision? As those at the forefront of a new approach to agriculture, do they share many of the personal characteristics of the early adopters in other research on innovators? Are they, in fact, champions of a new order?

<u>Motivations of Organic Farmers to Convert from Conventional Farming Practices</u>

One of the preconditions for searching out new and innovative ideas is dissatisfaction with the status quo (Van de Ven, 1986). In many ways this reflects the state for many organic farmers who usually have several years of conventional farming experience before they have converted to organic farming methods (USDA, 1980). What distinguishes organic farmers from the majority of farmers (who may also be dissatisfied with the status quo but continue as before) is the way in which they have acted on this dissatisfaction. Motivations to convert to organic farming have been studied by a number of researchers (Blobaum, 1983; Conacher & Conacher, 1983; Hill, 1984; Molder, Negrave & Schoney, 1991; Oelhaf, 1978; Saskatchewan Dept. of Agriculture and Food, 1990; Sparling, Wilken & MacKenzie, 1992; Weymes, 1990). The major motivations for organic farmers' conversion decision cited are an overall concern for protecting soil, human and animal health from the potential hazards of pesticides and a desire for lower production input costs. Often the desire to improve family health was prompted by personal experiences with allergic reactions to pesticides and cases of acute pesticide poisoning. Concern for livestock health was elevated on learning of the lower incidence of disease and death of livestock on organic farms. Another major influencing factor to switch to organic methods has been the encouragement of a friend or relative or other organic farmers met at organic farming meetings. The decision to convert can also be prompted by financial considerations due to an increase in chemical fertilizer and pesticide prices coupled with the growing demand for (and higher prices of) organic produce in the marketplace. Thus the conversion decision can be the result of either a pivotal crisis, a slow accumulation of dissonant information or persuasion by influential others.

The growing incidence of conversion to organic methods can also be traced to an ideological shift towards environmental values amongst farmers. As MacRae et al. (1990, p. 159) observe:

> "One common, although not prerequisite, motivational change among farmers in transition concerns the way they view the farm and the practice of farming. Many farmers experience a major shift in their values, and place even greater emphasis on their role as guardians of human health, through the provision of essential nutrients to consumers, and of the health of the rural community and environment."

Oelhaf notes that amongst those most committed to organic farming there are some who express the belief that their work is part of a spiritual relationship with the land and related plants and animals. This religious or spiritual influence is perhaps most pronounced amongst those groups (e.g., the Amish and members of the 1960s counterculture) who reject modern society in favour of continuing a tradition of natural methods. A number of organic farmers who are deeply religious take the cue for some of their practices from the Bible itself. As Oelhaf (1978, p. 148) notes, the practice of leaving land fallow one year out of seven can be traced to the Biblical instruction of Exodus 23: 10-11 and Leviticus 25: 1-7 where the seventh day of rest for people is interpreted as the seventh day of rest for the land.

Barriers to Conversion to Organic Farming

The majority of organic farmers have experience in both conventional and organic methods of production. However, the decision to convert is not one without problems given that conventional farming is the predominant mode of operation in Western agriculture. There have been identified a number of technical, practical, institutional and social barriers or obstacles to this course of action. These include: the lack of technical information about organic methods; difficulties in developing marketing and distribution networks for organic food products; negative social pressures (non-supportive opinions of farm neighbours, agribusiness dealers, academic researchers); lack of adequate certification of organic products as such; as well as uncertainty about the impact of organic methods on crop yields, weed problems, etc. (Agricultural Economics Research Council of Canada, 1972; Aubert, 1982; Blobaum, 1983; Oelhaf, 1978; Saskatchewan Dept. of Agriculture, 1990; Sparling, Wilken & McKenzie, 1992; U.S. Department of Agriculture, 1980) A summary list of identified barriers is provided in Table 2-5.

Several studies have focused on the economic implications of converting to organic farming methods. Foremost is the observed decline in crop productivity yields (especially during the initial conversion period) when conventional farming technologies are foregone. In studies on various grain (wheat, oats), vegetable (corn, potatoes, carrots peas, onions) and fruit (apples) crops under both systems of production, organic yields are generally 15% below those obtained under conventional methods (Childers, 1975; Lockeretz et al., 1976; Oelhaf, 1978). However, there is considerable variability among these findings with in some cases, organic yields surpassing that of conventional methods by up to 30%. In comparisons of organic and conventional farms in the U.S. corn belt, it has been found that the observed differences in yields was highly dependent on

TABLE 2-5. SUMMARY OF BARRIERS TO CONVERSION TO ORGANIC FARMING.

FINANCIAL

1. High cost of land
2. Need for extra initial investments
3. Sunk costs into existing system of production
4. Crop losses
   - yield losses during initial conversion period
   - increased losses due to weeds and insects
5. Credit discrimination (loans, crop insurance)
6. Conversion over landlord objections

RESOURCE CONSTRAINTS

1. Labour resources
   - organic farming requires more labour of higher quality
2. Land resources
   - organic farming requires more land for some crops
   - production may be restricted to certain regions (to avoid pests)
3. Organic fertilizers
   - availability of uncontaminated animal and human wastes unsatisfactory products
   - inadequate delivery system
4. Lack of biological controls

TECHNICAL CONSTRAINTS

1. Lack of research information on organic production methods
2. Lack of information advice and support from agricultural extension services
3. Lack of education

MARKETING CONSTRAINTS

1. Lack of adequate certification of organic products
2. Cosmetic standards regulating size and appearance of produce
3. Consumer habits/education
4. Lack of information about special organic markets
5. Market distribution problems
6. Low market prices for agricultural products

PSYCHOLOGICAL CONSTRAINTS

1. Farmer's habits and attitudes
2. Social pressures in favour of conventional farming (lack of support for organic methods)

Sources: Oelhaf, 1978, 1982; Aubert, 1982; Blobaum, 1983; USDA, 1980; Hill, 1984; Kramer, 1984; National Research Council, 1989 weather conditions -- it is generally recognized that the successful use of chemical fertilizers requires better weather to fulfil their promised potential (Lockeretz et al., 1976; Shearer, Kohl, Wanner, Kuepper, Sweeney & Lockeretz, 1981). In 1974, yields under both approaches were the same whereas the generally better weather experienced in 1975 resulted in conventional yields being 20-30% greater.

An eight year study of crop production systems conducted by Sahs, Helmers and Langemeier (1986) in Nebraska compared organic vs. nonorganic systems and continuous (corn) vs. rotation (corn-soybeans-corn-oats/sweet clover) cropping systems. They found that the four rotation cropping systems (organic and nonorganic) outperformed the continuous cropping system in terms of yields and economic returns. However, the organic rotations had lower economic returns than the inorganic rotations.

With the exceptions of potatoes and certain fruits, crop losses due to insects and diseases are not regarded as major problems for organic farmers (MacRae et al., 1990). In fact, organic farmers report fewer plant pest problems due to the greater plant and insect diversity promoted by organic farming practices. While weeds are regarded as a major problem during the conversion period, in the long term, weed problems under organic systems are not greater than under conventional systems. This may not mean that there are fewer weeds to contend with but that organic farmers have a higher tolerance for weeds when weeds are seen as beneficial for nutrients, disease and pest control, soil and moisture conservation, and as a source of green manure.

These studies also indicate that the labour requirements of organic methods are substantially greater. For corn, small grains and soybeans the recorded differential ranges from 16% to 20% (Lockeretz et al., 1976; Oelhaf, 1978); for vegetables, the average labour differential is 30%; and for apples, the differential can be from 26% to 390% greater for hand harvested fruit as opposed machine harvested fruit. However, the lower income per labour unit is often internalized within the family farming unit and may rise in the long term as new biological and management strategies are implemented (MacRae et al., 1988; MacRae et al., 1990).

Offsetting these increased production costs for organic farming methods is the observed savings in total operating costs. Organic producers' operating costs are generally 10% of assets versus 33% for conventional producers (MacRae et al., 1988). In addition to reducing expenditures for synthetic chemical production inputs, organic methods have lower asset requirements (fewer buildings, less technologically sophisticated equipment), therefore there is a lower debt service load for capital investment. Energy requirements in terms of fossil fuels are significantly less (average 37%) under the organic production regime (Lockeretz et al., 1976). However, there is a wide degree of variability with organic wheat and corn production being 29-70% more energy efficient while organic apple and potato production can be 10-90% less energy efficient than conventional means (Pimentel, Glenister, Fast & Gallahan, 1983). In another study comparing organic and conventional production of corn, wheat and potatoes, Pimentel, Berardi and Fast (1984) found that organic corn and wheat production was more energy efficient (26% to 70%) while organic potato production was less energy efficient (7% to 20%). They also determined that these relative energy efficiencies for organic crop production were offset by lower labour productivity (22% to 61%) and the restricted availability of organic fertilizers.

When the observed price differential (10% - 50% price premiums) for organic produce is taken into account, the net result of these economic differentials is that the overall profitability of both methods of production is essentially the same or favourable for organic products (Henning, Baker & Thomassin, 1991; Lockeretz et al., 1976; Oelhaf, 1978; MacRae et al., 1988).[13] Lampkin (1990) reports of several studies conducted in the U.K. and Europe which challenge the

[13] Oelhaf (1978) concludes that while the retail prices for organic produce are significantly higher than for conventionally produced food, the differential is due not to higher production costs but primarily to a lack of economies of scale in marketing organic food. His economic analysis traced the higher costs associated with the distribution of organic produce to: the higher mark up and gross margins in health food stores which are the major distributors of organic produce; the small batch processing and small plants of the natural foods industry; the higher transportation costs due to the smaller markets for organic foods dispersed over larger geographic areas thereby necessitating shipments of smaller quantities.

belief that organic farming is not financially viable. In studies which compared matched samples of organic and conventional farms, the 10% to 30% lower yields in organic farming systems and higher labour requirements are more than offset by their significantly lower total variable and fixed costs. The gross profit margins per hectare on organic bio-dynamic farms were consistently higher than or at least equal to that of conventional farms producing the same products.

What is not generally included in these economic comparisons are the differences in environmental costs associated with each approach. Generally, organic farming methods are regarded as yielding a number of environmental benefits such as (see Canter, 1986; OECD, 1989; USDA, 1980):

a. enhancing soil and water conservation by reducing soil erosion through crop and soil management practices (soil based rotations, cover crops, noninversion type tillage and organic matter management) which also improve water infiltration of the soil;
b. reduced nitrate pollution through the avoidance/restriction of commercial fertilizers;
c. reduced pesticide pollution through reduced runoff of agricultural chemicals and the spread of chemical residues in the environment (soil, surface and groundwaters);
d. reduced reliance on non-renewable fossil fuel resources through the use of crop rotations and application of organic wastes in place of chemical fertilizers. An OECD (1989) review of energy consumption in agriculture concluded that organic food production can produce up to 90% of the yield per acre of conventional chemical agriculture at 66% of the energy cost;
e. reduced destruction of nontarget organisms;
f. reduced air pollution caused by aerial crop spraying; and
g. public health.

Advocates of organic farming methods assert that if these environmental "externalities" were included in the overall equation comparing the relative costs and benefits of both approaches, then the organic approach would be significantly more advantageous than the conventional approach. This is a line of argument consistent with that commonly found throughout the literature on costing environmental pollution (see Henderson, 1988). However, as Fletcher and Phipps (1991) point out, there are significant methodological barriers and difficulties in conducting scientific research to assess environmental quality issues in agriculture.

Another critique of the nature of comparative research conducted to date is the neglect or inability of current approaches to capture qualitative differences of both systems of production. As Oelhaf (1978) identifies, the emphasis on quantitative differences in productivity yields does not test the product quality claims (better nutritional value and taste) of organic farming advocates. Additionally, it is difficult to test quality claims about the superior plant, animal and human health benefits to be derived from organic methods of production. However, as Lampkin's (1990) survey of European research on the quality of organic versus conventionally produced food shows, there are a few research studies which have addressed these questions. One notable study was conducted in West Germany where comparative taste tests conducted over a 10 year period revealed that organically grown celery, beetroot and cabbage had consistently higher scores than conventionally grown ones. Only organically grown carrots scored lower over the 10 year span of the research project. Another European study demonstrated that storage losses for vegetables grown with organic fertilizers was consistently less (ranging from 11% to 29%) than for vegetables grown with mineral and synthetic fertilizers. Not surprisingly, still other research studies in Germany and Switzerland have shown that organically grown fruits and vegetables have lower levels of pesticide residues and nitrates than conventionally grown fruits and vegetables. Another study by Stopes, Woodward, Forde and Vogtmann (1988) which compared the nitrate content of organic and conventionally grown vegetable and salad crops confirms that the concentrations of nitrates in organic vegetables were generally lower. However, they also found that levels were highly variable depending on harvest date and source.

Many of the conclusions regarding the relative superiority of conventional practices (in terms of increased yields) are based on short term studies (one year) when it is generally acknowledged that longer term studies are more appropriate to control for fluctuations in weather and production variations. Another problem has been the general lack of controlled research and statistical comparisons in research on organic methods. And even when controls are used, often times the "organic" plots neighbour the chemically treated plots thereby suffering disproportionate pest infestations caused by insects seeking refuge from chemically treated fields. While this may be the case in North American studies, the results of controlled tests in U.K. and Europe appear to have minimized these problems.

Given that biological systems of production are more complex than chemical systems and effects, productive research needs to be longitudinal. Oelhaf (1978, pp. 165-167) cites one notable, and rare, study based on 40 years of data comparing chemical and organic fertilizers on corn, oats and wheat which found comparable yields. However, this research methodological requirement runs counter to the preference of many scientists and research administrators whose careers and funding are based on short term results and incremental modifications of previous research.

What then are the implications of widespread adoption of organic farming? Some authors discount the viability of such a possibility with one typical assessment being: "The organic philosophy...is an ill-defined approach that would involve major problems if practised on a large scale...The social and political implications of such systems would be great" (Fairbairn, 1984, pp. 71-72). Large scale conversion could conceivably result in a return to diversified farming, adjustments in farm equipment size, changes in Canadian eating habits, the market development of secondary crops, etc. Others predict that the higher cost of organic products would initially increase total food expenditures by 1% with selected items increasing by up to 99%. Over time, the initial increase due to premium prices for organic products would be offset by the economies of scale resulting from more organic products entering the marketplace. (Madden, 1990;

Oelhaf, 1982; Science Council of Canada, 1991)

There would also be a number of socio-economic changes if organic production systems became the norm rather than the exception. Organic farming practices are more labour-intensive (Lockeretz, Klepper et al., 1976; Oelhaf, 1978) thereby creating an opportunity to stem out-migration from rural communities. There would be a greater number of farms and increased farm employment as small and medium sized labour-intensive farms became more economically viable. The decreased demand for agrichemical inputs would also mean a dislocation in the synthetic chemical fertilizer and pesticide industry. (MacRae et al., 1990; Madden, 1990). It is predicted that for the individual family farmer there would be an increase in net income due to an increase in crop prices, a reduction in production costs, lower asset requirements and debt loads (Langley, Heady & Olson, 1982; Lockeretz, Klepper et al., 1976; MacRae et al., 1990).

In a model designed to estimate the effects of a complete transformation towards organic production in the U.S., Langley, Heady and Olson (1982) estimated that there would be enough food produced to meet domestic consumption needs. However, U.S. exports would need to be cut back. The prospect of shortages during low producing years (due to poor growing conditions) is present. For the consumer, food costs would rise. However, Madden (1990) challenges the validity of the research methodology and assumptions of Langley et al. (1982) and thus their predictions. Citing other research studies that show that organic methods attain similar yields to conventional methods, Madden asserts that only gradual shifts in food prices and resource use would occur as a result of the slow adoption rate of organic and low-input practices. Yet another simulation study conducted by Van Bers and Robinson (1992) indicates that if organic farming were the only method of production in Canada in the year 2031, there would be insufficient food and land supply to meet the demand for vegetables and fruits while there would be surpluses of grains, oilseeds and potatoes.

Whatever the socio-economic implications may be, perhaps most importantly for environmental advocates, the widespread conversion to organic farming methods would result in a reduction of agrichemical environmental contamination.

The Organization of the Organic Farming Movement in Canada

Unlike the case for agrichemical and biogenetic engineering innovations, the impetus for organic farming innovations has not come from the industrial economic sector. Instead, the major players promoting organic farming are nonprofit farmers' associations, environmental advocacy groups, a select group of university researchers, and international agencies (e.g., those affiliated with the United Nations). Within the last 25 years, these organizations have been active in organizing a number of conferences focusing on the promotion of sustainable agriculture. The most notable has been the IFOAM (International Federation of Organic Agriculture Movements) international conferences which have been held throughout the world (see Hill and Ott (1982) for the proceedings of the 1978 conference held in Montreal, and Lockeretz (1982) for the proceedings of the 1982 conference held in Cambridge, Massachusetts). The close linkage between sustainable agriculture and environmental issues has also led to its inclusion on programmes of conferences and commissions on the environment. For example, sustainable agriculture was one of the themes of the World Commission on Environment and Development (1987a, 1987b) and the Globe '90 Conference on the Environment and Industry (Agriculture Canada, 1990).

Within Canada, the organic agriculture movement started in the 1950s with the founding of the Canadian Organic Soil Association (later to be renamed the Land Fellowship) and has gathered momentum during the 1980s (Hill & MacRae, 1990).[see Table 2-6] In 1974, the Ecological Agriculture Projects was established at McGill University's MacDonald College and as related by Hill and MacRae (1990, p. 4) it "quickly became a key centre for networking and information exchange in Canada". The 1980s has seen sustainable agriculture and agricultural environmental issues become the subjects of government funded research studies, university and college courses and conferences (Hill & MacRae, 1990). It is currently estimated that there are over 30 organic certifying associations across Canada -- of particular interest in this study are the nine

TABLE 2-6. A CHRONOLOGY OF ORGANIC FARMING ORGANIZATIONS IN CANADA AND B.C.

1953.	Canadian Organic Soil Association (later the Land Fellowship) established by Christopher Chapman. Initial membership size -- 50 (by 1971, 500 members).
1972.	International Federation of Organic Agriculture Movements (IFOAM) established.
1970's.	Organic organizations appear independently in six provinces. Bio-dynamic gardening and farming groups established. Main functions: organize conferences, publish newsletters, lobby government.
	Establishment of urban sustainable food production projects in Montreal, Toronto, PEI, and Vancouver.
	Organic farming included in conventional agriculture organization publications and conferences.
	TV and radio programmes on organic farming starting to be broadcasted.
	NFB film on organic farming, "A Sense of Humus," produced by Christopher Chapman.
1974.	Ecological Agriculture Projects (EAP) established at Macdonald College, McGill University, Montreal.
1978.	IFOAM conference on sustainable agriculture held in Montreal.
1979.	Quebec Ministry of Agriculture established le Comite' Conjoint pour le Developpement de l'Agriculture Ecologique (a joint project between the federal, provincial governments and producer groups). Funding of one model organic farm in each of Quebec's 12 agricultural regions.
1980's.	Establishment of Organic Food Certification Programs.
	Government studies of organic farming, organic food markets and certification funded.
	Sustainable agriculture courses established at college and university levels. Proposed degree programme in sustainable agriculture at MacDonald College.
	First major conference in Canada, "Research in Sustainable Agriculture," held at MacDonald College (funded by Agriculture Canada).
1989.	Department of Consumer and Corporate Affairs define organic food and farming.
	All provinces, with the exception of Newfoundland, have sustainable agriculture organizations.
1989.	Alliance of B.C. Organic Producers Associations (ABCOPA) formed.
1990.	Announcement by B.C.M.A.F. that provincial regulations for organic products were to be developed under Bill 85 -- B.C. Food Choice and Disclosure Act

TABLE 2-6.(Cont.)
A CHRONOLOGY OF ORGANIC FARMING ORGANIZATIONS IN CANADA AND B.C.

1990.	First national conference of organic producers associations held in Montreal.
1990.	Canadian Organic Unity Project established to develop national organic certifying board and national organic certification standards to regulate the organic food industry.
1992.	Certified Organic Associations of B.C. (COABC) formed.
1993.	Final proposal for Canadian Organic Advisory Board and Canadian Organic Certification Standards (to be implemented under Canadian Agricultural Products Act) submitted to Agriculture Canada. Canadian Organic Unity Project dissolved. [Projected enactment of regulations -- 1994]
1993.	Final proposals for Organic Agricultural Products Certification Regulation, Certified Organic Associations of B.C. and Certified Organic Associations of B.C. Production Standards submitted to B.C. Ministry of Agriculture and Food for enactment under B.C. Food Choice and Disclosure Act. [Projected enactment of regulations -- 1993]
Sources:	Hill (1984, 1989); Egri & Frost (1992); Egri (1993)

regional organic organizations, one provincial bio-dynamic society and two provincial organic organizations located in B.C.

At this point in time, it would appear that the organic farming associations within Canada could be categorized as either "issue-oriented" or "fledgling" organizations (Pross, 1986). In many respects, organizations involved in organic farming appear to be "loosely coupled" alliances based on a common ideological purpose -- that of effecting a fundamental change in how agriculture is conducted. Forbes' (1985) study of the institutions and influence groups in the Canadian food policy process provides a mapping of the conventional agriculture sector. Aside from lists of various organizations and individuals involved in the promotion of sustainable agriculture, no similar mapping has been conducted for this interest group. One of the intended outcomes of this research project was to construct such a map of organic farming organizations within B.C. which are less than five years old and are still in the midst of organizing. [This is provided in Chapter 6 on farm organizations in B.C. agriculture.]

There is evidence that organic farming organizations in B.C. are maturing to the extent to which they are developing cooperative linkages to facilitate education and information sharing as well as to influence public policy. In 1989, an umbrella group called the Alliance of B.C. Association of Organic Producers Associations (ABCOPA) was formed to provide a linkage between the various bioregional groups. During the course of this research project, this organization has undergone a number of crises in terms of the development of its organizational mission, goals and processes. One outcome of these difficulties has been the subsequent formation in 1992 of the Certified Organic Associations of B.C. (COABC) by a number of the original ABCOPA member organizations. The development of a provincial body to represent organic producers in B.C. will be addressed in detail in Chapter 7.

The Organizational Politics of Organic Farming

Organic farming is one alternative which the environmentalists apparently can live with. There is a commonality between organic farming advocates and environmentalists in that they promote systemic preventative approaches to solving agricultural pest and environmental problems. There also appears to be widespread support from the public and governments for organic farming and its products. Given this general consensus about the environmental and public health benefits of organic farming, is this an innovation devoid of organizational politics?

Zakreski (1989) reported of some of the problems which organic farmers in Saskatchewan face in terms of government regulations, antagonistic neighbours and agricultural researchers. A June 1990 report about organic farmers in the Pemberton Valley provided initial evidence that organic farming is indeed becoming a contentious issue for some (Forgas, 1990). That year organic farmers, Pat and Jackie Quigley decided to expand their operation to produce potatoes. However they encountered serious resistance from the Pemberton Seed Potato Control Area Committee (representing the 17 seed potato farmers in the area) which views such action as threatening the international reputation of Pemberton Valley growers to produce disease and virus free potatoes. Spraying regularly with pesticides is the means by which local farmers have chosen to eliminate these pest problems. Empowered by the Seed Potato Act of 1949, the Area Committee which monitors the $900,000 a year industry has warned the Quigleys that if unacceptable levels of pests or diseases are found in their potatoes, their crops would be destroyed. Undeterred, the Quigleys are reported to "insist they will never spray their crops and are prepared to resist any action taken by the growers' association" (Forgas, 1990, p. B2). As found later, a confrontation was avoided when the Quigley's financial situation forced them to give up their farm (much to the relief of the B.C. Seed Potato Growers Association as learned during one of the interviews for this study).

While information about political battles is somewhat sparse (a deficiency which this research project sets out to remedy to some extent), there are other indications that a number of forces are operating which serve to limit the widespread diffusion of organic farming within the agricultural sector. Unlike the highly public and controversial political contests surrounding agrichemical and biogenetic engineering innovations, much of the organizational political contests around organic farming are operating at the less observable deep structural level. The dynamics of these contests appear to be serving to contain rather than eliminate this agricultural innovation.

(1) The Politics of Research on Organic Farming

As earlier identified in Chapter 2, research on organic farming alternatives has been plagued by a lack of longitudinal comparisons, a lack of adequate controls, problems in measuring qualitative and environmental outcomes, among others. These identified deficiencies in research methodology are further aggravated by what some authors view as the inherent biases of the agricultural research process as it is conducted in Canada (MacRae, Hill, Henning & Mehuys, 1989) and in the United States (Oelhaf, 1978; Hightower, 1976). Traditional scientific process and institutional forces serve as barriers to the conduct of research on sustainable agriculture alternatives. For example, these authors discuss how the process of conventional scientific inquiry based on the principles of reductionism, objectivity and inductive generalization is ill-suited to the study of biological system phenomena which are holistic, complex, subjective, contextually specific and interrelated. Norgaard (1987) asserts that there is a contrast in epistemology between traditional Western science and that proposed by the agroecologists. He asserts that: "The most important difference between the agroecological world view and that of Western science is that agroecologists perceive people as part of evolving local systems. The nature of each biological system has evolved to reflect the nature of the people -- their social organization, knowledge, technologies and values." (Norgaard, 1987, pp. 23-24)

Whereas research on sustainable agriculture often requires interdisciplinary research teams engaged in long term projects, the training, rewards and evaluation systems of university research institutions are biased towards individual short-term research projects within established disciplines. Industry funded research programmes and the peer review process (with review panels comprised most often of established scientists who have built their reputations on work in conventional agriculture) serve to discourage innovative basic research which challenges the status quo. Especially when some of these scientists are of the same mind as Don Rennie, the former dean of the College of Agriculture at the University of Saskatchewan who is a staunch opponent of organic farming (Rennie, 1991; Zakreski, 1989).

Further compounding the difficulties of conducting research on alternative agriculture methods is the lack of funds to do so. Within the United States, the largest funders of agricultural research are the agribusiness interests who have few incentives to fund research on alternatives which could conceivably reduce demand for their products (Oelhaf, 1978; van den Bosch, 1978; Hightower, 1976). A similar prospect is identified in the Canadian arena when one considers the recent government policy of promoting cooperative research projects with industry (MacRae, Hill, Henning & Mehuys, 1989; Science Council of B.C., 1988).

(2) The Organizational Politics of Government Regulation of Organic Farming

The late 1980s saw the initiation of federal and provincial organic food certification programs in Canada. In 1989, the federal Department of Consumer and Corporate Affairs adopted a definition of organic food and farming which was consistent with that of OFPANA. Shortly thereafter the Canadian Organic Unity Project (COUP) was established after the Canadian Agricultural Research Council had struck an ad hoc committee to look at farming standards. Thus far, over 375 groups or persons have been involved in the development of national organic certification standards and a regulatory system to accredit organic certifying agencies.(Egri & Frost, 1992)

One impetus for a national system of organic certification was the need for consumers and producers to have a common understanding of what the term "certified organic" meant in order to give more credibility and legitimacy to the industry. A second impetus was the European Economic Community's deadline (initially 1992, later extended to 1993) for national certification of organic product imports. The task of gaining a consensus amongst the over 30 organic certifying agencies across Canada and their representatives took over two years of difficult negotiations between individuals holding different philosophies and perspectives on organic farming as well as having differences in their previously established organic certification standards.(Egri & Frost, 1992) In January 1993, COUP delivered their final proposal for Canadian Organic Certification Standards and the Canadian Organic Advisory Board (the proposed accreditation body) to be implemented under the Canadian Agricultural Products Act. It is expected that the new regulatory system (intended to be self-regulated by the organic food industry) will be in place before the 1994 growing season.

A parallel (but separate) initiative to develop a provincial government regulatory system for organic food certification was initiated in 1992 following the passage of Bill 85 -- The Food Choice and Disclosure Act. While Bill 85 was designed as umbrella legislation that could be utilized by any part of the agriculture sector, the first application of the legislation has been to develop a regulatory system for organic foods. Government regulation has proven to be the most contentious and divisive issue within the B.C. organic farming community during the past three years. As will be discussed in detail in Chapter 7, the philosophical differences amongst B.C. organic farmers concerning the merits of government involvement in organic agriculture have informed a number of political contests between the various regional organic associations.

As advocates for organic farming have asserted, government endorsed certification programmes are major steps towards overcoming the problem of ensuring that organic food is not misrepresented. The intended effect of this type of legislation is to guarantee the "purity" of food products through the establishment of enforceable standards and regulation. It is interesting that both the federal and provincial regulatory systems set up mechanisms for the regulation of organic food products with the intent that the industry be self-regulating. This could be interpreted in two ways: first, that the producers can be trusted to act in the best interests of the consuming public; or second, that violation of these regulations will pose minimal, or no, risk or hazard to the general public. This is in direct contrast to the regulatory mechanism constructed to deal with agricultural chemicals such as pesticides, herbicides, fungicides (Castrilli & Vigod, 1987). However, the government regulation of organic food production may be a two-edged sword. On the one hand, it provides a measure of legitimacy to organic producers and protection against misrepresentation within the marketplace. On the other hand, the spectre of government regulation (and the scrutiny and inevitable recordkeeping it entails) may serve to discourage those considering converting to organic farming thus limiting the growth of the organic farming movement.

Regulation of organic products is primarily in the form of certification standards. Bill 85 -- The B.C. Food Choice and Disclosure Act provides a key critical issue around which to gather data regarding the political influence tactics of organic farming organizations (relative to other interest groups) at a government policy level. In his framework for understanding interest group-government relations in Canada, Stanbury (1993) identifies four primary means by which firms and business groups influence government. They include: lobbying;

participation in the political process; advocacy advertising; and the use of the media to influence public opinion. As outlined in his analytic framework, changes in public policy are the result of a combination of factors including: (1) changes in environmental variables (economic, demographic, social, ideological); (2) shift in political power; and (3) changes in pressure group behaviour. A priori, it appears that the impetus for the B.C. Food Choice and Disclosure Act could be traced primarily to a change in environmental variables and possible changes in pressure group behaviour rather than a shift in political power.

Recent public opinion polls have revealed that the environment is regarded as one of the more critical issues facing our society (Bakvis & Nevitte, 1992). The promotion of organic foods is consistent with the wider environmental ethic which has gained prominence in B.C. politics. This is evidenced by the provincial government's sponsorship of the Globe '90 Conference on Environment and Business which focused on the achievement of sustainable development. One stream of the conference sessions was devoted to sustainable agriculture. Also, as evidenced by the April 1990 Throne Speech and recent government publications, the promotion of environmental programmes has been placed high on the political agenda. Additional evidence of this increased commitment to environmental issues was the 1990 announcement of a BCMAFF programme to provide special financial assistance to farmers endeavouring to try environmentally sound agricultural practices.

This research study spanned the three year time period from the announcement of the intent to develop a regulatory system for organic products to its enactment in legislation. As will be discussed in detail in the chapter concerning the organizational politics of organic farming in B.C., Bill 85 proved to be the focal point for the majority of interorganizational and intraorganizational politics within the B.C. organic community.

Summary

Stuart Hill (1989) has adapted Lewin's Force Field Analysis to delineate the driving forces and restraining forces in the development of sustainable agriculture in Canada (see Table 2-7). An organizational political reading of these forces highlights the nature of the political contests which have served to control the widespread diffusion of organic farming. There is preliminary evidence of a number of political tactics to control the resources (financial and intellectual) needed to promote organic farming (Hill, 1989). In the competition for industrial research funds, organic farming innovations would appear to be the least successful recipient when compared to those conducting research on

TABLE 2-7. DRIVING AND RESTRAINING FORCES IN THE DEVELOPMENT OF SUSTAINABLE AGRICULTURE

(Source: Hill, 1989, p. 72)

DRIVING FORCES	RESTRAINING FORCES
* Consumer demand due to growing awareness and fears about toxins in food and the environment	* Misleading information and advertising in media and educational institutions
* Farmer interest	* Confusion over concept of sustainability
* New information and research on conventional and organic approaches	* Lack of support for long term, large scale research
* Interest by wholesalers and retailers	* Lobbying by individuals and groups interested in continuing status quo of conventional farming
* Activities by societies and groups (publications, conferences, services)	
* Establishment of certification criteria	* Lack of comprehensive high quality education and training (perpetuation of inappropriate training)
* Government involvement (funding, services, information)	* Lack of institutional and structural support and presence of ones which discourage diversification and self-reliance
* Media interest	
* Environmental media	* Disempowerment

agrichemical and biogenetic engineering innovations (McEwen & Milligan, 1991). One result of this industrial bias is that the onus is placed on government funding agencies to support research on sustainable agriculture.

Hill notes that there has been misleading information and advertising in the media and educational institutions about sustainable agriculture. The variability in interpretations about what constitutes sustainable agriculture creates a fertile environment for the use of the political tactic of manipulative communication.

As found during the development of the Canadian organic regulatory system through the Canadian Organic Unity Project (Egri & Frost, 1992), interorganizational politics have come into play in the lobbying of government for the certification of organic food products. Identification of the specific political tactics which were involved in the development of the B.C. regulatory system for organic products will be presented and discussed. While it was expected that the political tactics of networking and building coalitions of support would be the predominant modes of influence, there was evidence of a number of competitive political games which took place.

There is evidence that the deep structure game of legitimation is operating in that academic researchers who want to conduct research on sustainable agriculture must still convince administrators and colleagues that the methodological innovations based on holistic principles which they propose will not compromise the scientific integrity of their research findings. Existing methodologies based on reductionistic logic are ill-suited to research questions on sustainable agriculture and will work, in fact, against producing a valid contribution to scientific knowledge. The denial of legitimacy for their research methodologies serves to limit the perceived legitimacy (and professional status) of researchers of sustainable agriculture.

The deep structure game of neutralization is evident in the continued subscription of university administrators and research funding agencies to quantitative, short term and intradisciplinary criteria as the basis for decisions on individual careers and the allocation of research funds. There is evidence of a number of small wins, for example, the establishment of centres for sustainable agriculture research such as the Ecological Agriculture Projects at McGill's MacDonald College. In 1991, Nature's Path Foods Inc. (an organic food processor) donated $2000 to U.B.C.'s Faculty of Agriculture for a scholarship to be awarded to a student pursuing studies in sustainable agriculture. This is part of the recently formed Bios Foundation whose mandate is to promote sustainable agriculture and organic food production (the U.B.C. Dean of Agriculture served as an advisor in setting up the foundation). However, as yet, there appear not to have been any major changes at institutional levels to embrace alternative criteria on a large scale. But academic institutions do not exist in complete societal isolation. In time, they may be forced to accommodate the growing government and public demand for scientific knowledge about sustainable agriculture. Government policy statements are being translated into research funds earmarked for these arenas. How fast and in what ways academic institutions adjust to these demands remains to be seen.

As identified by MacRae et al. (1990), current university policies and structures offer few rewards or incentives for new entrants to academia to experiment outside the mainstream of agricultural research. Instead of being encouraged to be creative in radically new ways, they learn that career survival carries with it a requirement to conform to those values, beliefs and behaviours deemed to be "appropriate." As lower level members of the academic community, young researchers have few resources or political power to resist this deep structure game of socialization. For those entering academia with visions of effecting transformational change in the current system, these ambitions often need to be placed on hold until they gain the freedom which comes with tenure. But by that stage in their careers, they may have either lost the will or energy to enter such battles or have too much invested in their traditional work to reject it. Still, there appear to be more established and tenured academics who can afford and do challenge the status quo.

The battle over synthetic organic chemicals (pesticides and other chemical additives to agricultural production) has been a long one. In many respects, it appears that critics have been winning the battle as evidenced by governmental initiatives to promote the practice of organic or environmentally benign agricultural practices (such as the B.C. government's Food Choice and Disclosure Act; the revised agricultural economic assistance program to practice ecological agriculture). This transition has been part of a surge of public awareness of environmental issues and a resultant commitment of government to promote environmentally safe practices.

CHAPTER 3. RESEARCH QUESTIONS REGARDING THE ORGANIZATIONAL POLITICS OF AGRICULTURAL INNOVATION

Based on the literature reviews contained in Chapters 1 and 2, it is evident that there are a number of research questions to be explored in regards to the processes of innovation and organizational politics in agriculture. In this chapter, the general research questions identified in the introductory chapter are augmented by a number of more specific ones which relate to specific findings in the existing empirical innovation and organizational power and politics literatures.[Appendix A provides a summary list of research questions] Research questions are organized into the following categories:

A. Socio-economic and personal background characteristics of farmers;

B. Information channels and communication behaviour;

C. Perceptions, beliefs and evaluations concerning: organic farming, synthetic agrichemicals, the natural environment, and biogenetic engineering technology;

D. Innovation championship;

E. Farm organizations;

F. Interorganizational networks in agriculture.

A. SOCIO-ECONOMIC AND PERSONAL BACKGROUND CHARACTERISTICS

To ascertain whether there are differences in the personal contexts within which individuals practising organic farming as opposed to conventional agricultural production methods are operating, the following research questions will be investigated.[1]

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[1] The empirical literature relating to Research Question 1 includes: Blobaum, 1983; Bolan & Smith, 1988; Buttel & Gillespie, 1984; Buttel et al., 1981; Coughenour & Shamala, 1989; Godwin & Marlowe, 1990; Lockeretz et al., 1984; Lockeretz & Wernick, 1980; Molder et al., 1991; Rogers, 1983; Taylor & Miller, 1978; Thomas et al., 1990; USDA, 1980.

The empirical literature relating to Research Question 2 includes: Altieri et al., 1983; Henning et al., 1990, 1991; Lampkin, 1990; Lockeretz & Wernick, 1980; Lockeretz et al., 1976; Lockeretz, Klepper et al., 1976; MacRae et al., 1990; Molder et al., 1991; Oelhaf, 1978; Rogers, 1983; Saskatchewan Dept. of Agriculture, 1990; Sparling et al., 1992; USDA, 1980; University of Victoria P.I.R.G., 1990.

QUESTION 1. Are organic farmers different from conventional farmers? Specifically, are organic farmers different from conventional farmers in terms of:

1a. age?
1b. gender?
1c. marital status?
1d. level and type of general education?
1e. level and type of agricultural education and training?
1f. prior career histories?
1g. current off-farm employment of themselves and/or family members/partners?

QUESTION 2. Are organic farms different from conventional farms?

Specifically, are organic farms different from conventional farms in term of:

2a. farm size?
2b. ownership status
2c. types and diversity of farm products?
2d. operating expenses?
2e. agricultural labour requirements (family and hired labour)?
2f. methods of marketing farm products?

The next set of research questions concern the relative innovativeness of organic farmers as compared to conventional farmers in respect to their farm operations.[2]

QUESTION 3. Are organic farmers more innovative than conventional farmers?

Specifically, are organic farmers different from conventional farmers in respect to:

3a. the number of new practices and/or products which they have adopted in their farm operations and in marketing farm products?

3b. the types of new practices and/or products which they have adopted in their farm operations and in marketing farm products?

3c. sources of ideas for innovations and changes in farm operations and marketing?

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[2] The empirical literature relating to Research Question 3 includes: Altieri, 1983; Conacher & Conacher, 1983; Henning et al., 1990, 1991; Lampkin, 1990; MacRae et al., 1990; Rogers, 1983; USDA, 1980.

B. INFORMATION CHANNELS AND COMMUNICATION BEHAVIOUR

The acquisition, channelling and utilization of information has proven to be instrumental in the process of technological innovation. However as Rogers (1983) and others have identified, communication behaviour is subject to selective exposure, that is, accessing only those communication messages which are consistent with pre-existing attitudes and beliefs.[3]

QUESTION 4. Are organic and conventional farmers different in terms of their communication behaviour?

4a. Organic farmers will attend to information from sources (individual farmers, organizations, and publications) which support organic farming concepts and philosophy.

4b. Conventional farmers will attend to information from sources (individual farmers, organizations, and publications) which support conventional approaches to agriculture.

Market information is generally regarded as a more important source of innovative ideas than those generated internally within the scientific community. This "market pull" vs. "technology push" dimension appears to have played a vital role in the process of agricultural innovation. The driving forces behind agrichemical innovations seem largely to be of the technology push variety. The emergence of significant scientific breakthroughs in chemistry during WWII and construction of chemical production facilities created the opportunity and need to seek practical applications for these products once the war effort ended.

The emergence of organic farming can be viewed as integrally market pull in its response to the public's demand for pesticide-free food and the environmentalists call for practices which forego synthetic chemicals. In this respect, the prognosis for the continued acceptance and promotion of organic farming would appear to be secure.

Biogenetic engineering innovations appear to be a combination of both types of driving forces. The market demand for nonchemical solutions to pest control and productivity problems has accelerated the search for genetic and biological solutions. At the same time, scientific discoveries in genetics research has

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[3] The empirical literature relating to Research Question 4 includes: Lawson, 1982; Rogers, 1983; Tait, 1990.

created the need to find practical applications to recoup expensive R&D expenses (Beier & Straus, 1985). Thus biogenetic represents a combination of both "market pull" and "technology push" forces.

One communication issue concerns the efficacy of various communication modes depending on the stage of the innovation decision process. During the initial innovation awareness stage, mass media channels are more important whereas interpersonal channels are more important during the adoption persuasion stage. It follows that early adopters of an innovation rely more heavily on and have a greater exposure (in terms of both variety and volume) to external sources of information about an innovation. In terms of communication about biogenetic engineering, these insights would lead us to expect farmers to rely more heavily on mass media for information about this very new technological innovation which can be construed as being in the awareness-knowledge stage of the innovation decision process.

Alternatively, we would expect farmers to rely more on interpersonal channels to obtain information about organic farming innovations for two reasons. First, it is generally acknowledged that organic farming has had limited coverage in the traditional agriculture mass media which rely on advertising revenue from agribusiness interests. Second, many of the organic farming concepts have been in existence for a longer period of time, therefore this innovation may be operating within the adoption persuasion stage. These preliminary conclusions form the basis of the following research questions to be examined in this research project and which will be compared to the findings of Rogers (1983).[4]

QUESTION 5. What communication channels do farmers' access for information concerning organic farming innovations and biogenetic engineering innovations?

5a. For farmers (conventional and organic), the primary sources of information about biogenetic engineering innovations will be through mass media communication channels.

[4] The empirical literature relating to Research Question 5 includes: Altieri et al., 1983; Conacher & Conacher, 1983; Damanpour, 1991; Hill & MacRae, 1990; MacRae et al., 1989; Nowak, 1987; Rogers, 1983; Soule & Piper, 1992; Tait, 1990; Thomas et al., 1990.

5b. For farmers (conventional and organic), the primary sources of information about organic farming innovations will be through interpersonal communication channels.

A number of studies have focused on the influence of information sources on the farmer's decision to use pesticides. There is a wide variety of information sources which a farmer can access (see Appendix B for a summary of research findings). These include: government and non-commercial sources (in U.K. studies this is the Agricultural Development and Advisory Service), agribusiness representatives (primarily commercial pesticide dealers), contracting companies, informal contacts (other farmers and family members). In many respects, these sources of information act in a gatekeeper role of channelling information (whether of a technical or market nature) which influences the innovation adoption decision (Allen, 1977; Becker, 1970; Tushman & Katz, 1980). The prevalence and influence of commercial advisors who had direct linkages with the commercial producers of pesticides was addressed in a number of studies. However the impact of their advice (which some would regard as being inherently biased towards the promotion of pesticide use) on actual pesticide usage is subject to dispute.

Tait (1978) and Lawson (1982) found that reliance on these commercial advisors as a primary source of information did not correlate with increased pesticide usage. They attributed this unexpected result to two factors. Tait suggests that non-commercial advisors lacked the knowledge and resources to effectively influence pest control decisions. Lawson notes that the preferred type of information channel, per se, did not appear to influence pest control decisions -- farmers chose those channels which suited their individual preferences (and pre-determined biases) although he found that less experienced farmers tended to rely more heavily on dealers. In contrast, Turpin and Maxwell (1976) noted that farmers who relied most on pesticide dealers for advice tended to use more pesticides.

These observations lead us to investigate the degree to which selective perception (interpreting and judging information and information sources in terms of one's existing attitudes and beliefs) is operating in farmers' decision making process regarding the adoption of innovations in conventional and organic farming.[5]

QUESTION 6. Are there differences between organic and conventional farmers in terms of how they rank different information sources in terms of relevance, understandability and trustworthiness?

6a. Organic farmers will rank information sources identified as subscribing to an organic farming philosophy higher (in terms of relevance, clarity and trust) than sources identified as promoting conventional agricultural practices.

6b. Conventional farmers will rank information sources identified as promoting conventional agricultural practices higher (in terms of relevance, clarity and trust) than sources identified as subscribing to an organic farming philosophy.

C. PERCEPTIONS, BELIEFS AND EVALUATIONS CONCERNING AGRICULTURAL INNOVATIONS AND THE NATURAL ENVIRONMENT

As identified in Chapter 1, the perceived attributes of innovations have been the basis of a number of contingency models developed to explain and predict the adoption/non-adoption of an innovation. The five primary innovation attributes identified by Rogers (1983) and Zaltman et al. (1973) include: (1) perceived relative advantage (economic and social) that an innovation offers the adopter; (2) perceived compatibility with existing sociocultural values and beliefs, felt needs and past experiences with innovation adoption; (3) complexity in terms of difficulty to understand and/or use the innovation; (4) trialability -- the extent to which an adopter can experiment with the innovation on a limited basis; and (5) observability or visibility of results. Given the available information on synthetic agrichemical, organic farming and biogenetic engineering innovations, what predictions can be drawn about their adoptability using this framework?

The first column of Table 3-1 presents a summary of Rogers' (1983) and Zaltman et al.'s (1973) reviews of the relationship between innovation attributes and their subsequent adoption and diffusion. Many of the studies reviewed were

[5] The empirical literature relating to Research Question 6 includes: Lawson, 1982; Molder et al., 1990; Tait, 1978, 1990.

TABLE 3-1. ATTRIBUTES OF INNOVATION AND THEIR IMPACT ON THE INNOVATION ADOPTION/REJECTION DECISION

	Impact on Innovation*	Agrichemical Innovations	Biogenetic Engineering	Organic Farming
1. Perceived Relative Advantage over Alternatives				
a. Economic				
- return on investment	+	+	+	+
efficiency (time savings)	+	+	+	-
- initial cost	+	-	-	+
- continuing cost	-	+	+	-
b. Social				
-power/status	+	+	+	-
-ridicule/exclusion (risk of isolation)	-	-	-	+
2. Compatibility				
a. Similarity to existing product or process, sociocultural values, past experiences	+	+	+	-
b. Pervasiveness (requires adjustments to other elements of system of production)	-	+	+	-
3. Complexity of ideas and/or implementation (higher)	-	+	+	-
4. Trialability/Terminality	+	+	+	-
- Ease of reinstating status quo (reversibility)	+	-	+	+
5. Communicability (clarity of results)	+	+	+	-
6. Scientific status	+	+	+	-
7. Support of gatekeepers (government, financial institutions, opinion leaders)	+	+	+	-
8. Point of origin (external (-);internal (+))	+	-	-	+

\+ positive relationship with innovation adoption
\- negative relationship with innovation adoption

* adapted from Rogers, 1993; and Zaltman, et al., 1973.

of innovations in agriculture and education. Columns 2 through 4 in Table 3-1 offer a preliminary analysis of how these variables could relate to synthetic agrichemical, biogenetic engineering and organic farming innovations. As indicated, each of these three types of innovations hold different characteristics with varying predicted impacts on their subsequent adoption and continued acceptance.

From this preliminary analysis, it would appear that the characteristics of both synthetic agrichemical and biogenetic engineering innovations facilitate the adoption decision. Part of this "advantage" can be traced to the manner in which each are supported by the existing operating paradigm of agriculture which values efficiency of operations (time-saving practices), low complexity in implementation (i.e., integration into existing standard operating procedures) and high observability or visibility of results. Furthermore, the perceived legitimacy of these innovations is enhanced by their relatively higher status within the scientific community (as indicated by the greater funds allotted to their research and development) as well as the support of governmental and industrial opinion leaders. Another factor favouring rapid adoption of biogenetic engineering innovations is that they can be easily integrated into existing conventional and organic farming practices.

Analysis using these parameters reveals that organic farming innovations present a less promising constellation of attributes to facilitate their adoption. For example, the economic rewards of organic farming are less certain and may even be less than those offered by conventional agriculture. Further deterrents to widespread adoption and diffusion would centre on the requirement for radical, complex and large scale changes to existing practices and the risk of isolation from their counterparts in mainstream agriculture (which can be mediated by the extent to which other organic farmers become their primary referent group). While the point of origin of this innovation is primarily internal (thereby facilitating the adoption decision), this advantage may be offset by the relative lack of scientific status and research efforts accorded to this alternative in mainstream agricultural research.

Overall, this analysis would lead us to expect that these attributes of agrichemical and biogenetic engineering innovations would facilitate their rapid adoption and diffusion. Alternatively, the attributes of organic farming appear to be more equivocal and may actually be a deterrent to their widespread adoption.

As earlier discussed, the degree of innovation radicalness is primarily a function of the perception of newness by the adopting unit or organization (Nord & Tucker, 1987). When introduced in the 1940s and 1950s, synthetic agrichemical innovations engendered radical technological and socio-economic changes in agricultural production. Their widespread acceptance and diffusion was facilitated by the demonstrated economic advantages (significant increases in productivity yields coupled with decreased losses caused by pests) and the support of leaders in science, industry and government. These new products were integrally compatible with existing sociocultural values in that they were ideologically consistent with (and reinforced) the dominant worldview which promoted human mastery over nature (and pests) and which regards all scientific progress as being inherently good. At the time of introduction of synthetic agrichemicals, the concepts of ecology and environmentalism had yet to be developed thus there was no cohesive societal force to play the critic role. Therefore initially, these innovations represented only incremental changes on attitudinal and behavioral dimensions.

Although the introduction of synthetic chemicals led to radical changes in farming practices, they did not involve complex implementation decisions for farmers. Early promoters of these products made their acceptance easier by advocating their usage as part of standard operating procedures -- decision making for pest control was simplified by the provision of set schedules of pesticide application (irrespective of the needs of variable local conditions).

Thus we see the effectiveness of the support of societal and economic elites for these innovations during the initial honeymoon period of the agrichemical age of agriculture. The agrichemical industry has also proven to be skilful in interspersing radical innovations within a continuous stream of incremental changes to existing product lines. The extent to which this process of transformation was successful is demonstrated by current references to this new way of agriculture as "conventional." Once this radical transformation was in effect, organizational success for the agrichemical industry has been enhanced by the constant stream of incremental variations of existing chemical compounds.

In contrast, the adoption of organic farming innovations represents radical changes both at ideological and practical levels. An ideological transformation is required in that organic farming requires a systemic interrelated perspective to focus on preventative solutions to pest control problems and productivity. Organic farming also represents a significant reversal in values with qualitative environmental and ecological criteria and values gaining prominence over quantitative economic ones. In economic terms, the benefits of organic farming are equivocal. Reduced revenue due to lower production yields are offset by reduced operating expenses (for fertilizers and pesticides) and often uncertain, premium market prices for organic produce. Further, conversion to organic farming methods requires additional labour costs, especially in the short term. Although there are large farms using organic farming methods, for several types of crops this additional labour requirement poses limits on how much land can be viably worked by a single operator. For the converting farmer, adoption of less capital intensive organic methods may require significant mechanical retooling of both scale and kind. Chemical fertilizer spreaders are replaced by ones designed to spread organic matter (manure). For some crops, chemical pesticide spraying equipment is made obsolete by organic methods. New types of tillage equipment (ploughs, discs, etc.) are required for organic methods. Smaller scale tractors and harvesting equipment are required to replace large ones designed for monoculture systems.

One way to examine these preliminary observations is through the following research questions which identify the degree of divergence in perceptions and beliefs held by conventional and organic farmers about these three sets of agricultural innovations. As shown by Rogers (1983) and others, such perceptions can serve to either hinder or assist the widespread adoption of an innovation.

Thus predictions can be made regarding the future success of an innovation based on the degree to which it is perceived to be advantageous, compatible and easy to implement by different groups. If an innovation scores high on these variables, the prognosis for the future of an innovation is positive. Alternatively, if there are negative perceptions about these attributes, the widespread diffusion of an innovation may be in jeopardy.

In regards to motivations, perceptions and evaluations concerning organic farming, the following research questions are investigated.[6]

QUESTION 7. What are organic farmers' motivations for choosing organic farming as a method of agricultural production?

QUESTION 8. Are there differences between organic and conventional farmers in how they perceive and evaluate organic farming?

8a. Compared to organic farmers, conventional farmers will hold more negative beliefs about the relative economic advantages of organic farming innovations.

8b. Compared to organic farmers, conventional farmers will attribute higher complexity to the incorporation of organic farming innovations into their existing agricultural practices.

8c. Organic farming innovations will be perceived by conventional farmers to require radical changes to their existing work practices.

8d. Organic farming innovations will be perceived by organic farmers to require incremental changes to their existing work practices.

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[6] The empirical literature relating to Research Question 7 includes: Altieri et al., 1983; Blobaum, 1983; Conacher & Conacher, 1983; Hill, 1984; Hill, 1984; Lockeretz & Wernick, 1980; Molder et al., 1991; Oelhaf, 1978; Saskatchewan Dept. of Agriculture, 1990; Sparling et al., 1992; USDA, 1980; Weymes, 1990;

The empirical literature relating to Research Questions 8 includes: Canter, 1986; Lampkin, 1990; MacRae et al., 1988, 1990; Oelhaf, 1978; Nord & Tucker, 1987; Rogers, 1983; Zaltman et al., 1973.

In regards to perceptions and evaluations concerning the use of synthetic chemicals in agricultural production, the following research questions are investigated.[7]

QUESTION 9. Are there differences between organic and conventional farmers in how they perceive and evaluate synthetic agrichemicals?

9a. Compared to conventional farmers, organic farmers will hold more negative beliefs about the relative economic advantages of the use of synthetic agrichemicals.

9b. Compared to conventional farmers, organic farmers will attribute higher complexity to the use of synthetic agrichemicals in agricultural production.

9c. Compared to conventional farmers, organic farmers will attribute greater risks (to the environment and to personal health) to the use of synthetic agrichemicals in agricultural production.

Given the debate concerning the environmental sustainability of each set of innovations, also of interest is the relationships between farmers' current perceptions and evaluations of organic farming, of synthetic agrichemicals, and their values and beliefs regarding the natural environment.[8]

QUESTION 10. Are there differences between organic and conventional farmers in terms of their values and beliefs regarding the natural environment?

QUESTION 11. What are the relationships between organic and conventional farmers' attitudes towards organic farming, synthetic agrichemicals and the natural environment?

Specifically, are organic farmers different from conventional farmers in respect to:

11a. the relationship between their perceptions of agrichemicals and their perceptions of organic farming?

11b. the relationship between their perceptions of organic farming and environmental values and beliefs?

11c. the relationship between their perceptions of agrichemicals and environmental values and beliefs?

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[7] The empirical literature relating to Research Question 9 includes: Carr, 1987; Nord & Tucker, 1987; Rogers, 1983; Tait, 1977, 1982; Zaltman et al., 1973.

[8] The empirical literature relating to Research Questions 10 and 11 includes: Albrecht et al., 1982; Buttel et al., 1981; Carr & Tait, 1991; Colby, 1990; Dunlap & Van Liere (1978); Fishbein & Ajzen, 1975; Geller & Lasley, 1985.

Up until this point, the primary focus has been on developing contrasts between organic and conventional farmers in regards to existing agricultural innovations and production methods (i.e., synthetic agrichemicals and organic farming). Given that biogenetic engineering technology represents a set of agricultural innovations which farmers have yet to widely adopt, there are a number of parallel and additional research questions to be explored. One issue to be explored is the degree the controversy surrounding biotechnology within scientific and government circles is present amongst its potential endusers in agriculture (i.e., perceptions of attributes). Thus, another research question involves farmers' risk assessments of biotechnology innovations in agriculture. As a very new technology, there is even less information and knowledge about its short and long term effects on humans, wildlife and the natural environment. Still in the early experimental stage, biotechnology research is recognized by both scientists and non-scientists alike as requiring new methods of evaluation and safety precautions to avoid undesirable consequences (Andow, Levin & Harwell, 1985; Doyle, 1985; Hedin, Menn & Hollingworth, 1988; Kenney, 1989; Teich, Levin & Pace, 1985). Furthermore, biotechnology involves the alteration of genetic codes which are at a level even less detectable than chemical substances and therefore elevates perceptions of risk. The moral and ethical questions raised by the manipulation of genetic codes in living organisms are also profound, especially when inter-species transfer of genes is involved. Using Douglas and Wildavsky's (1982) typology of risk assessment, biotechnology represents very uncertain knowledge and incomplete knowledge at levels even lower than that for synthetic chemicals. Thus, one could conclude that the perceived (and actual) risks associated with biotechnology in agriculture is significantly higher than risks associated with the more established synthetic chemicals. However, given that there is significantly less information available about biogenetic engineering technology in the public realm, are organic farmers giving this new technological innovation the "benefit of the doubt" until further information is available? Are they, in fact, postponing evaluation of this technological innovation until there is disconfirming evidence which would support the contentions and warnings of critics of biotechnology? Given the newness of this technology, is it one for which there is agreement between organic and conventional farmers in terms of risk assessments?

Are organic farmers means oriented or ends oriented? If they are primarily ends oriented, it can be predicted that the biogenetic engineering technology will be regarded generally positively or at the very least, benign in that it meets their goal of production methods which do not require chemical additives. On the other hand, if they are means oriented, their distrust of biogenetic engineering technology will be relatively higher in that they focus on the parties (agribusiness and associated scientific researchers) who are the prime instigators and beneficiaries of biotechnology.

The following research questions focus on exploring whether there are differences between organic and conventional farmers in terms of their support and/or opposition to biotechnology.[9]

QUESTION 12. Are there differences between organic and conventional farmers in how they perceive biogenetic engineering technology in agriculture?

Specifically, are organic farmers different from conventional farmers in respect to:

12a. their perceptions of the potential benefits of biogenetic engineering technology?

12b. their perceptions of the potential costs/risks of biogenetic engineering technology?

From earlier discussion, we learned how the promotion and acceptance of biogenetic engineering innovations closely parallels that of synthetic chemicals. First of all, biogenetically engineering crop seeds represent a radically new way of combatting pests and enhancing crop productivity by engendering desirable genetic strengths rather than externally applied solutions. However, their usage is one of incremental change to existing agricultural practices in that adoption involves substitution (of one type of crop seed with another) and the reduction, not elimination, of other agricultural inputs (synthetic chemical fertilizers and

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[9] The empirical literature relating to Research Question 12 includes: Douglas & Wildavsky, 1982; Doyle, 1985; Kenney, 1989; OECD, 1988; Rifkin, 1983.

pesticides). Existing capital investments in sophisticated farm equipment and large land holdings are supported to the extent that crop seeds are being designed for utilization in monocultured environments and to withstand the stresses of mass production planting and harvesting (Doyle, 1985). Biogenetic engineering innovations are also economically efficient in that they promote labour-saving practices while reducing costly operating expenses for petrochemical agricultural inputs. Therefore, from the practical standpoint of the farmer, the adoption of these innovations represents an economically attractive, incremental adjustment to existing practices.

The following research questions exploring differences in perceptions and evaluations of biogenetically engineered agricultural products due to chosen production method and other explanatory variables.[10]

QUESTION 13. Are there differences between organic and conventional farmers in their evaluation of the perceived attributes of biogenetically engineered agricultural products?

13a. Both conventional and organic farmers will hold positive beliefs about the relative economic advantages of biogenetic engineering innovations.

13b. Both conventional and organic farmers will view biogenetic engineering innovations as being compatible with their existing agricultural practices.

13c. Both conventional and organic farmers will attribute low complexity to the incorporation of biogenetic engineering innovations with their existing agricultural practices.

13d. Biogenetic engineering innovations in agriculture will be perceived by farmers (conventional and organic) to require incremental changes to their existing agricultural practices.

QUESTION 14. What is the influence of various information sources on farmers' attitudes towards and stated intentions to use bioengineered products?

QUESTION 15. To what extent is a farmer's willingness to try out biogenetically engineered agricultural innovations related to his/her socioeconomic characteristics, agricultural production experience, and assessment of biotechnology's projected benefits, costs and risks?

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[10] The empirical literature relating to Research Question 13, 14 and 15 includes: Doyle, 1985; Fishbein & Ajzen, 1975; Nord & Tucker, 1987; Rogers, 1983; Zaltman et al., 1973.

D. INNOVATION CHAMPIONSHIP

Innovation champions have been shown to play an integral role in the process of innovation. The championship role can also be assumed by individuals, groups or organizations. Individual champions have been characterized as venturesome, eager to try new ideas, knowledgeable, creative. Studies of the personality characteristics of product champions describe their propensity to be self-confident risk takers who have a low need for clarity coupled with a persuasive tenacity. They also exhibit a high degree of interpersonal competence coupled with political astuteness. Their ability to develop lateral support (coalitions, consensus) within and outside organizations have often proven to be critical to innovation success.

In terms of organizational leadership, innovation champions score high on transformational leadership behaviours (charisma, inspiration, individualized consideration and intellectual stimulation) as well as on contingent reward transactional type behaviour. Studies of the communicative patterns of product championship indicate that innovation pioneers and early adopters hold positions of centrality in sociometric networks (discussion, advice and information, friendship) of influence.

Another critical role in the innovation process involves the management champion -- a role which is somewhat different from the product champion. Management champions serve to buffer the innovation process and the activities of the product champion from outside interference as well as procuring the needed time and resources for product development. The role of the management sponsor has been shown to be a critical one in facilitating and ensuring the success of an innovation by altering expectations to motivate or prompt change and by procuring the needed resources for innovation development.

Whereas much of the organizational literature on innovation focuses on individuals, the management championship role can also be seen to operate on a collective level within organizations and society. Societal interest groups can influence the acceptance of one innovation over competing alternatives through the dedication of research and development funds, dissemination of information through the mass media or by lobbying of government agencies for supportive legislation or regulatory policy interpretations (either individually or through affiliated associations). Through these and other actions, the preferred course receives preferential treatment while those judged to be less "suitable" (or beneficial) are denied the necessary resources for survival or visibility to gain supporters. While the presence of collective support for an innovation does not obviate the need for spokespersons, under these conditions the nature of the championship role is an organizational rather than individual dynamic. Thus, it is expected that the presence of organizational or interest group support would reduce the need for individual champions while the absence of such support would require the presence of dedicated individuals to champion an innovation.

How then has the championship role emerged in regards to organic farming innovations and biogenetic engineering innovations? Are there differences in the types of championship? And if so, how have these differences played out?[11]

QUESTION 16. Are there differences in the innovation championship of organic farming and biogenetic engineering technology innovations?

16a. The championship role for organic farming innovations will tend to be assumed by individuals and will more closely resemble that of the product innovation champion.

16b. Champions of organic farming innovations are centrally situated in interpersonal sociometric and communication networks.

16c. The championship role for biogenetic engineering innovations will tend to be diffused among organizations and/or societal interest groups and will more closely resemble that of the management innovation champion.

16d. Champions of biogenetic engineering innovations are centrally situated in societal level sociometric and communication networks.

[11] The empirical literature relating to Research Question 16 includes: Becker, 1970; Blau & McKinley, 1979; Delbecq & Mills, 1985; Doyle, 1985; Hage & Dewar, 1973; Howell & Higgins, 1988, 1990; Kenney, 1986; Nutt, 1986; Olson, 1986; Rogers, 1983; Woolley, 1992.

The analysis presented Chapter 2 lays the groundwork for a number of research questions regarding the organizational political dynamics around agricultural innovations. The use of competitive political strategies often require that the player operate from a powerful resource base. It is the control of these resources (financial and social) which are instrumental in influencing the eventual success or failure of an innovation. Compared to proponents of biogenetic engineering innovations, those individuals and organizations advocating organic farming innovations appear to be at a relative disadvantage in terms of available financial resources and established networks of influence with key decision makers in both government and academic circles (social resources). Thus it is expected that this would constrain the types of political strategies which can be effectively utilized by champions of organic farming.[12]

QUESTION 17. To what degree does the championship of organic farming and biogenetic engineering technology involve collaborative and/or competitive organizational politics?

17a. Championship of organic farming innovations will be limited to collaborative political strategies.

17b. Championship of biogenetic engineering innovations will encompass both competitive and collaborative political strategies.

However, given the fundamental nature of change envisioned by advocates of farming innovations and the challenges which such a change poses to existing power relationships within of agriculture, there is a greater requirement for social innovations to support these changes. Therefore, it is predicted that champions of organic farming (individual and organizational) will have developed a number of social innovations in the way they have organized and the manner by which they have communicated their goals to the public and government policy makers. Alternatively, given the deep structural support for biogenetic engineering technology, there is a lesser impetus to develop new structures and processes to promote this alternative.

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[12] The empirical literature relating to Research Question 17 includes: Clegg, 1989; Deetz, 1985; Falbe & Yukl, 1992; Fidler & Johnson, 1984; Frost, 1987; Frost & Egri, 1991; Kipnis et al., 1980; Mintzberg, 1983; Nutt, 1986; Pelz, 1983; Whitt, 1979.

Therefore, it is also proposed that there is an interrelationship between technological innovations and social innovations. To succeed, technological innovations require the support of complementary social innovations. One purpose of this research project is to identify social innovations which have been developed to support biogenetic engineering and organic farming innovations.[13]

QUESTION 18. To what degree does the championship of organic farming and biogenetic engineering technology involve social innovation?

18a. Individual and organizational champions of organic farming will exhibit a greater propensity than champions of biogenetic engineering to develop new social innovations in the way they interact and influence others to engender public and governmental support for their proposed changes.

18b. Technological innovation success requires a combination of both technological and social innovation.

E. Farm organizations

One level of analysis in this research project is that of farm organizations with one focus being on the incidence and nature of organizational politics within and between organizations. As such, an understanding of the membership, goals, processes and activities of farm organizations within the B.C. agriculture sector is a necessary precursor to ascertaining the incidence and nature of organizational politics in these primarily voluntary associations. Of particular interest is whether there are substantive differences between those farm organizations which represent organic farmers and those which represent farmers in conventional agriculture. Therefore, the following questions regarding farm organizations in B.C. agriculture are addressed.[14]

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[13] The empirical literature relating to Research Question 18 includes: Frost & Egri, 1991; Jelinek & Schoonhoven, 1990; Van de Ven & Poole, 1989, 1990.

[14] The empirical literature relating to Research Questions 19, 20 and 21 includes: Hill, 1989; Molder et al., 1991; Moore et al., 1975; Simpson et al., 1992.

The empirical literature relating to Research Questions 22a, 22b and 23 includes: DiMaggio & Powell, 1983; Forbes, 1985; Greiner, 1972; Pross, 1986; Quinn & Cameron, 1983; Scott, 1987; Simpson et al., 1992; Tolbert & Zucker, 1983; Tushman & Romanelli, 1985.

QUESTION 19. Are organic and conventional farmers different in terms of the number and types of farm organizations they belong to?

QUESTION 20. Are organic and conventional farmers different in terms of their motivations for belonging to farm organizations?

QUESTION 21. Are organic and conventional farmers different in terms of their memberships in organizations outside of agriculture?

QUESTION 22. What are the history, mission and objectives, activities, organizational structure and processes of different types of farm organizations?

Specifically, are there differences between farm organizations involved in mainstream agriculture as opposed to those involved in organic agriculture in terms of:

22a. organizational goals and processes?

22b. how critical issues are addressed and decisions are made?

22c. the extent to which organizational politics have operated within their organizations and in relation to other organizations?

22d. the nature of organizational politics which have operated within their organizations and in relation to other organizations?

QUESTION 23. What roles do different types of farm organizations serve for their members?

QUESTION 24. What roles do leaders play in different types of farm organizations?

24a. Which leadership roles are most required in organizations which are predominantly voluntary associations?

24b. Are there differences in leadership roles due to the size and age of an organization?

24c. Do leaders play different roles in organic farm associations as compared to farm organizations in mainstream agriculture?

QUESTION 25. What is the incidence and nature of social innovations within different types of farm organizations?

The empirical literature relating to Research Questions 22c and 22d includes: Browne, 1988; Falbe & Yukl, 1992; Frost, 1987; Hickson et al., 1971; Kanter, 1983; Kipnis et al., 1980; Mintzberg, 1983; Pfeffer, 1981; Porter et al., 1981; Yukl et al., 1993.

The empirical literature relating to Research Question 24 includes: Quinn, 1988; Quinn et al., 1989.

The empirical literature relating to Research Question 25 includes: Daft, 1978, 1982; Galbraith, 1982; Jelinek, 1979; Kimberly, 1987.

Of particular interest in this study are the actions (political and otherwise) taken by farm organizations to champion and/or challenge the three identified sets of agricultural innovations at both organizational and interorganizational levels. By including the organizational level into this study of innovation processes, one can then explore a series of questions concerning the incidence and operation of individual versus organizational innovation championship; the operation of collaborative versus competitive power and politics; the interplay between social innovations and technological innovations.

F. Interorganizational networks in agriculture.

As earlier discussed, there is evidence that farm organizations often do not operate in isolation but rather form (either on a continuous or temporary basis) interorganizational alliances or networks (Cummings, 1984; Trist, 1983; Gray, 1989). For example, there is evidence of networking and coalitions of support within the organic movement through the development of government regulatory systems (Egri, 1994, forthcoming; Egri & Frost, 1992) as well as within conventional agriculture, eg., the development of co-operative marketing and distribution such as the Saskatchewan Organic Industry Development Council (Shein, 1991a). To what extent are current interorganizational linkages within the B.C. agriculture either "underorganized" or "overorganized"? The answer to this question influences the nature of the conflict within the movement. As proposed by David Brown (1983), if the interorganizational network is underorganized, then the critical problems for the network's survival and influence centre around obtaining resources, developing consensus, and channelling members' energy towards intended goals. Within underorganized systems, internal conflicts may escalate to a level which prompts members to leave the network. Alternatively, the critical problems for an overorganized network are a lack of innovation and suppression of constructive conflict. Following from these observations, questions need to be asked of members of farm organizations as to which issues have prompted the most conflict within the network. Has the conflict centred primarily around goals and objectives? Or has it been over the means by which to achieve widely accepted objectives? What political strategies have been used in attempts to resolve these conflicts? Were they primarily competitive or collaborative ones and were they successful?[15]

QUESTION 26. What has been the incidence, purpose and nature of interorganizational networks in agriculture?

During the course of this field analysis, the B.C. government passed legislation (Bill 85 -- The B.C. Food Choice and Disclosure Act) which allowed for a government sanctioned system of accreditation and certification for organic agricultural products. Recognized as a new approach in government regulation (a social innovation in its own right), the Bill 85 initiative had significant implications for existing organic certifying associations and their fledging interorganizational network, not least of which were fundamental changes in organizational governance and operating procedures. In many respects, the introduction of the new regulatory system constituted a social innovation in organizing for all concerned.

The three year period during which the organic accreditation and certification regulatory system was developed proved to be one of significant organizational politics at organizational and interorganizational levels. As such, this new government regulatory system offered a unique opportunity to study the dynamics of organizational and interorganizational politics surrounding a social innovation throughout its development.

In their case analyses of critical incidents and events in the development process of technological innovations, Van de Ven and Pooley (1992) and Garud and Van de Ven (1992) found that the pattern of events tends to be an episodic one. They found low activity levels during the initial gestation period of an innovation to be followed by a significant increase in activity (occurring in discontinuous bursts) during the subsequent stages of an innovation's development. Their model of adaptive learning also suggests that the origin of an event (internal or external to the innovation unit) has implications for the

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[15] The empirical literature relating to Research Question 26 includes: Brown, 1983; Cummings, 1984; Egri & Frost, 1992; Gray, 1989; Trist, 1983.

whether a prior course of action was continued or changed.

Following this tack, if political action around an innovation is considered to be a critical incident or event, then one can investigate whether similar patterns to those identified by Van de Ven and Pooley (1992) and by Garud and Van de Ven (1992) also occur in regards to political action surrounding social innovations in interorganizational networks. Thus, one can explore questions regarding: the temporal pattern of political activity; the relationship between political action and changes in an innovation's development; and the origin (external or internal) of "triggers" of episodes of high levels of political activity within interorganizational networks.[16]

QUESTION 27. What is the incidence and nature of organizational politics operating within interorganizational networks in agriculture?

Specifically, in regards to organizational politics within interorganizational networks:

27a. Is the level of political action surrounding a social innovation either continuous or episodic?

27b. Are episodes of high levels of political activity more likely to be triggered by events/actions exogenous or endogenous to the environment of those involved in the innovation unit?

27c. Are episodes of high levels of political activity a result of a substantive change, a part of a substantive change, or a precursor to substantive changes in the courses of action concerning a social innovation?

Whilst there are a number of empirical studies concerning the championship of technological innovations within corporations, this field analysis offers an opportunity to explore their generalizability to social innovations occurring in an interorganizational domain. In their study of champions of product innovations, Howell and Higgins (1990) found a positive relationship between championship and frequency of influence attempts. They also found that champions utilized collaborative tactics (in particular coalition building and reasoning) more often than did nonchampions with no differences observed for strategies such as assertiveness, bargaining, sanctioning or appeals to higher authority.

[16] The empirical literature relating to Research Question 27 includes: Brown, 1983; Cummings, 1984; Egri & Frost, 1992; Garud & Van de Ven, 1992; Gray, 1989; Van de Ven & Pooley, 1992.

Several studies of upward influence tactics (Mowday, 1978; Porter et al., 1981; Schilit & Locke, 1982; Yukl et al., 1993) have found there to be a preference for rational and informational persuasion tactics over less rational and sanction based tactics. Falbe and Yukl (1993) also found collaborative political tactics were more effective than competitive ones. Thus there are several questions to be explored concerning the incidence, nature and pattern of political action by champions and nonchampions of a social innovation in an interorganizational network.[17]

QUESTION 28. What is the incidence and nature of social innovation championship and nonchampionship in interorganizational networks?

28a. Do innovation champions initiate a greater number of political tactics than nonchampions of a social innovation?

28b. Do innovation champions differ from nonchampions in the types of political tactics (collaborative vs. competitive) they initiate?

28c. Does the frequency of political tactics initiated by champions and by nonchampions change or remain relatively constant over the course of a social innovation's development?

28d. Does the nature of political tactics initiated by champions and by nonchampions change over the course of a social innovation's development?

CONCLUDING COMMENTS

As set out in the introductory chapter, adopting a holistic research approach involves investigating different facets and levels of the phenomenon of interest. The numerous research questions identified in this chapter outline an ambitious agenda for study. Section II describes the methodologies which were utilized to gather data to answer these research questions. Research findings related to the individual level of the innovation decision making process in

[17] The empirical literature relating to Research Question 28 includes: Brown, 1983; Egri & Frost, 1992; Falbe & Yukl, 1993; Gray, 1989; Howell & Higgins, 1990; Mowday, 1978; Porter et al., 1987; Schilit & Locke, 1982; Yukl et al., 1993.

regards to organic and conventional agriculture are reported, analyzed and discussed in Section III whereas an organizational level of analysis is adopted in Section IV. Section V then relates research findings regarding biogenetic engineering technology as the source of future innovations in agriculture.

SECTION II. RESEARCH METHODOLOGY

To focus on the innovation process, one needs to embark on an analytic journey in which the signposts of quantitative data serve only as symptoms of underlying processes. Essentially, the process of innovation is more appropriately represented by a multiplicative model where innovation is a "function of an interaction among the motivation to innovate, the strength of obstacles against innovation, and the availability of resources for overcoming such obstacles" (Mohr, 1969, p. 111).

Thus far, the technical approach to the study of innovation has resulted in a fragmented proliferation of models which depict an incomplete representation of reality which bears only tangential reference to the energy and forces of the human agents involved. A more complete agenda for the study of innovation would encompass both objective and subjective facets of the process and outcomes and the immediate and derivative impact of an innovation on individual, organizational, and societal levels. It is an interactive recursive model of innovation which does not lend itself to easy and sure answers but rather highlights the political, ethical and social aspects of change.

Consistent with these observations, the overall methodological approach of this research project has been to utilize a balance of qualitative and quantitative research methods to study what is essentially a qualitative phenomenon.

This section on research methodology is organized as follows: a description of the research approach employed in this project; a description of the subject sample; the means by which subjects were selected; the methods of data collection and the types of data obtained; the coding of qualitative interview data; description of the development of the three questionnaires utilized in this research project; and finally, a discussion of the caveats regarding the use of a single interviewer in a research project of this kind.

PART A. RESEARCH APPROACH

This exploratory research project utilized an organizational field analysis approach to the study of the process of innovation within agriculture. As part of the field analysis, a number of detailed case studies of organizations and interorganizational networks were also conducted. As defined by Yin (1984, p. 23):

> "A case study is an empirical inquiry that:
> * investigates a contemporary phenomenon within its real-life context; when
> * the boundaries between phenomenon and context are not clearly evident; and in which
> * multiple sources of evidence are used."

One focus of this study is on the identification and analysis of political contests between individuals and organizations who support organic farming practices and those who advocate conventional (in particular, the use of synthetic chemical pesticides) farming practices to explore a number of research questions regarding the innovation process. These are questions of the "how" and "why" variety which require a qualitative interpretive research approach to trace current and past social, political and historical perspectives, frames of reference, relationships and activities amongst individuals, organizations and interest groups. To answer these types of questions, the research strategy adopted in this field analysis has been to obtain information about individual perceptions, attitudes and behaviours from self-reports in interviews and questionnaires, and to obtain objective indicators of the perceptions and behaviours of interest groups from printed documents. The researcher was also able to attend the annual general meetings of two of the organic certifying associations (B.C. Association for Regenerative Agriculture (March 1991, March 1992); The Bio-Dynamic Agriculture Society of B.C. (March 1992)). These multiple sources of information were then used in an integrative analysis to understand the dynamics of the processes of innovation and organizations within agriculture to date.

This research strategy was chosen for a number of reasons. First, the nature of the research questions about the process of change necessitate an interactive model of information gathering. Given the exploratory nature of this field analysis, there is a need for flexibility on the part of the researcher to explore emerging issues and themes which may arise.

Second, the choice of one's research methodology should be as "user-friendly" as possible for the research subjects. Farming is not a paper and pencil process therefore it is expected that there would be considerable resistance from study subjects to completing an extended survey questionnaire instrument.[1] In comparison, personal interviews are a less threatening mode of gathering information from this group of individuals. The experience of other researchers (e.g., Blobaum, 1983; Oelhaf, 1978) with mail questionnaire surveys reveals a response rate of 39% to 57% with this methodology. Given the relatively small size of the organic farming population in B.C., there was a need to have a higher participation rate. At the time that the research project was initiated in 1989, one estimate of the number of organic farmers in B.C. was 190 (Country Life in B.C., 1989, Nov.). A third reason involves my personal training and experience with interview methods as an academic researcher and personnel officer. It is a methodology with which I am familiar with and have considerable expertise in (Egri, 1983; Moore, Egri & Vanderbeck, 1975).

PART B. DESCRIPTION OF SAMPLE

A total of 137 persons were interviewed in this study -- 116 farmers, 4 farm organization employees (non-farmers), and 17 government representatives (B.C. Ministry of Agriculture).[See Table II-1] The farmer respondents were allocated to one of four categories: (1) 56 organic farmers -- individuals who practised organic farming production methods on their entire farm acreage; (2) 45 conventional farmers -- individuals who utilized synthetic agrichemicals in farm production; (3) six organic-conventional farmers -- individuals who utilized both organic and conventional production methods with designated farmland areas being recognized as "organic" (certified or in transition) by an organic

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[1] In fact, in personal conversation with one potential study subject, an organic farmer, I was told that I could not expect him to spend a lot of time filling out a questionnaire or even taking time out from his schedule to do a formal interview. He said that he would be willing to talk to me but only if I were willing to tag along (and help) as he worked.

certifying association; and (4) nine bio-dynamic farmers. While the large majority (85.7%) of the organic farmers were also members of their local organic certifying association, a number were not currently members but either had been or would be recognized as such if they applied for organic certification status (this categorization was confirmed through conversations with current members of the local organic certifying agency). Representation of the bio-dynamic farming community is especially high when one considers that nine of the 11 commercial bio-dynamic farmers in the province participated in the study.

PART C. SELECTION OF SUBJECTS

Given the bioregional differences in food production throughout the province (due to climate and physical geography), a representative sample based on geographic location was sought. As indicated in Table II-1, subjects were located in one of seven geographic regions: Vancouver Island and the Northern Gulf Islands; the Lower Mainland/Fraser Valley; the Shuswap-Thompson; the Cariboo; the Okanagan Valley (north and south); the Kootenays; and the Peace River region. While there appears to be an overrepresentation of the Okanagan Valley in the sample, in reality the 38 respondents were divided into 17 located in the North Okanagan and 21 in the South Okanagan.

Contact was made with organic and bio-dynamic farmers in each geographic region of the province through one of three ways: by mail, by telephone, and by referral. Initial contact letters were initially sent out to all executive members of organic certifying associations and the one bio-dynamic society in the province as well as to organic farmers listed in the Canadian Organic Growers' Directory of Organic Agriculture and the B.C. Organic Growers Directory The initial contact letters introduced the researcher, outlined the purpose of the study, the study's sponsorship, the time commitment involved on the part of the respondent, the confidentiality of responses plus assurances regarding participant's rights as part of the research project. A list of sample questions was also included in the correspondence with a form letter to be completed and

FIGURE II-1. GEOGRAPHIC LOCATION OF FARMERS INTERVIEWED

TABLE II-1. PARTICIPANTS IN THE STUDY: GEOGRAPHIC REGION AND PRODUCTION METHOD TYPE

GEOGRAPHIC REGION	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS (Note 2) No. (%)	OTHER (Note 1) No. (%)	GOVERNMENT REPRESENTATIVES No. (%)
Vancouver Island	20 (14.5%)	7 (12.5%)	4 (8.9%)	1 (16.7%)	1 (11.1%)	2 (50.0%)	5 (29.4%)
Lower Mainland/ Fraser Valley	21 (15.3%)	7 (12.5%)	8 (17.8%)	1 (16.7%)	0	2 (50.0%)	3 (17.6%)
Shuswap-Thompson	15 (11.9%)	7 (12.5%)	5 (11.1%)	0	3 (33.3%)	0	0
Cariboo	18 (13.1%)	8 (14.3%)	7 (15.6%)	0	1 (11.1%)	0	2 (11.8%)
Okanagan	38 (27.7%)	17 (30.4%)	11 (24.4%)	3 (50.0%)	3 (33.3%)	0	4 (23.5%)
Kootenays	11 (8.0%)	4 (7.1%)	4 (8.9%)	1 (16.7%)	1 (11.1%)	0	1 (5.9%)
Peace River	14 (10.2%)	6 (10.7%)	6 (13.3%)	0	0	0	2 (11.8%)
TOTALS	137 (100.0%)	56 (100%)	45 (100%)	6 (100%)	9 (100%)	4 (100%)	17 (100%)
Group as Percentage of Total Sample		40.9%	32.8%	4.4%	6.6%	2.9%	12.4%

Note 1: Other = Farm Organization Staff Members (non-farmers)

Note 2: Government Representatives: Agricultural Extension Officers = 11; Other BCMAFF Staff = 6.

signed by the respondent if they wished to participate. A stamped self-addressed envelope was enclosed for ease of response.[See Appendix C for a copy of the initial contact letter and supporting material.] The overall response rate for the 88 contact letters sent to organic and bio-dynamic farmers was 47%. Additional names of organic and bio-dynamic growers were obtained through subsequent contact with those who had responded to the initial contact letter. A total of 22 organic and bio-dynamic farmers were interviewed from peer referrals.

Contact letters were also sent to all farm organizations listed in the "Who's Who in B.C. Agriculture" which is published annually by Country Life Ltd. The four farm organization staff members included in this study were those who responded to the contact letter to their organizations but did not operate a farm (all were employed by non-organic farm organizations). Individuals who held executive positions in these organizations but who were also actively farming were allocated to one of the four farmer categories of organic, conventional, organic-conventional and bio-dynamic. The response rate for contact letters sent to these conventional organizations was 41%.

Provincial government representatives were of two types -- Ministry of Agriculture officials/staff who served in specialist administrative functions (6 persons) and regional agricultural extension agents (11 persons). BCMAFF administrative personnel were those who had been mentioned by name in the agriculture newspapers and by organic association executives as being actively involved in the development of organic certification regulations under Bill 85, the Food Choice and Disclosure Act. The names of the BCMAFF agricultural extension agents were obtained from the listing of District Agriculturalists and District Horticulturalists in the "Who's Who in B.C. Agriculture" as well as through identification by their counterparts in the different regions. The assistance of the BCMAFF extension agents was very helpful in that their participation in the study was twofold. First, agricultural extension agents were asked if they would be willing to be interviewed for the study. Second, they were asked if they could assist in the identification of conventional farmers in their region who produced similar food products to participating organic farmers in the nearby area. In this way, differences between organic and conventional farmers in terms of growing conditions (e.g., climate, soil, pests) and type of food produced were minimized. Extension agents were also asked to provide a balance of potential candidates in terms of age and/or farming experience. This basis for matching conventional to organic farmers was informed by previous studies of organic farmers. In these studies, comparisons of conventional and organic farmers have revealed no significant differences in terms of age, work experience, or education levels (e.g., U.S.Department of Agriculture, 1980; Rogers, 1983) therefore these factors were not expected to be relevant factors in the selection of a comparison sample of conventional farmers. However, the types of crops produced and geographic location may be of consequence. Therefore the primary criteria for selection of conventional farmers was their match to organic farmers in terms of geographic region and types of food produced.

Conventional farmers nominated by the government extension agents were then contacted either by letter or by telephone to determine their willingness and/or ability to participate in the study. Generally, the response of these individuals to being interviewed was very positive and 44 conventional farmers referred by government extension agents were interviewed. While initially there was concern that the agricultural extension agents would only nominate those individuals who they had frequent contact with (and thus produce a positive bias in terms of their support for government services and programmes), this concern proved to be unwarranted. A number of the conventional farmers (11) who were interviewed indicated that they had very little, if any, contact with their local extension agent and proved to be highly skeptical of government programmes. An equal number indicated that they had occasional contact while 12 stated that they were in frequent contact with their BCMAFF extension agent. This would suggest that there was a balance in the degree of farmer contact with their local agricultural extension agents. Following informal personal conversations (one at the B.C. Fruit Growers Association Annual Convention, the other at a social function in the North Okanagan), two additional conventional farmers volunteered to participate in the study.

PART D. DATA COLLECTION

The primary mode of information gathering in this field analysis was through semi-structured personal interviews with organic and conventional farmers and their organizational leaders. Interviews followed a semi-structured format and solicited the following information (a copy of the interview questionnaire is provided in Appendix D):

a. personal background: age, gender, marital status

b. career history: farming experience, whether had grown up on a farm, jobs held in the past, current off-farm employment of self and/or spouse/partner, formal education (general and agricultural) for self and spouse/partner.

c. farm operations: size of farm (in acres/hectares); ownership status of farmland; land use; crop production data for the most recent three growing seasons (type of crop, acres, amount produced and sold); previous types of crops produced and reasons for any changes; use of farmland by previous owner; individual operating expenses (as a percentage of total operating expenses); marketing and distribution of food produced; on-farm employment of farmers and their immediate family or operating partners; hired agricultural labour. Farmers involved in poultry or livestock production were asked supplemental questions regarding production numbers, sources of feed, disposal of animal wastes, and animal health and nutrition products.[2]

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[2] Given the literature on economic comparisons of organic and conventional farm operations (Lampkin, 1990; Henning et al., 1991; and others), careful thought was given to obtaining income (farm and off-farm) and operating expenses data. During the process of developing the interview protocol, preliminary discussions with farmers indicated that there would be considerable sensitivity to revealing these data. Given the potential of these types of questions to create a defensiveness on the part of interviewees which would be counterproductive in respect to obtaining data regarding the majority of the research questions of interest in this research study, the decision was made not

d. farming practices: definitions of organic farming, attitudes regarding organic farming (an 11 item questionnaire using a 5-point Likert-type scale); innovations (new practices, ideas) in farming practices which had been tried in the past five years; for organic farmers, perceptions of risk (initial and current) regarding organic farming; methods of pest control and fertilization (synthetic chemical, biological and cultural).

e. sources of information regarding farm practices and products: identification of sources which had been accessed in the past three years; a card sorting exercise ranking seven types of information sources on each of three criteria -- relevance/utility, clarity/easy to understand, and trust.

f. organizational membership: current and past involvement in farm organizations; level of involvement; membership in other types of organizations; the perceived role of farm organizations. For primary organizations, additional questions were asked regarding the organization's history, mission and goals, organizational leadership, organizational issues, new ideas or programs.

g. biogenetic engineering technology: current knowledge regarding biogenetic engineering technology in agriculture; source of information regarding biotechnology; perceived potential benefits and costs/risks associated with biotechnology; willingness to use or try out specific products of biogenetic engineering (from a list of types of crop seeds, microbial organisms, and biological control); the government review and regulation of biogenetically engineered products and/or synthetic agrichemicals.

h. general summary questions: assessment of the greatest problems, risks and/or challenges in agriculture today; the role of government in agriculture; visions of what a "perfect world" would be.

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to gather this information at this time.

Interviews for organizational leaders followed the same format with additional questions focusing on (a copy of the organizational leadership questionnaire is provided in Appendix E):

a. their leadership role and activities: accomplishments; problems and issues that have been dealt with; relationships with organizational members; contacts with other organizations and individuals.

b. involvement and knowledge of the initiative to develop provincial organic certification standards under the B.C. Food Choices and Disclosure Act.

c. involvement and knowledge of the federal Bill C-15, the Plant Breeders' Rights Act to extent patent rights to organisms.

Interviews with government representatives followed a less structured format and included a number of predetermined questions augmented by questions regarding specific issues which had emerged during interviews with farmers in the region. [See Appendix D for a copy of the basic government representatives' interview questions.]

At the start of each interview, participants were asked to read and sign a "Participant Interview Consent Form" which outlined their rights as research subjects (see Appendix C for a copy of the form). On average, interviews took two hours to complete with a number of interviews extending to three or four hours. The majority of the interviews took place in the participant's home at the kitchen table. A few interviews were literally conducted "in the field" as the participant conducted a tour of the farm operations or continued with his/her work. Government representatives and farm organization staff members were interviewed in their offices.

To ensure interview information accuracy, I supplemented hand notes with tape recordings of interviews. As identified by Buchanan, Boddy & McCalman (1988) and by McCracken (1988), tape recording an interview provides a more complete record for subsequent analysis thereby allowing the interviewer to capture the richness (e.g., inflections) of the interview. Furthermore, it allows the interviewer to focus more on the content of the exchange rather than the recording of it. Based on my experience, I would concur with these observations. Interviewees did not object to the recording device once they had been told that the purpose of the tape recorder was that we could ensure greater accuracy in obtaining information, that it was for my personal use only (I was the only person who would listen to it), and that it could be turned off at any time. After the first 5 to 10 minutes, interviewees did not look at the tape recorder which was placed in an obtrusive place with only the free-standing miniature microphone in between us. I found that using a tape recorder permitted the interview to be conducted more as a conversation with note-taking (and the interruptions to the continuity of the interview and possible cues that note-taking may engender) being kept to a minimum. On only two occasions did an interviewee ask that his/her answer to a specific question be "off the record" and the tape recorder be shut off. Tape recording the interview proved especially valuable during the farm tours and interviews conducted in the fields where note-taking was very difficult.

Buchanan et al. (1988) also recommend that a transcript of each interview be returned to respondents for comment as a way to validate information and check for accuracy. In this study, participants were given the option to request a copy of the interview transcript to review. Copies of the interview transcriptions were sent to the ten interviewees who requested them. Only three farmers returned their transcripts with notations for change which related primarily to corrected spellings or additions of agrichemicals used in production. There were no substantive changes in the content of responses to questions of a qualitative nature.

Information was also gathered via a paper questionnaire format. At the end of each interview, survey questionnaires (the "Environmental Opinion Survey"; "The Use of Agrichemicals in Farming" questionnaire; and for farm organization leaders, the "Organizational Leadership Questionnaire") were left with interviewees to be completed after the interview and returned by mail (a stamped self-addressed envelope was provided). In total these questionnaires could be completed within approximately 20 minutes. Government representatives were also asked to complete the "Environmental Opinion Survey", "The Use of Agrichemicals in Farming" questionnaire, and the "Organic Farming" questionnaire which was included as part of interviews with farmers. If not received within one month, a telephone call to the individual usually resulted in its quick return. In 14 instances, additional questionnaires needed to be sent out as the originals had been misplaced or lost. The final response rates for the survey questionnaires was 87.8% for the Environmental Opinion Survey, 90.8% for the Use of Agrichemicals in Farming Questionnaire, and 86.1% for the Organizational Leadership Questionnaire. [See the section on Research Scale Construction for details regarding the development of these three questionnaires.]

With the exception of two telephone interviews (which followed the same format as interviews conducted in person), all initial interviews were conducted in person during several trips to the different regions of the province (excluding the airplane miles to Dawson Creek, total distance travelled by car was 14,981 km). The itinerary of personal data collection was as follows:

Okanagan Valley -- North : February 1991, July 1991, November 1991
South: April 1991, November 1991

Cariboo -- June 1991

Shuswap-Thompson -- June 1991, November 1991

Peace River -- July 1991

Vancouver Island -- December 1991, April 1992

Kootenays -- October 1991

Lower Mainland/Fraser Valley -- January-March 1991, May 1991,
January-March 1992

In those regions where multiple trips were taken, the first trip was primarily to interview organic farmers whereas the subsequent trips were to interview conventional farmers with follow-up telephone calls or visits to farmers previously interviewed. There have also been several follow-up telephone interviews to informants in executive positions in farm organizations since the initial contact. In this way, additional information concerning developments (especially in regards to organizational issues) was obtained from informants.

PART E. CODING OF INTERVIEW DATA

During the initial development of the interview questions, a preliminary coding protocol was developed. However, as stated by a number of authors on qualitative research methods (Miles & Huberman, 1984; Patton, 1990; Strauss & Corbin, 1990), coding of qualitative data is often an emergent process especially when there are open-ended and semi-structured questions as in this study.

The development of coding categories for the analysis of interview data followed a combination of deductive and inductive reasoning. As part of the interview questionnaire development process, a preliminary coding scheme was determined based on the review of the literature addressing similar research questions. However during the interviews, respondents identified additional items or categories which were relevant. This was especially prevalent in response to the open-ended questions in the interview. In the subsequent coding of interview responses to these questions, an inductive process for determining relevant categories was conducted. As Patton (1990, p. 390) identifies, inductive coding involves looking for "...the patterns, themes and categories of analysis come from the data: they emerge out of the data rather than being imposed, on them prior to data collection and analysis." As a result, some of the questions' coding categories were dropped and others added for the final analysis.

Recognizing that the coding of qualitative data by one person raises the issue of individual bias in the results, a person was hired to independently code a sample of open-ended questions (in total 85 responses were coded). A comparison of the coded responses yielded an estimate of intercoder reliability of 70.1% for the open-ended questions thus indicating general overall agreement in the coding protocol.

PART F. QUESTIONNAIRE DEVELOPMENT

Three questionnaires were utilized in this research study: The Use of Agrichemicals in Farming Questionnaire; The Environmental Opinion Survey; and the Organizational Leadership Questionnaire. This section details both the rationale for using each questionnaire, method by which each was developed, and the internal consistency and reliability of questionnaire scales.

The Use of Agrichemicals in Farming Questionnaire

The 16 items in this questionnaire were developed in reference to the literature on the advantages (benefits) and disadvantages (costs/risks) of synthetic chemicals in agriculture. Respondents were asked to indicate the degree to which they agreed or disagreed (on a 7 point Likert-type scale) with each statement. Scoring of the individual items was such that a high score indicated a positive evaluation (high benefit/low risk). To prevent response bias, 6 items were presented such that a high score indicated a low evaluation and were subsequently reverse coded. To facilitate statistical analyses between scales, all item scores were converted to a scale with 1 and 7 as anchors (from -3 to +3).

Scales were developed through a content analysis of the individual items. These scales were constructed as follows:

AC1: Production/Economic Benefits [items (3+5+7+9+11+14)/6]

AC2: Pest/Weed Control [items (2+11+14)/3]

AC3: Effect on the Soil [items (4+15)/2]

AC4: Ease of Use (Complexity) [item 9]

AC5: Effect on Natural Environment [items (6+10+16)/3]

AC6: Safety for Farmer/Farmworker [items (1+8+12+13)/4]

AC7: Effect on Food Produced (presence of chemical residues) [item 13]

AC8: Global Assessment of Agrichemicals [(all items)/16]

Results of the statistical tests of each scale's internal consistency (Cronbach's Alpha Coefficient) and split-half reliability (Guttman's Split-Half Reliability) are presented in Table II-2.

TABLE II-2. USE OF AGRICHEMICALS IN FARMING QUESTIONNAIRE: INTERNAL CONSISTENCY AND RELIABILITY OF SCALES

AGRICHEMICAL SCALE		NO. OF ITEMS	INTERNAL CONSISTENCY (CRONBACH'S ALPHA)	RELIABILITY (GUTTMAN'S SPLIT-HALF)
AC1:	Production/Economic Benefits	6	.7945	.8063
AC2:	Pest/Weed Control	3	.7902	.8500
AC3:	Effect on Soil	2	.7192	.7192
AC4:	Ease of Use (complexity)	1	n/a	n/a
AC5:	Effect on Natural Environment	3	.8737	.8072
AC6:	Safety	4	.9137	.9078
AC7:	Effect on Food Produced	1	n/a	n/a
AC8:	Global Assessment of Agrichemicals	16	.9402	.9523

Note 1. Statistics based on sample of 120 respondents.

The global assessment of agrichemicals score (all 16 items) had the highest levels of internal consistency (Cronbach's Alpha = .9402) and reliability (Guttman's split half reliability = .9523). The internal consistency and split-half reliability scores for the other scales (with the exception of the 2 single item variables) were quite high despite the relatively small numbers of items in each scale. With the exception of the two one-item factors, all scales had a Cronbach's alpha of greater than 0.70, the recommended threshold (Nunnally, 1978).

Environmental Opinion Survey

The New Environmental Paradigm Scale on which the Environmental Opinion Survey is based was initially comprised of 12 items -- four per assumption or factor concerning environmental attitudes (Dunlap & Van Liere, 1978). In their study of environmental attitudes of Alberta residents, Kuhn and Jackson (1989) developed an extended version of the NEP scale. The four factors of "negative consequences of growth and technology", "relationship between mankind and nature", "quality of life", and "limits to the biosphere" were measured by the 10 of the original NEP scale items plus an additional 12 items. As part of their study on environmental attitudes of U.B.C. business students, Shetzer et al. (1991) developed the business-environment scale which had 11 items measuring three factors ("devoting resources towards environmental protection", "concern with profits", and "attention to environmental issues").

Based on the reported scale reliability of these three instruments, a preliminary version of the Environmental Opinion Survey was developed which included the original 12 NEP scale items, 11 items from Kuhn & Jackson, three items from Shetzer et al.'s business-environment instrument plus 10 items derived from Devall's (1988, p. 33) list of ecological principles. The 36 item Environmental Opinion Survey was then administered to 83 business students enrolled in organizational behaviour classes at the U.B.C. Faculty of Commerce and Business Administration. Based on the results of this pre-test, six items were dropped to arrive at a 30 item survey instrument. Items were scored such that higher scores denoted pro-environmental attitudes consistent with the New Environmental Paradigm assumptions.

Items were allocated to seven scales (6 for individual factors and 1 summary scale) based on previous research on factors to measure environmental attitudes. The seven scales were constructed as follows (* denotes item was reverse scored):

EOS1: Negative consequences of growth and technology (8 items)
EOS1 = [(2 + 3 + 5 + 11 + 15 + 20 + 23 + 26)/8]

EOS2: Relationship between humankind and nature (7 items)
EOS2 = [(6* + 8* + 13* + 16* + 17* + 19 + 29*)/7]

EOS3: Quality of life (6 items)
EOS3 = [(1* + 10 + 12* + 18* + 22* + 24*)/6]

EOS4: Limits to the biosphere (5 items)
EOS4 = [(9 + 21 + 25 + 28 + 30)/5]

EOS5: Attention to environmental issues (2 items)
EOS5 = [(4* + 14*)/2]

EOS6: Role of Government (2 items)
EOS6 = [(7* + 27)/2]

EOS7: Total Environmental Concern
EOS7 = [(1+ 2 + 3 + ... + 28 + 29* + 30)/30]

Table II-3 provides the results for scales' internal consistency (Cronbach's Alpha) and split-half reliability (Guttman's split-half) based on the responses of the 116 individuals in this study who completed the Environmental Opinion Survey.

As a test of whether the extended scales yielded higher reliabilities than the original NEP scale and Kuhn and Jackson's Environmental Attitudes scales, separate analyses were conducted. As evidenced in Table II-3, use of the extended EOS scales was indicated by their higher levels of internal consistency and reliability. All scales except the two two-item scales had a Cronbach's alpha of greater than 0.70, the recommended threshold (Nunnally, 1978). Internal consistency for the two item scales (EOS5: Attention to environmental issues; and EOS6: Role of government regarding environmental issues) are a concern. Despite the negative Cronbach's Alpha (Alpha = -2.1647) for the EOS5 scale, and the very low internal consistency for the EOS6 scale (Alpha = .1162), both scales were retained so that comparisons to Shetzer et al.'s (1991) research findings could be made.[3]

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[3] A principal components factor analysis of the item responses of participants in this study yielded 11 factors explaining 64.1% of the variance. A subsequent factor analysis utilizing 7 factors accounted for only 49.6% of the total variance in the data. In both analyses the factor loadings of individual items were not completely congruent with the identified EOS scales. Despite these results, it was decided to proceed with the scales as proposed given the extensive validation and reliability scale development research on the NEP scale and its extensions.

TABLE II-3. ENVIRONMENTAL OPINION SURVEY: INTERNAL CONSISTENCY AND RELIABILITY OF SCALES (N=115)

		NO. OF ITEMS	INTERNAL CONSISTENCY (CRONBACH'S ALPHA)	RELIABILITY (GUTTMAN'S SPLIT-HALF)
ENVIRONMENTAL OPINION SCALES (Note 1)				
EOS1:	Negative Consequences of Growth & Technology	8	.8027	.7792
EOS2:	Relationship between Humankind and Nature	7	.7490	.7357
EOS3:	Quality of Life	6	.7446	.7543
EOS4:	Limits to the Biosphere	5	.6088	.5606
EOS5:	Attention to Environmental Issues	2	-2.1647	-2.1647
EOS6:	Role of Government re: Natural Environment	2	.1162	.8357
EOS7:	Total Environmental Concern	30	.8763	.9135
NEW ENVIRONMENTAL PARADIGM SCALES (Note 2)				
NEP1:	Balance of Nature	4	.6522	.6521
NEP2:	Limits to Growth	4	.6177	.5629
NEP3:	Man Over Nature	4	.6937	.6961
ENVIRONMENTAL ATTITUDES SCALES (Note 3)				
EA1:	Negative Consequences of Growth & Technology	8	.8027	.7792
EA2:	Relationship between Mankind & Nature	6	.6610	.6882
EA3:	Quality of Life	4	.7391	.7034
EA4:	Limits to the biosphere	4	.5578	.5921

Note 1. Environmental Opinion Survey Scale items selected and/or adapted from Dunlap & Van Liere (1978); Geller & Lasley (1985); Kuhn & Jackson (1989); Albrecht, Bultena, Hoiberg, and Nowak (1982); Shetzer, Stackman & Moore (1990).

Note 2. New Environmental Paradigm Scale from Dunlap & Van Liere (1978).

Note 3. Environmental Attitude Scale items from Kuhn & Jackson (1989).

Organizational Leadership Questionnaire

The Competing Values Model of Leadership Roles developed by R.E. Quinn (1988) was used to measure organizational leadership in this study. Given the diversity of leadership theories and measurement instruments available in the literature (Bass, 1990), why was the Competing Values Model of Leadership Roles chosen over others? The primary reason concerns the central constructs which this instrument measures. Quinn proposes that leadership can be analyzed along two dimensions: internal vs. external focus; control vs. flexibility. Within that two-dimensional space, he posits that there are four models of leadership within which there are eight leadership roles:

Human Relations Model (Flexibility -- Internal Focus)
- Facilitator Role
- Mentor Role

Open Systems Model (Flexibility -- External Focus)
- Innovator Role
- Broker Role

Rational Goal Model (Control -- External Focus)
- Producer Role
- Director Role

Internal Process Role (Control -- Internal Focus)
- Coordinator Role
- Mentor Role

Quinn asserts that leadership in organizations involves a balancing between the often conflicting values and requirements of each of these roles. To measure the extent to which a leader has a preferred leadership role, Quinn has developed both extended and abbreviated versions of the Competing Values Leadership questionnaire. Extensive research on the construct validity and reliability of these instruments have been conducted on these instruments thus increasing one's confidence in their use to accurately measure these leadership constructs (Quinn, 1988; Quinn, Denison & Hooijberg, 1989). The factor loadings of each questionnaire item for the extended version are provided in Appendix E.

TABLE II-4. ORGANIZATIONAL LEADERSHIP QUESTIONNAIRE
(adapted from Quinn, 1988, pp. 128, 176-178)

Listed below are some statements that describe leadership behaviours. You should indicate how often you engage in these behaviours. Please use the following scale to respond to each statement. Place a number from 1 to 7 in the space just before each of the items.

Very infrequently 1 2 3 4 5 6 7 Very frequently

In doing my job, I

____ 1. listen to the personal problems of others in my organization.*
____ 2. meticulously review detailed reports.
____ 3. influence decisions made outside the organization.*
____ 4. do problem solving in creative, clever ways.
____ 5. clearly define areas of responsibility for others.*
____ 6. display a wholehearted commitment to the job.
____ 7. facilitate consensus building in working sessions.*
____ 8. protect continuity in day-to-day operations.
____ 9. compare records, reports, and so on to detect any discrepancies in them.
____ 10. show empathy and concern in dealing with others in my organization.*
____ 11. set clear objectives for the organization.*
____ 12. experiment with new concepts and procedures.**
____ 13. work on maintaining a network of influential contacts.
____ 14. keep track of what goes on inside the organization.***
____ 15. push the organization to meet objectives.***
____ 16. make sure everyone knows where the organization is going.**
____ 17. encourage others to share ideas in the organization.***
____ 18. search for innovations and potential improvements.

* wording modified
** added from extended version
*** replaced with item from extended version

Wording modifications (previous wording)

1. listen to the personal problems of others in my organization. (of subordinates)

3. influence decisions made outside the organization. (at higher levels)
5. clearly define areas of responsibility for others. (subordinates)
7. facilitate consensus building in working sessions. (work-group)
10. show empathy and concern in dealing with others in my organization. (subordinates)
11. set clear objectives for the organization. (work unit)

Item replacements

14. keep track of what goes on inside the organization.
REPLACES: insist on minimum disruption to the work flow.

15. push the organization to meet objectives.
REPLACES: reflect high motivation for my role.

17. encourage others to share ideas in the organization.
REPLACES: encourage participative decision making in work-group sessions.

TABLE II-5. ORGANIZATIONAL LEADERSHIP QUESTIONNAIRE: ITEM KEY

1. Innovator
   - 4. do problem solving in creative, clever ways.
   - 12. experiment with new concepts and procedures.
   - 18. search for innovations and potential improvements.

2. Broker
   - 3. influence decisions made outside the organization.
   - 13. work on maintaining a network of influential contacts.

3. Producer
   - 15. push the organization to meet objectives.
   - 6. display a wholehearted commitment to the job.

4. Director
   - 5. clearly define areas of responsibility for others.
   - 11. set clear objectives for my organization.
   - 16. make sure everyone knows where the organization is going.

5. Coordinator
   - 8. protect continuity in day-to-day operations.
   - 14. keep track of what goes on inside the organization.

6. Monitor
   - 2. meticulously review detailed reports.
   - 9. compare records, reports, and so on to detect any discrepancies in them.

7. Facilitator
   - 7. facilitate consensus building in working sessions.
   - 17. encourage others to share ideas in the organization.

8. Mentor
   - 1. listen to the personal problems of others in my organization.
   - 10. show empathy and concern in dealing with others in my organization.

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The choice of the Competing Values Model of Leadership questionnaire for this research study was also prompted by the measures of innovative (Innovator role) and political (Broker role) leadership orientations which it offers. Both of these constructs are of particular interest in this research study of innovation and organizational politics. Permission was obtained from Dr. Quinn in 1990 to utilize his research instrument in this study.

In the interests of enhancing response rates, the short version of the Competing Values of Leadership Roles was utilized. Several modifications to this instrument were necessary in order to make the questionnaire items more appropriate to the context of voluntary small organizations (as opposed to the larger multi-unit business organizations for which the questionnaire was designed). The final version of the Organizational Leadership Questionnaire was 18 items of which six had minor wording changes, five had been added from the extended version to replace items from the short version of the questionnaire. The specific changes which were made are detailed in Table II-4. Table II-5 details which items were selected to measure each of the leadership roles.

PART G. CAVEATS REGARDING THE USE OF A SINGLE INTERVIEWER

As Miles and Huberman (1984) and Patton (1990) suggest, in qualitative research it is recommended that there be multiple interviewers to control for individual bias in interview responses and interpretation. When there is only one interviewer, what assurances are there that the responses obtained are an artefact of the interaction between interviewer and interviewee demographic similarity/differences (e.g., age, gender)? There is also the question regarding control for unconscious cuing of desirable responses when the interviewer is not blind to the propositions or hypotheses being tested. The need for neutrality in both verbal and body language is especially important in the interviewing process where the interviewer, to some degree, is the "stimulus".

Given my personal experience as both a research interviewer and as a professional recruiter and counsellor, I was particularly sensitive to these concerns and strove to present questions in a neutral manner and not to guide the respondent in their answers. Unfortunately, the parameters of conducting a Ph.D. dissertation meant that the use of multiple interviewers was not a possibility in this research study. Therefore the existence of single interviewer bias cannot be entirely discounted.

I do not believe that my gender had a detrimental effect on the nature of the interview and in fact was an advantage when interviewing the women in the study who often stated that they appreciated talking to a woman in an occupation that is male-dominated. As identified by Warren (1988), being female can be advantageous in sociology and anthropology fieldwork for a number of reasons. Traditionally women have been perceived (whether accurately or not) as being "more accessible and less threatening than men" and as possessing better communication skills which result in respondents being more relaxed and open with female interviewers.

As identified by McCracken (1988), in qualitative research, the concept of the "investigator as instrument" wherein there is a match between one's experience and that of the respondent can be advantageous in the interview process. One variable on which there was a matching of personal background was age. During the course of data collection I turned 39 years of age. Given the average age of the persons interviewed was 45 years, I was often talking with individuals in my peer age group. One factor that did appear to be an influence on interaction during the interview was the fact that I grew up on a farm. As part of the initial "getting to know you" phase of the interview during which the interviewee often asked questions regarding my personal background and interests (e.g., why was I doing this study?), interviewees responded positively to the fact that I had prior experience in agriculture and asked where I had grown up and what type of farm it had been. Often, they visibly relaxed and treated me as "one of them" and as commented by a number of interviewees, appreciated that I was not just an academic researcher who didn't know about the realities (i.e., hardships) of farming. In one instance when we had not talked about this aspect of my personal history at the beginning of the interview but rather in closing, the farmer said, "Why didn't you say so? I would have told you some other things!" I believe that having grown up on a farm, this proved to be an advantage in eliciting frank and honest responses from interviewees as well as making individuals more comfortable during the interview process. On the other hand, what are the negative aspects of being perceived to be an insider? In the traditional research model, the researcher-interviewer is advised to remain an objective and impartial observer-recorder of data. For this researcher, the perception of insider status was not fully matched to the reality of insider status in that I have not lived or worked on a farm for over 20 years. Thus time and life experience in other occupations have served to distance me from those interviewed. Thus, the perception versus the reality of insider status is not totally congruent and would contribute to the objectivity (although not complete) of the observer.

SECTION III. THE INNOVATION PROCESS AT THE INDIVIDUAL LEVEL

Extensive data were collected in this research study at both individual and organizational levels in order to fully understand the motivations and actions of farmers and farm organizations in regards to innovations in agriculture. The chapters in Section III focus on the individual level of the innovation decision making process. Adopting a holistic research approach to studying innovation and political action necessitates analyzing a wide range of data concerning individuals' socioeconomic background, farm operations, information sources, perceptions and attributions, and personal values and beliefs. Of particular interest in this research study is the degree to which those who practice conventional or alternative agriculture are different in regards to these variables and the reasons for any differences or similarities. In addition, it is necessary to analyze data concerning the operation and actions of farm organizations and interorganizational networks within agriculture.

The chapters in Section III follow the sequence of research questions outlined in Chapter 3. The focus of Chapter 4 is to ascertain whether there are differences between organic and conventional farmers in terms of their personal contexts. In Chapter 4, research questions which are investigated concern differences between organic and conventional farmers in terms of: their socio-economic background characteristics and career experiences (past and present); farm operations and marketing; and the innovativeness of farmers in their farm operations. As established earlier, communication channels and behaviour are important factors in the innovation process. Chapter 5 reports and analyzes data regarding differences in the information channels and communication behaviour of organic and conventional farmers as well as their evaluations of alternative sources of agricultural information. Together, Chapters 4 and 5 offer a detailed understanding of the differences between organic and conventional farmers in respect to prior conditions and knowledge stages of the innovation decision process model (as per Rogers, 1983, p. 165).

Chapter 5 also reports and analyzes data relating to farmers' current perceptions and evaluations of organic farming and synthetic agrichemicals as well as their values and beliefs concerning the natural environment (relating to the persuasion stage of the innovation decision model). One purpose of this chapter is to delineate whether there are differences (and the effect of those differences) between conventional and organic farmers in terms of their perceptions of these two sets of innovations and whether their perceptions are related to values and beliefs concerning the natural environment. Another purpose of this chapter is to ascertain the motivations of organic farmers to adopt this innovation and their subsequent experiences.

In summary, the chapters in Section III yield an understanding of the psychological, practical and economic factors involved in the innovation adoption and/or rejection processes within agriculture as they relate to synthetic agrichemical and organic farming innovations. This focus on the individual in turn lays the foundation for Section IV which is concerned with the goals, operation and politics of the organizations to which farmers belong.

CHAPTER 4. THE PERSONAL CONTEXT AND INNOVATIVENESS OF FARMERS

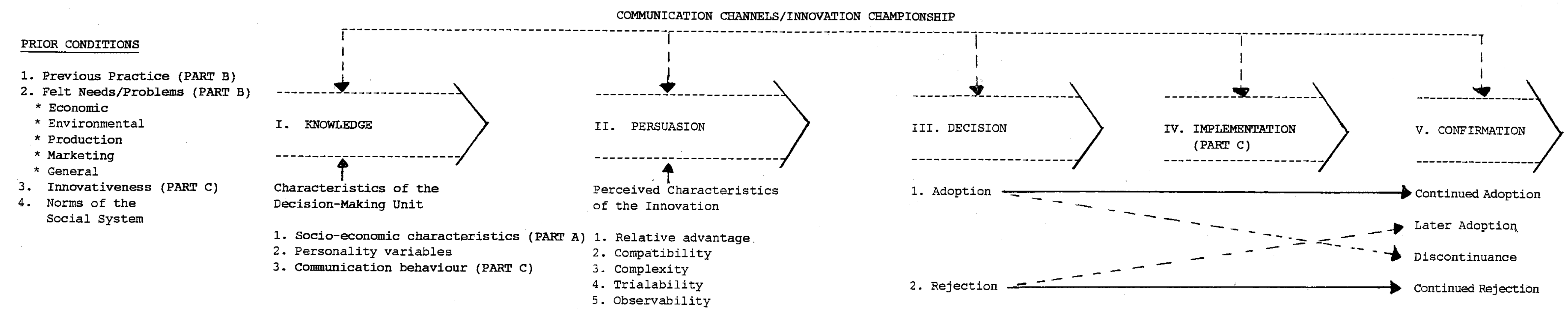
One purpose of this chapter is to delineate whether there are differences between organic and conventional farmers in terms of the personal contexts within which they are operating. To do so, Chapter 4 is divided into three parts: socioeconomic characteristics (PART A); farm operations and marketing (PART B); innovations and changes in farm production and marketing (PART C). The general research questions which will be explored in Chapter 4 are the following: Are organic farmers different from conventional farmers? (Research Question 1); Are organic farms different from conventional farms? (Research Question 2); Are organic farmers more innovative than conventional farmers? (Research Question 3); What communication channels do farmers access for information concerning organic farming innovations? (Research Questions 5 and 5b)

PART A. SOCIOECONOMIC CHARACTERISTICS OF FARMERS

This part of Chapter 4 focuses on the demographic and socioeconomic characteristics of the individuals interviewed in this study as well as their spouses/partners. The general research question to be investigated in Part A is: Are organic farmers different from conventional farmers? (Research Question 1)

In addition to assessing whether organic and conventional farmers are different in respect to these characteristics, one purpose is to assess how representative this study's sample of farmers is to the Canadian and B.C. farmer population in terms of their demographic (age, gender and marital status) and socioeconomic (education and off-farm employment status) characteristics. Another purpose is to assess the degree to which the farmers surveyed have the characteristics of early adopters of innovations and whether there are any differences between farmers based on their method of production (i.e., organic, conventional or bio-dynamic). This is of interest given that the adoption of innovations has been shown to be related to socioeconomic characteristics such as age and education level (Rogers, 1983). A fourth purpose is to examine the relationship between age and education

FIGURE 4-1. ANALYSIS OF THE PERSONAL CONTEXT AND INNOVATIVENESS OF ORGANIC AND CONVENTIONAL FARMERS



1. Previous Practice (PART B)
   - farm size (RQ# 2a)
   - farm products (type & diversity) (RQ# 2c)
   - marketing outlets (RQ# 2f)

2. Felt Needs/Problems (PART B)
   * Economic
     - off-farm employment (self & partner)(RQ# 1g)
     - farm ownership (RQ# 2b)
     - operating expenses (RQ# 2d)
     - agricultural labour (RQ# 2e)

3. Innovativeness (PART C)
   - number (RQ# 3a) & types (RQ# 3b) of new practices & products in operations & marketing

1. Socio-economic characteristics (PART A)
   - age (RQ# 1a)
   - gender (RQ# 1b)
   - marital status (RQ# 1c)
   - education level (RQ# 1d)
   - type of education: general (RQ# 1d) & agricultural (RQ# 1e)
   - farming experience (general & organic) (RQ# 1f)
   - career experience and mobility (RQ# 1f)

3. Communication behaviour (PART C)
   - information sources for new products and practices (RQ# 3c)

IV. IMPLEMENTATION (PART C)
Organic vs. Conventional
- number (RQ# 3a) & types (RQ# 3b) of new practices & products in operations & marketing

level and environmental beliefs and attitudes as has been found in other studies. Therefore comparisons are made in respect to the likelihood that each group of farmers (organic vs. conventional) would subscribe to these concepts.

In addition to describing general education levels, the nature of respondents' agricultural training (both formal and informal) and career experience is also presented. Comparisons between farmer groups in terms of their agricultural training and experience (both current and past) provide an indication of the diversity of education and life experiences of each group of farmers.

Current off-farm employment data for both farmers and their spouses/partners is presented to provide a preliminary indication of the degree to which the farms in this study are financially self-sufficient. As will be discussed, the incidence of off-farm employment by farm families has been found to be related to financial need, education (level and type), gender and marital status. The experience of the farm families in this study will be compared to those in other Canadian and U.S. studies.

Age

As revealed in Table 4-1, the average age of the farmers in this study was 45.3 years. The bio-dynamic farmer group proved to be the oldest with an average age of 58.6 years (which was significantly higher than all other groups, $F_{(3,112)} = 6.4254$, $p = .0005$).

Discussion. Compared to 1991 Census statistics, the farmers interviewed in this study were somewhat younger than B.C. farm operator population of whom 12% were under the age 35, 52% were between 35 and 54 years, and 34% were 55 years or older. (Statistics Canada, 1992d) The comparative statistics for the farmers in this study were 12% (<35 years), 81% (35-54 years), and 7% (55+ years). Closer examination of detailed age statistics shows that the 40-45 year age group in this study is relatively over-represented compared to the B.C. farm operator population while the 65 and older age categories are under-represented.

TABLE 4-1. SOCIOECONOMIC CHARACTERISTICS: FARMERS' AGE, GENDER, MARITAL STATUS

	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
AGE					
< 30 years	2 (1.7%)	1 (1.8%)	1 (2.2%)	--	--
30-34 years	12 (10.3%)	4 (7.1%)	8 (17.8%)	--	--
35-39 years	21 (18.8%)	10 (17.9%)	10 (22.2%)	--	1 (11.1%)
40-44 years	34 (30.4%)	21 (37.5%)	8 (17.8%)	4 (66.7%)	1 (11.1%)
45-49 years	17 (15.2%)	13 (23.2%)	3 (6.7%)	1 (16.7%)	--
50-54 years	9 (8.0%)	3 (5.4%)	5 (11.1%)	--	1 (11.1%)
55-59 years	4 (3.6%)	1 (1.8%)	2 (4.4%)	1 (16.7%)	--
60-64 years	10 (8.9%)	1 (1.8%)	7 (15.5%)	--	2 (22.2%)
65-69 years	5 (4.4%)	1 (1.8%)	--	--	3 (33.3%)
70 + years	2 (1.7%)	1 (1.8%)	1 (2.2%)	--	1 (11.1%)
TOTAL	116 (100%)	56 (100%)	45 (100%)	6 (100%)	9 (100%)
Means	45.2759	43.6250	44.7111	45.0000	58.5556
Std.Dev.	10.1934	7.6860	11.2384	5.5498	12.4209
GENDER					
Male	99 (85.3%)	42 (75.0%)	43 (95.6%)	5 (83.3%)	9 (100%)
Female	17 (14.7%)	14 (25.0%)	2 (4.4%)	1 (16.7%)	0 (0)
TOTAL	116 (100%)	56 (100%)	45 (100%)	6 (100%)	9 (100%)
MARITAL STATUS					
Married	97 (83.6%)	42 (75.0%)	41 (91.1%)	5 (83.3%)	8 (88.9%)
Single	13 (11.2%)	9 (16.1%)	3 (6.6%)	--	1 (11.1%)
Divorced/Separated	7 (6.0%)	5 (8.9%)	1 (2.2%)	1 (16.7%)	--
TOTAL	116 (100%)	56 (100%)	45 (100%)	6 (100%)	9 (100%)

The major portion of these differences can be traced to the age distribution of the organic farmer group whereas the conventional farmer group more closely approximates the provincial age distribution. Therefore it appears that in terms of age, organic farmers are somewhat different than the general farm operator population but are probably representative of the organic farming community given the larger sampling of this group.

Lockeretz and Wernick (1980) also found there to be no age differences between organic and conventional farmers in their survey of the U.S.A. Corn Belt. Based on his review of 228 innovation studies, Rogers (1983) concluded that no definitive relationship exists between age and early adoption of innovations. In 48% of the studies reviewed there was no relationship while in 19% of the studies, early adopters were younger and in 33% early adopters were older than later adopters. However, younger farmers have been found to be more likely to adopt soil conservation (Coughenour & Chamala, 1989) and Integrated Pest Management (Thomas, Ladewig & McIntosh, 1990) practices. Younger farmers have also been found to be more likely to subscribe to agrarian environmentalist values and beliefs in a study of New York and Michigan farmers (Buttel, Gillespie, Larson & Harris, 1981). This is consistent with studies of environmental concern amongst the general public which show a negative correlation between age and environmental concern (Van Liere & Dunlap, 1980). Thus it appears that in some respects the relative youth of the farmers in this study, as compared to the overall Canadian farmer population, may yield a positive bias to this study's findings in regards to environmentalist beliefs and attitudes and the adoption of innovations which are oriented towards conservation or sustainable agriculture goals.

<u>Gender</u>

A comparison of the gender of respondents shows that of those who are farming or are employed by conventional farm organizations ("other"), the majority (85.8%) were male. [See Table 4-1] As a proportion of respondents, it is noteworthy that there were significantly more women who were in the organic farmer category (25% female) than in the other categories. This is not to say that women did not participate in farm operations (as will be revealed later when on-farm family labour is examined) but that there were significantly more women involved in organic farming (as compared to conventional farming) who were identified as either the primary farmer or an equal partner in farm operations and were interviewed as such. [As confirmed by the Kruskal-Wallis One-way ANOVA nonparametric test, Chisquare = 7.8292, p = .0051, n = 101.]

Discussion. There has been a dramatic increase in the number of women employed as farm operators and in farm related occupations (either as farmworkers in horticulture, animal husbandry, etc.) over the past 40 years. While in 1951, 3.9% of farmers/farmworkers were female, by 1971 this had increased to 11.9% and in 1991, the percentage was 27.8% (Smith, 1988; Statistics Canada, 1992e). As revealed by the 1991 Canadian census (Statistics Canada, 1992e), there has been a 6.2% increase in the number of women who are farm operators from 1986 to 1991. However, one reason for this numerical increase is attributed to a change in 1991 Census procedures which allowed for the recording of more than one operator per farm. This contrasts with the 10.8% decrease in the number of men occupied as farmers during the same time period. In 1991, 19% of all Canadian farm operators were female. B.C. appears to be at the forefront of this trend with in 1991, 35% of B.C. farm operators being female (primarily in farms with 2 or more operators) while the number of male farm operators has declined by 21%.(Statistics Canada, 1992d) Thus it appears that the overall increase in the number of farmers in B.C. (which contrasts with the decline in other provinces) can be attributed to the dramatic increase in the number of women farmers and farmworkers. It should be noted that the majority of B.C. female farm operators (both singly and with others) were located on smaller farms with less than 240 acres and with total gross farm receipts (in 1990) of less than $50,000 (Statistics Canada, 1992d). In the sample of farmers interviewed in this study, it appears that those utilizing organic farming methods are more representative of the farm operator population in terms of gender balance than are conventional, organic-conventional or bio-dynamic farmers.

Marital Status

In terms of marital status, the majority (83.3%) of respondents were currently married (either in a traditional or common-law relationship) whereas significantly fewer were single/never married (10.8%) or divorced/separated (5.8%). [see Table 4-1] There were no significant group differences in marital status based on production method type.

Discussion. The marital status of farmers has implications for the availability of family members to work on the farm as well as to provide additional income through off-farm employment. 1991 Census data on B.C. farm operators indicate that 7.4% of farm operators were single (never married), 83.7% were married, and 8.8% were separated, widowed or divorced. (Statistics Canada, 1992d) Overall, the farmers in this study closely approximated this distribution however, it appears that for individual subgroups there were proportionately more single persons (16.1%) and fewer married persons (75%) amongst organic farmers and a relatively greater proportion of married persons in the conventional (91%) and bio-dynamic (100%) farmer groups. This would indicate that compared to the conventional and bio-dynamic farmers in this study, organic farmers have fewer family members who can contribute either labour or income to the family unit. However, this observation is mitigated by the fact that there are a number of organic farmers (8) in this study who are farming as part of an intentional community or non-family partnership (but living on the same farm) thus providing labour and financial resources from their nontraditional "extended family".

Education Level

Two-thirds (67.5%) of the farmers interviewed had completed at least one year of post-secondary education with 35.9% holding at least a university Bachelor's degree [see Table 4-2]. Group comparisons of education level based on production method type indicate that organic and bio-dynamic farmers have a higher level of formal education than conventional farmers (statistically significant differences: at the p = .0191 level for organic farmers (Chisquare = 5.4931); and p = .0121 level for bio-dynamic farmers (Chisquare = 6.2932) based on Kruskal-Wallis one-way ANOVA nonparametric tests).

While these results indicate that as a group, organic and bio-dynamic farmers had higher education levels than conventional farmers, an examination of the type of post-secondary education which each group has completed indicates the degree to which this education has been directly job-related. Overall, 40.5% of all of these farmers had received formal instruction in the agricultural sciences.[see Table 4-3] For conventional farmers who had formal post-secondary education, the majority (54.2%) had enrolled in Agricultural Sciences programmes with a smaller number having had Applied Sciences/Engineering training (25.0%). In contrast, organic farmers with post-secondary education had more diversity in their formal post-secondary education. While 32.5% of organic farmers had received formal agricultural training at a post-secondary institution, a significant proportion had degrees or diplomas in the Arts (27.5%) and in the general Sciences (17.5%).

Thus it appears that conventional farmers who have post-secondary education have chosen formal training more directly related to their current occupation than organic or bio-dynamic farmers. On the other hand, while organic and bio-dynamic farmers come from a greater variety of disciplines, a substantial proportion of farmers have formal technical training in agriculture thus negating perceptions that all those who choose organic farming methods are less knowledgeable about agricultural technology. What may be different for organic farmers is their evaluation of the utility of this training in general and in respect to their chosen production method.

TABLE 4-2. SOCIOECONOMIC CHARACTERISTICS: RESPONDENTS' HIGHEST EDUCATION LEVEL

HIGHEST EDUCATION LEVEL	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)	OTHER (Note 1) No. (%)
Number of Respondents (%)	117 (100%)	53 (100%)	45 (100%)	6 (100%)	9 (100%)	4 (100%)
Grade School [<Gr.8]	2 (1.7%)	--	2 (4.4%)	--	--	--
High School [Gr.8-11]	7 (6.0%)	2 (3.8%)	4 (8.8%)	1 (16.7%)	--	--
High School Graduation [Gr. 12]	29 (24.8%)	11 (20.7%)	15 (33.3%)	1 (16.7%)	1 (11.1%)	1 (25.0%)
College Diploma/Partial University	37 (31.6%)	19 (35.8%)	14 (31.1%)	1 (16.7%)	1 (11.1%)	2 (50.0%)
University Bachelor Degree	34 (26.5%)	16 (30.2%)	9 (20.0%)	1 (16.7%)	7 (77.7%)	1 (25.0%)
Post-Graduate University	11 (9.4%)	6 (11.3%)	3 (6.7%)	2 (33.3%)	--	--

TABLE 4-3. SOCIOECONOMIC CHARACTERISTICS: RESPONDENTS' TYPE OF POST-SECONDARY EDUCATION

	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)	OTHER (Note 1) No. (%)
No. with Post-secondary Education	79 (100%)	40 (100%)	24 (100%)	4 (100%)	8 (100%)	3 (100%)
TYPE OF POST-SECONDARY EDUCATION						
Agriculture	32 (40.5%)	13 (32.5%)	13 (54.2%)	1 (25.0%)	2 (25.0%)	2 (66.7%)
Applied Science (Engineering)	13 (16.5%)	5 (12.5%)	6 (25.0%)	1 (25.0%)	2 (25.0%)	--
Arts	17 (21.5%)	11 (27.5%)	2 (8.3%)	1 (25.0%)	3 (37.5%)	--
Business Administration	6 (7.6%)	3 (7.5%)	1 (4.2%)	--	1 (12.5%)	1 (33.3%)
Education	2 (2.5%)	1 (2.5%)	1 (4.2%)	--	--	--
Health Care (Medicine, Nursing)	4 (5.1%)	1 (2.5%)	2 (8.4%)	1 (25.0%)	--	--
Law	1 (1.3%)	--	1 (4.2%)	--	--	--
Sciences	7 (8.9%)	7 (17.5%)	--	--	--	--

Note 1: Other = Farm Organization Staff Members (non-farmers)
Note 2: Three subjects have 2 post-secondary diplomas/degrees each.

Given the involvement of many of the farmers' spouses and/or partners in agricultural production, a comparison of education levels and type of post-secondary education of these individuals was conducted [see Tables 4-4 and 4-5]. Note that in this study, partners were defined as individuals who were in a farm ownership relationship with the farmer interviewed, were actively involved in farm production activities and were living on the same farm. One-half (50.6%) of the spouses/partners of farmers interviewed had completed at least one year of post-secondary education with 24.2% holding at least a university bachelor degree. Unlike the farmers interviewed, spouses/partners (who were predominantly female) were more likely to have post-secondary education in the Arts (30.4%), Education (26.1%) and Medical (17.4%) disciplines rather than in the Agricultural Sciences (8.7%). Thus the farmers interviewed were more likely to be the agricultural technical specialists in the farm operating unit.

Discussion. The finding that organic farmers have a high level of education is consistent with that of Lockeretz et al. (1984), Lockeretz and Wernick (1980), and the U.S. Department of Agriculture (1980) who also found that organic farmers have an above-average education level. This sample of organic farmers appears to have higher education levels than those studied in Saskatchewan (Molder et al, 1991). Specifically, whereas 77% of the B.C. organic farmers had post-secondary education, only 35% of Saskatchewan organic farmers had progressed beyond high school. There is more comparability in respect to the spouses/partners' education level in that 57% of B.C. spouses/partners and 56% of Saskatchewan organic farmers' wives had post-secondary education (noting however that a number of the B.C. sample were male).

Education levels have been consistently found to have a positive relationship with innovation adoption in general (Rogers, 1983). In studies of innovation adoption in agriculture, the education level of farmers was positively related with the adoption of environmental innovations (Taylor & Miller, 1978), soil conservation practices (Bultena & Hoiberg, 1983; Gould, Saupe & Klemme, 1989) and Integrated Pest Management programs (Thomas, Ladewig & McIntosh, 1990).

TABLE 4-4. SOCIOECONOMIC CHARACTERISTICS: FARMERS' SPOUSE/PARTNER'S HIGHEST EDUCATION LEVEL

	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
Number of Respondents (%)	91 (100%)	37 (100%)	41 (100%)	5 (100%)	8 (100%)
EDUCATION LEVEL (Highest Level Completed)					
Grade School [<Gr.8]	2 (2.2%)	--	2 (4.9%)	--	--
High School [Gr.8-11]	7 (7.7%)	3 (8.1%)	4 (9.8%)	--	--
High School Graduation [Gr. 12]	36 (39.6%)	13 (35.1%)	15 (36.6%)	3 (60.0%)	5 (62.5%)
College Diploma/Partial University	24 (26.4%)	10 (27.0%)	12 (29.3%)	1 (20.0%)	1 (12.5%)
University Bachelor Degree	19 (20.9%)	9 (24.3%)	7 (17.1%)	1 (20.0%)	2 (25.0%)
Post-Graduate University	3 (3.3%)	2 (5.4%)	1 (2.4%)	--	--

TABLE 4-5. SOCIOECONOMIC CHARACTERISTICS: FARMERS' SPOUSE/PARTNER'S TYPE OF POST-SECONDARY EDUCATION

	TOTAL GROUP	ORGANIC FARMERS	CONVENTIONAL FARMERS	ORGANIC-CONVENTIONAL FARMERS	BIODYNAMIC FARMERS
No. with Post-secondary Education	46 (100%)	21 (100%)	20 (100%)	3 (100%)	3 (100%)
TYPE OF POST-SECONDARY EDUCATION					
Agriculture	4 (8.7%)	2 (9.5%)	2 (10.0%)	--	--
Applied Science (Engineering)	4 (8.7%)	3 (14.3%)	--	1 (33.3%)	--
Arts	14 (30.4%)	8 (38.1%)	5 (25.0%)	--	2 (66.7%)
Business Administration	2 (4.3%)	1 (4.8%)	1 (5.0%)	--	--
Education	12 (26.1%)	5 (23.8%)	7 (35.0%)	--	--
Health Care (Medicine, Nursing)	8 (17.4%)	1 (4.8%)	4 (20.0%)	2 (66.7%)	1 (33.3%)
Law	--	--	--	--	--
Sciences	3 (6.5%)	2 (9.5%)	1 (5.0%)	--	--

Note 2: Two subjects (1 organic; 1 organic-conventional) have 2 post-secondary diplomas/degrees each.

The positive relationship between education level and environmental concern in the general public (Van Liere & Dunlap, 1980) has been found to also apply to farmers (Buttel, Gillespie, Larson & Harris, 1981). Based on these findings, it would appear that the organic farmers in this study may have a greater propensity than conventional farmers to be early adopters of innovations, especially those which are supportive of environmental and sustainable agriculture principles.

Agricultural Education and Training

Educational institution diploma and degree programmes were only one type of formal agricultural knowledge and training accessed by the individuals interviewed. Many had also taken individual academic (26.5% of the total sample) and technical (48.7%) courses as part of their continuing education [see Table 4-6]. Agricultural conferences also proved to be a frequent source of technical education for 38.5% of the farmers interviewed. To a much lesser extent, farmers' spouses/partners engaged in similar continuing education regarding agricultural technology [see Table 4-7].

Perhaps most interesting number is the proportion of farmers and their spouses/partners who had not received any formal agricultural education or training. While 26.5% of the total farmer group (and 85.7% of spouses/partners) indicated that they had no formal agricultural training, a between groups comparison showed that the majority of these persons were those who practised organic (32.1% of all organic farmers) or bio-dynamic (45.4%) farming methods. This is perhaps reflective of the lesser extent to which organic and bio-dynamic farmers view such educational opportunities as offering useful or relevant information for their operations.

TABLE 4-6. FORMAL AGRICULTURAL EDUCATION AND TRAINING: FARMERS AND FARM ORGANIZATION STAFF

	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)	OTHER No. (%)
No. Respondents	117 (100%)	53 (100%)	45 (100%)	6 (100%)	9 (100%)	4 (100%)
Agricultural Education						
1. University degree/ College diploma	19 (16.2%)	4 (7.5%)	10 (22.2%)	2 (33.3%)	1 (9.1%)	2 (50.0%)
2. Academic courses	31 (26.5%)	18 (40.0%)	10 (22.2%)	2 (33.3%)	1 (9.1%)	--
3. Technical courses	57 (48.7%)	21 (39.6%)	30 (66.6%)	5 (83.3%)	1 (9.1%)	--
4. Formal apprenticeship	1 (0.9%)	1 (1.9%)	--	--	--	--
5. Conferences	45 (38.5%)	20 (37.7%)	21 (46.7%)	3 (50.0%)	1 (9.1%)	--
6. Other	3 (2.6%)	--	2 (4.4%)	1 (16.7%)	--	--
No formal agricultural education	31 (26.5%)	17 (32.1%)	7 (15.5%)	--	5 (45.4%)	2 (50.0%)

TABLE 4-7. FORMAL AGRICULTURAL EDUCATION AND TRAINING: FARMERS' SPOUSES/PARTNERS

	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
No. Respondents (%)	91 (100%)	37 (100%)	41 (100%)	5 (100%)	8 (100%)
Agricultural Education					
1. University degree/ College diploma	3 (3.3%)	2 (5.4%)	1 (2.4%)	--	--
2. Academic courses	2 (2.2%)	1 (2.7%)	1 (2.4%)	--	--
3. Technical courses	9 (9.9%)	4 (10.8%)	4 (9.8%)	1 (20.0%)	
4. Formal apprenticeship	--	--	--	--	--
5. Conferences	3 (3.3%)	2 (5.4%)	--	1 (20.0%)	--
6. Other	--	--	--	--	--
No formal agricultural education	78 (85.7%)	31 (83.8%)	35 (85.4%)	4 (80.0%)	8 (100%)

On-the-job training: Farming experience. For many of the respondents, their on-the-job training in agriculture started in childhood. 61.7% of those interviewed had grown up on a farm while an additional 3.5% had a spouse or partner who had grown up on a farm [see Table 4-8]. The continuation of the family occupational tradition was strongest for the conventional farmer group of which 84.4% had grown up on a farm. In contrast, significantly fewer organic (45.4%) and bio-dynamic (44.4%) farmers had childhood farming experience (Chisquare = 21.778, d.f. = 6, p = .001). When asked whether they had always farmed for a living, relatively more conventional farmers (35.6%) and organic-conventional farmers (33.3%) responded "yes" than did either organic (12.7%) or bio-dynamic (11.1%) farmers.

Both of these factors contributed to the greater years of total farming experience of the conventional and organic-conventional farmers in the sample. Calculated on the basis of number of years farming experience since the age of 18, the farmers interviewed had an average of 17 years farming experience [see Table 4-9]. Intergroup comparisons proved that organic farmers (mean = 13.82 years, s.d. = 9.64) had significantly fewer years of total farming experience

TABLE 4-8. SOCIOECONOMIC CHARACTERISTICS: FARMERS WHO HAVE GROWN UP ON A FARM

	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
Grew up on a Farm					
1. Yes	71 (61.7%)	25 (45.4%)	38 (84.4%)	4 (66.7%)	4 (44.4%)
2. No (self)--Yes (spouse/partner)	4 (3.5%)	3 (5.5%)	--	1 (16.7%)	--
3. No (self)--No (spouse/partner)	40 (34.8%)	27 (49.1%)	7 (15.6%)	1 (16.7%)	5 (55.5%)
Total	115 (100%)	55 (100%)	45 (100%)	6 (100%)	9 (100%)

than did conventional farmers (mean = 20.60 years, s.d. = 12.56) [$F_{(3,112)}$ = 3.5045, $p = .0178$]. While a farmer's number of years farming experience is strongly correlated with his/her age ($r = .5968$, $p < .001$), age proved not to be an explanatory variable for this difference between the two groups.

To determine their experience with both types of production methods (organic/bio-dynamic and conventional), organic, organic-conventional, and bio-dynamic farmers were also asked how many of their years of farming experience involved organic farming methods. [see Table 4-9] Whereas 71.8% of this combined group stated that they had only practised organic farming methods, a number had experience with both methods of production. This contrasts with Lockeretz and Wernick's (1980) survey of organic farmers in the U.S. of whom 87% had previous experience with conventional agricultural methods of production. Not surprisingly, compared to both organic and bio-dynamic farmers, organic-conventional farmers proved to be the relative newcomers to the use of organic farming methods ($F_{(2,68)} = 3.3638$, $p = .0405$).

However in terms of total years of organic farming experience, there were no statistically significant differences. On average, organic farmers have spent 11.1 years of their 13.8 years farming experience utilizing organic farming methods. Only one bio-dynamic farmer (out of a total of nine) had experience with both bio-dynamic and conventional farming systems. In contrast, organic-conventional farmers who have the greatest number of years total farming experience (mean = 19.83) have spent an average of 11 of those years practising organic farming methods.

TABLE 4-9. YEARS OF FARMING EXPERIENCE: TOTAL AND ORGANIC

TOTAL YEARS FARMING EXPERIENCE	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
< 5 years	11 (9.5%)	7 (12.5%)	4 (8.9%)	--	--
6-10 years	23 (19.8%)	17 (30.4%)	4 (8.9%)	--	2 (22.2%)
11-15 years	29 (25.0%)	17 (30.4%)	8 (17.8%)	2 (33.3%)	2 (22.2%)
16-20 years	25 (21.5%)	8 (14.3%)	14 (31.1%)	3 (50.0%)	--
21-25 years	7 (6.0%)	1 (1.8%)	2 (4.4%)	--	4 (44.4%)
26-30 years	6 (5.2%)	3 (5.4%)	2 (4.4%)	--	1 (11.1%)
31-35 years	4 (3.4%)	--	3 (6.7%)	1 (16.7%)	--
36-40 years	4 (3.4%)	1 (1.8%)	3 (6.7%)	--	--
> 40 years	7 (6.0%)	2 (3.6%)	5 (11.1%)	--	--
TOTAL	116 (100%)	56 (100%)	45 (100%)	6 (100%)	9 (100%)
Means	17.0862	13.8214	20.6000	19.8333	18.0000
Std.Dev.	11.0513	9.6391	12.5579	7.1949	8.1548

YEARS ORGANIC FARMING EXPERIENCE	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
< 5 years	17 (23.6%)	14 (25.0%)	1 (2.2%)	2 (33.3%)	--
6-10 years	19 (26.3%)	16 (28.6%)	--	1 (16.7%)	2 (22.2%)
11-15 years	23 (31.9%)	18 (32.1%)	--	2 (33.3%)	3 (33.3%)
16-20 years	4 (5.6%)	4 (7.1%)	--	--	--
21-25 years	4 (5.6%)	--	--	1 (16.7%)	3 (33.3%)
26-30 years	3 (4.2%)	2 (3.6%)	--	--	1 (11.1%)
31-35 years	--	--	--	--	--
36-40 years	1 (1.4%)	1 (1.8%)	--	--	--
> 40 years	1 (1.4%)	1 (1.8%)	--	--	--
TOTAL	72 (100%)	56 (100%)	45 (100%)	6 (100%)	9 (100%)
Means	11.8028	11.1071	.1000	11.0000	16.667
Std.Dev.	8.6547	8.7150	.0000	7.5100	8.2158

Career Mobility

Given that relatively fewer organic and bio-dynamic farmers (12.7% and 11.1% respectively, as compared to 35.6% of conventional farmers) indicated that they have always farmed for a living or had grown up on a farm (45.4% of organics, 44.4% of bio-dynamics, as compared to 84.4% of conventionals and 66.7% of organic-conventionals) it follows that organic and bio-dynamic farmers had more diverse occupational backgrounds. In response to questions regarding the jobs which they have held in the past (a maximum of five jobs were recorded), organic farmers indicated that they have had a significantly greater number of jobs (mean = 2.71, s.d. = 1.27) than had conventional farmers (mean = 1.73, s.d. = 1.30)($F_{(3,111)}$ = 5.0376, p = .0026).[see Table 4-10] Bio-dynamic and organic-conventional farmers have had an intermediate average number of jobs in their careers but were not significantly different from the other groups (mean number of jobs = 2.11, s.d. = 1.62 for bio-dynamics; mean = 1.50, s.d. = 1.76 for organic-conventionals).

A comparison of the types of jobs held previously in respondents' careers showed that agriculture/horticulture were predominant, especially for organic farmers. Other occupational categories which were most often reported included: managerial/administrative (26.7% of the total number of jobs reported); natural sciences/engineering/research (26.7%); and forestry/logging (25.0%); construction trades (21.6%). Jobs in sales (12.9%), education (12.1%), hospitality services (9.5%), and manufacturing (9.5%) were the next most often reported. Correlation analysis revealed that there was no significant relationship between the total number of jobs reported by respondents and age (r = .0016) or total years of farming experience (r = -.0808).

Of respondents who stated that they had prior employment in agricultural jobs (mean = .30, s.d. = .64), the majority of these jobs (75.1%) were in Canada.[see Table 4-11] Only organic and bio-dynamic farmers indicated that they had worked in agriculture outside of Canada.

TABLE 4-10. FARMERS' CAREER EXPERIENCES: TYPES OF PREVIOUS JOBS

	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
Number of Respondents (%)	116 (100%)	56 (100%)	45 (100%)	6 (100%)	9(100%)
Type of Previous Jobs (Note 1)					
1. Agriculture/Horticulture	31 (26.7%)	21 (37.5%)	7 (15.5%)	1 (16.7%)	2 (22.2%)
2. Managerial/Administrative	31 (26.7%)	19 (33.9%)	8 (17.8%)	--	4 (44.4%)
3. Natural Sciences/Engineering	31 (26.7%)	13 (23.2%)	13 (28.9%)	1 (16.7%)	4 (44.4%)
4. Forestry/Logging	29 (25.0%)	16 (28.6%)	11 (24.4%)	2 (33.3%)	--
5. Construction trades	25 (21.6%)	16 (28.6%)	8 (17.8%)	--	1 (11.1%)
6. Sales	15 (12.9%)	8 (14.2%)	4 (8.9%)	--	3 (33.3%)
7. Education	14 (12.1%)	10 (17.9%)	1 (2.2%)	1 (16.7%)	2 (22.2%)
8. Manufacturing	11 (9.5%)	4 (7.1%)	6 (13.3%)	1 (16.7%)	--
9. Services (hospitality)	11 (9.5%)	8 (14.2%)	3 (6.7%)	--	--
10. Health Care (medicine, nursing)	9 (7.8%)	4 (7.1%)	4 (8.9%)	1 (16.7%)	--
11. Mining/Oil	9 (7.8%)	4 (7.1%)	4 (8.9%)	1 (16.7%)	--
12. Transportation	9 (7.8%)	4 (7.1%)	5 (11.1%)	--	--
13. Clerical	6 (5.2%)	4 (7.1%)	1 (2.2%)	1 (16.7%)	--
14. Social Sciences (counselling)	5 (4.3%)	4 (7.1%)	1 (2.2%)	--	--
15. Machining	4 (3.4%)	3 (1.8%)	1 (2.2%)	--	--
16. Fishing/trapping	1 (0.9%)	1 (1.8%)	--	--	--
17. Other	8 (6.9%)	7 (12.5%)	1 (2.2%)	--	--
Average No. of Jobs per Respond.	2.2174	2.7091	1.7333	1.5000	2.1111
Std.dev.	1.4066	1.2718	1.3038	1.7607	1.6159

Note 1. Maximum number of jobs per respondent = 5.

TABLE 4-11. FARMERS' CAREER EXPERIENCES: NUMBER AND GEOGRAPHIC LOCATION OF AGRICULTURAL JOBS (Note 1)

Number of Agricultural Jobs	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
0	89 (76.7%)	41 (73.2%)	37 (82.2%)	4 (66.67%)	7 (77.7%)
1	21 (18.1%)	10 (17.9%)	8 (17.8%)	2 (33.33%)	1 (11.1%)
2	5 (4.3%)	4 (7.1%)	--	--	1 (11.1%)
3	--	--	--	--	--
4	1 (0.9%)	1 (1.8%)	--	--	--
Total	116 (100%)	56 (100%)	45 (100%)	6 (100%)	9 (100%)
Means	.3017	.3929	.1778	.3333	.3333
Std.dev.	.6355	.7788	.3866	.5164	.7071

Geographic Location of Agricultural Jobs	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
Canada					
B.C.	20 (62.5%)	13 (61.9%)	6 (85.7%)	1 (100%)	--
Prairies (note 2)	2 (6.3%)	2 (9.5%)	--	--	--
Central/Eastern (note3)	2 (6.3%)	1 (4.8%)	1 (14.3%)	--	--
U.S.A.	4 (12.5%)	2 (9.5%)	--	--	2 (66.7%)
U.K.	--	--	--	--	--
Europe	2 (6.3%)	2 (9.5%)	--	--	--
Asia	--	--	--	--	--
Australia/New Zealand	1 (3.1%)	--	--	--	1 (33.3%)
Other (note 4)	1 (3.1%)	1 (4.8%)	--	--	--
Total	32 (100%)	21 (100%)	7 (100%)	1 (100%)	3 (100%)

Note 1. Maximum number of jobs per respondent = 5.
Note 2. Prairie provinces = Alberta, Saskatchewan, Manitoba
Note 3. Central/Eastern = Ontario, Quebec, New Brunswick, Nova Scotia
Note 4. Other = Africa, Central America, Mexico

Organic farmers have had an average of 2.2 nonagricultural jobs (s.d. = 1.24) while conventional farmers reported an average of 1.6 nonagricultural jobs (s.d. = 1.20), organic-conventional farmers reported an average of 1.3 jobs (s.d. = 1.37) and bio-dynamic farmers reported an average of 1.8 nonagricultural jobs (s.d. = 1.30) in their careers.[see Table 4-12] Organic farmers proved to have held more nonagricultural jobs than conventional farmers have ($F_{(3,112)}$ = 2.8376, p = .0413). In terms of geographic mobility, the location of the majority of nonagricultural career employment has been in British Columbia (71.8%) or other parts of Canada (11.3%). The only major observed difference concerned the bio-dynamic farmer group who, with the exception of one individual, have immigrated from Europe thus explaining the relatively greater geographic mobility in their careers.

Discussion. These findings would suggest that as a group, organic and bio-dynamic farmers tend to have been more occupationally and geographically mobile than either conventional or organic-conventional farmers. The total number of jobs in a respondent's career was found not to be significantly related to age (r = -.0295, p = .383), the number of years farming experience (r = -.1009, p = .153) or education level for the total group or for production method subgroups (for total group, $F_{(5,\ 107)}$ = .736, p = .598). However, part of the difference in career experiences can be explained by the higher proportion of conventional and organic-conventional who grew up on farms and have chosen to continue farming either on or near the original family farm. Thus it would appear that conventional farmers, in particular, have more specialized career paths focused primarily on agriculture whilst organic and bio-dynamic farmers may tend to bring more different perspectives (based on the greater diversity in their career and educational experiences) to their agricultural practices. Another interpretation that can be derived from these results is that organic and bio-dynamic farmers, especially those who have not grown up on farms, have exercised more personal choice in their career decisions to practice agriculture. For those individuals who spent their childhood on a farm, the decision to farm is obviously a more informed one in that they have had on-the-job agricultural training and

TABLE 4-12. FARMERS' CAREER EXPERIENCES: NUMBER AND GEOGRAPHIC LOCATION OF NONAGRICULTURAL JOBS (Note 1)

Number of Nonagricultural Jobs	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
0	15 (12.9%)	4 (7.1%)	9 (20.0%)	1 (16.7%)	1 (11.1%)
1	34 (29.3%)	11 (19.6%)	15 (33.3%)	4 (66.7%)	4 (44.4%)
2	31 (26.7%)	20 (35.7%)	10 (22.2%)	--	1 (11.1%)
3	23 (19.8%)	13 (23.2%)	8 (17.8%)	--	2 (22.2%)
4	10 (8.6%)	5 (8.9%)	3 (6.7%)	1 (16.7%)	1 (11.1%)
5	3 (2.6%)	3 (5.4%)	--	--	--
Total	116 (100%)	56 (100%)	45 (100%)	6 (100%)	9 (100%)
Mean	1.8966	2.2321	1.5878	1.3333	1.7778
Std.dev.	1.2606	1.2357	1.1964	1.3663	1.3017

Geographic Location of Nonagricultural Jobs	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
Canada					
B.C.	158 (71.8%)	90 (72.0%)	52 (73.2%)	8 (100%)	8 (50.0%)
Prairies (note 2)	15 (6.8%)	9 (7.2%)	5 (7.0%)	--	1 (6.3%)
Central/Eastern (note 3)	10 (4.5%)	6 (4.8%)	4 (5.6%)	--	--
U.S.A.	13 (5.9%)	9 (7.2%)	3 (4.2%)	--	1 (6.3%)
U.K.	6 (2.7%)	2 (1.6%)	3 (4.2%)	--	1 (6.3%)
Europe	9 (4.1%)	2 (1.6%)	3 (4.2%)	--	4 (25.0%)
Asia	5 (2.3%)	3 (2.4%)	1 (1.4%)	--	1 (6.3%)
Australia/New Zealand	1 (0.5%)	1 (0.8%)	--	--	--
Other (note 4)	3 (1.4%)	3 (2.4%)	--	--	--
Total	220 (100%)	125 (100%)	71 (100%)	8 (100%)	16 (100%)

Note 1. Maximum number of jobs per respondent = 5.
Note 2. Prairie provinces = Alberta, Saskatchewan, Manitoba
Note 3. Central/Eastern = Ontario, Quebec, New Brunswick, Nova Scotia
Note 4. Other = Africa, Central America, Mexico

experience from an early age. As they continued the family farming tradition, the majority have the advantage of an established informal network (family and neighbours) of agricultural expertise. For those who have taken over the family farm, there are other benefits to be derived from the within family transfer of farmland and equipment as well as access to pre-existing marketing and distribution channels.

In contrast, there is often greater effort required in start-up for the 43 farmers who did not come from an agricultural background. Why have these individuals chosen farming as an occupation? In answer to this question, five themes emerged [see Table 4-13]. The primary motivations for many were the rural lifestyle which farming offered and the nature of farmwork itself. While not growing up on a farm, several farmers (11) stated that they had visited the farms of relatives (such as grandparents) during their childhood so had occasional contact with those who farmed. For a number of organic and bio-dynamic farmers (10), their motivation to farm was informed by concerns regarding the natural environment. Four individuals (all organic) became farmers as part of their involvement with intentional communities (spiritual and communal) in which farming was considered an essential part of the community's activities.

TABLE 4-13. MOTIVATIONS TO FARM: FARMERS WHO HAD NOT GROWN UP ON FARMS

	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
Number of Farmers	43 (100%)	29 (100%)	7 (100%)	2 (100%)	5 (100%)
Motivations to Farm					
1. For the Lifestyle	22 (51.2%)	17 (58.6%)	4 (57.1%)	2 (100%)	1 (20.0%)
2. Enjoy the work	14 (32.6%)	7 (24.1%)	3 (42.9%)	2 (100%)	2 (40.0%)
3. Environmental Concerns	10 (23.3%)	6 (20.7%)	--	--	4 (80.0%)
4. Family members farmed/ gardened	11 (25.6%)	6 (20.7%)	2 (28.6%)	--	3 (60.0%)
5. Member of an intentional community which has a farm	4 (9.3%)	4 (13.8%)	--	--	--

Current Off-Farm Employment

Farm operations were the sole source of employment income for only 49 (42.2%) of the farmers in the sample. Of the remaining 67 farmers interviewed, 36 engaged in off-farm employment whilst in an additional 40 households, spouses/partners held off-farm jobs. In 21 cases (18.1%) both the farmer and his/her spouse/partner were employed elsewhere.

The total time commitment to off-farm employment for farmers and their spouses/partners are also presented in Table 4-14. On average, members of the farm operating unit (farmers plus spouses/partners) work an average of 25.50 weeks per year (s.d. = 30.60) off the farm. Those with organic-conventional operations worked the greatest number of weeks (mean = 41.00, s.d. = 35.66), followed by those with organic operations (mean = 31.30, s.d. = 30.07), conventional operations (mean = 20.16, s.d. = 30.55), and lastly, bio-dynamic operations (mean = 5.78, s.d. = 17.33). In terms of annual weeks of off-farm employment, organic-conventional and organic farmers and their spouses/partners worked significantly (at the p = .05 level) more weeks in off-farm jobs than did those on bio-dynamic farms ($F_{(3,112)}$ = 3.0431, p = .0319).

In terms of annual hours spent in off-farm employment, those operating organic-conventional farms worked significantly more hours (mean = 1641.67, s.d. = 1298.34) at their off-farm jobs than either conventional (mean = 509.33, s.d. = 849.77) or bio-dynamic (mean = 346.67, s.d. = 1040.00) farmers. For their part, organic farm operators spent more time in off-farm employment (mean = 1083.80, s.d. = 1112.19) than did conventional farm operators ($F_{(3,112)}$ = 4.5639, p = .0047). These results suggest that those individuals who have organic-conventional and organic farms are dedicating a larger proportion of their working time to activities other than farmwork.

TABLE 4-14. OFF-FARM EMPLOYMENT: FARMERS AND THEIR SPOUSES/PARTNERS

EMPLOYMENT STATUS	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
FARMERS					
Full-time Regular	12 (10.3%)	6 (10.7%)	4 (8.9%)	1 (16.7%)	1 (11.1%)
Full-time Seasonal	16 (13.8%)	13 (23.2%)	2 (4.4%)	1 (16.7%)	--
Part-time Regular	--	--	--	--	
Part-time Seasonal	5 (4.3%)	3 (5.4%)	1 (2.2%)	1 (16.7%)	--
Occasional	3 (2.6%)	3 (5.4%)	--	--	--
Sub-total employed off-farm	36 (31.0%)	25 (44.6%)	7 (15.5%)	3 (50.0%)	1 (11.1%)
No off-farm employment	80 (69.0%)	31 (55.4%)	38 (84.4%)	3 (50.0%)	8 (88.9%)
TOTAL	116 (100%)	56 (100%)	45 (100%)	6 (100%)	9 (100%)
SPOUSES/PARTNERS					
Full-time Regular	19 (17.3%)	13 (25.0%)	5 (11.6%)	1 (16.7%)	--
Full-time Seasonal	3 (2.7%)	1 (1.9%)	--	2 (33.3%)	--
Part-time Regular	10 (9.1%)	4 (7.7%)	5 (11.6%)	1 (16.7%)	--
Part-time Seasonal	8 (7.3%)	4 (7.7%)	4 (9.3%)	--	--
Occasional	--	--	--	--	--
Sub-total employed off-farm	40 (36.4%)	22 (42.3%)	14 (32.6%)	4 (66.7%)	0 (00.0%)
No off-farm employment	70 (63.6%)	30 (57.7%)	29 (67.4%)	2 (33.3%)	9 (100.0%)
TOTAL SPOUSES/PARTNERS	110 (100%)	52 (100%)	43 (100%)	6 (100%)	9 (100%)
NOT APPLICABLE	6	4	2	0	0
TOTAL WEEKS PER YEAR					
Means	25.50	31.30	20.16	41.00	5.78
Std.Dev.	30.60	30.07	30.55	35.66	17.33
TOTAL HOURS PER YEAR					
Means	832.61	1083.8	509.33	1641.67	346.67
Std.Dev.	1068.02	1112.19	849.77	1298.34	1040.00

For organic farmers in particular, the commitment to off-farm jobs was most often of a full-time seasonal nature with a number holding full-time regular jobs. The most often cited reasons farmers gave for their off-farm employment were financial such as the need to supplement farm income (80.5% for the total group) and to subsidize farm operations (13.9%). A much smaller proportion stated that they worked off the farm because the off-farm job was their primary occupation (2 organic farmers and 1 organic-conventional farmer) or that they did so out of personal interest (4 organic, 1 conventional, and 1 bio-dynamic).[see Table 4-15]

TABLE 4-15. OFF-FARM EMPLOYMENT: REASONS FOR FARMERS AND THEIR SPOUSES/PARTNERS

	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
No. Farmers employed Off-farm	36 (100%)	25 (100%)	7 (100%)	3 (100%)	1 (100%)
Reasons					
1. To supplement farm income	29 (80.5%)	22 (88.0%)	5 (71.4%)	2 (66.7%)	--
2. To subsidize farm operations	5 (13.9%)	4 (16.0%)	--	--	1 (100%)
3. Off-farm job is primary occupation	3 (8.3%)	2 (8.0%)	--	1 (33.3%)	--
4. Personal interest	6 (16.6%)	4 (16.0%)	1 (14.3%)	--	1 (100%)
No. Spouses/Partners Employed Off-farm	40 (100%)	22 (100%)	14 (100%)	4 (100%)	0 (100%)
Reasons					
1. To supplement farm income	25 (62.5%)	17 (77.3%)	6 (42.9%)	2 (50.0%)	--
2. To subsidize farm operations	4 (10.0%)	3 (13.6%)	--	1 (25.0%)	--
3. Off-farm job is primary occupation	14 (35.0%)	7 (31.8%)	6 (42.9%)	1 (25.0%)	--
4. Personal interest	10 (25.0%)	5 (22.7%)	5 (35.7%)	--	--

NOTE: Multiple reasons for off-farm employment often provided

While farmers were employed in a wide array of occupations, the most predominant were in agriculture/horticulture (7 farmers), management/ administration (6), forestry/logging (5), education (5), and construction (4). In the 110 farm units where they were present, many spouses/partners were employed on a full-time basis (17.3% of this group). This was especially true for the organic farmers who had relatively more spouses/partners working in off-farm employment. While financial need was the most often cited reason for a spouse/partner to be employed elsewhere (being cited by 72.5% of those employed), another important factor was that the off-farm job was often the primary occupation of the spouse/partner (cited by 35%). Noting that the type of post-secondary education of spouses/partners was less likely to be related to agriculture, it follows that these individuals were most often employed in education (11), management/administration (6), and health care (5).

The average number of weeks of off-farm employment for farmers was 9.6 weeks (s.d. = 17.046) with organic-conventional farmers reporting the greatest number of 16.5 weeks followed by organic farmers with 12.9 weeks per year with bio-dynamic (mean = 5.78) and conventional (mean = 5.42) farmers at much lower levels. [See Table 4-16] A comparison of means revealed that organic farmers as a whole worked significantly more weeks off the farm than did conventional farmers ($F_{(3,112)}$ = 2.1376, p = .0995, group difference significant at p = .05 level). A between groups comparison for only those who were engaged in off-farm employment revealed no statistically significant differences in regards to annual weeks worked off-farm ($F_{(3,32)}$ = .662, p = .529).

Additional analysis in regards to the total number of hours in which a farmer is employed off-farm showed that at this level of analysis, organic-conventional (mean = 22.50, s.d. = 32.21) and organic (mean = 15.29, s.d. = 19.59) farmers worked significantly (at p = .05 level) greater number of hours than did conventional farmers (mean = .31, s.d. = 10.41) ($F_{(3,112)}$ = 5.1543, p = .0022). This relationship held even after subsequent analyses which controlled

TABLE 4-16. OFF-FARM EMPLOYMENT: FARMERS' NUMBER OF WEEKS AND HOURS PER YEAR

	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
WEEKS WORKED PER YEAR					
0 weeks	80 (69.0%)	31 (55.4%)	38 (84.4%)	3 (50.0%)	8 (88.9%)
1 - 13 weeks	7 (6.0%)	7 (12.5%)	--	--	--
14 - 26 weeks	13 (11.2%)	8 (14.3%)	3 (6.6%)	2 (33.4%)	--
27 - 39 weeks	4 (1.7%)	2 (3.6%)	2 (4.4%)	--	--
40 - 52 weeks	12 (10.3%)	8 (14.3%)	2 (4.4%)	1 (16.7%)	1 (11.1%)
TOTAL NO. FARMERS	116 (100%)	56 (100%)	45 (100%)	6 (100%)	9 (100%)
Means	9.6293	12.8929	5.4222	16.5000	5.7780
Std.Dev.	17.0460	18.5087	13.6290	20.9165	17.3333
Only Farmers Employed Off-Farm					
No. of Farmers	36	25	7	3	1
Means	31.0278	28.8800	34.8571	33.0000	52.0000
Std.Dev.	16.6241	17.4387	12.8508	16.6433	.0000
HOURS WORKED PER YEAR					
0 hours	80 (69.0%)	31 (55.4%)	38 (84.4%)	3 (50.0%)	8 (88.9%)
1 - 79 hours	4 (3.5%)	1 (1.8%)	3 (6.7%)	--	--
80 - 480 hours	10 (8.6%)	8 (14.3%)	1 (2.2%)	1 (16.7%)	--
481 - 960 hours	6 (5.2%)	6 (10.7%)	--	--	--
961 - 1440 hours	5 (4.3%)	3 (5.4%)	1 (2.2%)	--	--
> 1440 hours	11 (9.5%)	7 (12.5%)	1 (4.4%)	2 (33.3%)	1 (11.1%)
TOTAL NO.FARMERS	116 (100%)	56 (100%)	45 (100%)	6 (100%)	9 (100%)
Means	10.2672	15.2857	3.1111	22.5000	6.6667
Std.Dev.	18.4119	19.5882	10.4059	32.2102	20.0000
Only Farmers Employed Off-Farm					
No. of Farmers	36	25	7	3	1
Means	1036.5556	961.8400	857.1429	1383.3333	3120.0000
Std.Dev.	848.9816	736.2784	965.2239	883.1950	0.0000

for differences in farm acres in production. However a group comparison based solely on those who were employed elsewhere shows that once off the farm, all groups had the same overall time commitment to their other jobs ($F_{(3,32)}$ = 2.6806, p = .0634). The only significant difference was found for the one bio-dynamic farmer who worked significantly longer hours as the owner/manager of a computer retail store.

Spouses/partners worked an average of 15.9 weeks (s.d. = 22.73) per year with only those on organic farms working more weeks off-farm than those on bio-dynamic farms who did not work off-farm ($F_{(3,112)}$ = 2.0780, p = .1071). There were no significant group differences amongst those who reported off-farm employment ($F_{(2,37)}$ = 1.780, p = .200). In terms of hours worked per year, spouses/partners of organic-conventional (mean = 30.00, s.d. = 27.56) worked the greatest number of hours. Spouses/partners of organic farmers (mean = 13.52, s.d. = 18.88) and conventional farmers (mean = 7.73, s.d. = 13.06) worked significantly fewer hours per year than those of organic-conventional farmers ($F_{(3,112)}$ = 4.9415, p = .0029). Of those who were employed off-farm, they averaged 1481.7 hours per year (s.d. = 726.04) with no statistically significant differences between groups ($F_{(2,37)}$ = 1.7781, p = .1831).

The incidence of off-farm employment appears to be related to the number of farm acres in production. Correlations between the number of acres in production and total number of weeks of off-farm employment (farmers and spouses/partners) was only r = -.1582 (p = .051) while a slightly stronger correlation was found with total hours of off-farm employment (r = -.1651, p = .044). As revealed by an examination of means of farm acres in production for each of the off-farm employment categories, those on smaller acreages had a greater time commitment to off-farm jobs. If the farmer was employed off-farm, his/her average acres in production was 81.6 acres (s.d. = 215.58). If not employed off-farm, the average was 287.4 acres (s.d. = 741.75). For those

TABLE 4-17. OFF-FARM EMPLOYMENT: FARMERS' SPOUSES/PARTNERS' NUMBER OF WEEKS AND HOURS PER YEAR

	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
WEEKS WORKED PER YEAR					
0 weeks	76 (65.5%)	34 (60.7%)	31 (68.9%)	2 (33.3%)	9 (100%)
1 - 13 weeks	--	--	--	--	--
14 - 26 weeks	4 (3.4%)	2 (3.6%)	--	2 (33.3%)	--
27 - 39 weeks	5 (4.3%)	2 (3.6%)	3 (6.7%)	--	--
40 - 52 weeks	31 (26.7%)	18 (32.1%)	11 (24.4%)	2 (33.3%)	--
TOTAL NO.	116 (100%)	56 (100%)	45 (100%)	6 (100%)	9 (100%)
Means	15.8707	18.4107	14.7333	24.5000	.0000
Std.Dev.	22.7319	23.7959	22.5715	23.3731	.0000
Only Spouses/Partners Employed Off-Farm					
Number	40	22	14	4	0
Means	46.0250	46.8636	47.3571	36.7500	0.0000
Std.Dev.	10.0141	9.2803	7.7817	17.6139	0.0000
HOURS WORKED PER YEAR					
0 hours	76 (65.5%)	34 (60.7%)	31 (68.9%)	2 (33.3%)	9 (100.0%)
80 - 480 hours	3 (2.5%)	2 (3.6%)	1 (2.2%)	--	--
481 - 960 hours	8 (6.9%)	3 (5.3%)	5 (11.0%)	--	--
961 - 1440 hours	9 (7.8%)	2 (3.6%)	4 (8.8%)	3 (50.0%)	--
> 1440 hours	20 (17.2%)	15 (26.8%)	4 (8.8%)	1 (16.7%)	--
TOTAL NO.	116 (100%)	56 (100%)	45 (100%)	6 (100%)	9 (100%)
Means	11.0776	13.5179	7.7333	30.0000	0.0000
Std.Dev.	17.4422	18.8757	13.0565	27.5681	0.0000
Only Spouses/Partners Employed Off-Farm					
No.	40	22	14	4	0
Means	1481.6750	1665.7727	1208.5714	1425.0000	0.0000
Std.Dev.	726.0362	789.7210	622.8349	452.9533	0.0000

respondents with spouses/partners, the average acres in production if the spouse/partner were employed off-farm was 125.5 acres (s.d. = 263.42); if not employed, the average was 260.8 acres in production (s.d. = 738.69). This negative relationship of off-farm employment for persons on larger acreages held for all production method groups and marital status groups. The relatively greater commitment of women (both as farm operators and spouses/partners) to off-farm employment is revealed in that 43.3% of farm women were employed elsewhere while only 32.1% of farm men held off-farm jobs.

There also appears to be a relationship between education level and whether a farm spouse/partner is employed off-farm. On farms where the farmer or his/her spouse/partner had high school graduation (n = 37) or post-graduate university education (n = 11), both were more likely to be employed more weeks per year at other jobs ($F_{(4,111)} = 3.1011$, $p = .0117$).

Discussion. The increasing off-farm labour participation rates of both farmers and their spouses has been noted in a number of studies in Canada and the United States. Based on the 1981 Census data, Bollman and Smith (1988) reported that only 47% of Canadian farms had no off-farm employment income. In their study, 47% of the farms were in this category as compared to 43% of the farms in this study. These figures are lower than those reported in the recent census which shows that in 1990, 55.8% of all B.C. farm operators were not engaged in paid off-farm work (Statistics Canada, 1992d). Most of this difference can be attributed to the larger proportion of conventional (84.4%) and bio-dynamic (88.9%) farmers who do not have off-farm employment. However the incidence of off-farm employment for this sample of organic farmers (i.e., 58%) is comparable to those in a survey of Saskatchewan organic farmers of whom approximately 50% had at least one member employed off the farm (Molder et al., 1991).

In terms of the number of days worked off-farm, the organic farmer group more closely approximates the B.C. farm operator population for whom 4.8% were employed 1-59 days, 13% for 60-189 days, and 26.2% for 190 days or more in 1990. There are gender differences in terms of off-farm employment for in 1990, 48% of male operators in B.C. and 37% of female operators were employed off-farm. Further, of those who were in paid off-farm jobs, a greater proportion of male farm operators (63%) than female farm operators (49%) were working 190 days or more.(Statistics Canada, 1992d) Thus it would appear that male farmers are more likely to have dual careers involving a greater time commitment than are female farmers. While the small number of female farmers in this study prevents any generalization, 8 (47%) of the female farmers and 28 (28%) of the male farmers interviewed were employed off-farm.

The negative relationship between farm size and the incidence of off-farm employment of both farm operators and their spouses has also been observed in other studies of labour force participation of farm families in Canada (Bollman & Smith, 1988; Smith, 1988) and the United States (Buttel & Gillespie, 1984; Godwin & Marlowe, 1990). The negative correlation between number of hours worked off-farm for both farm operators and their spouses/partners is also consistent with the findings of Buttel and Gillespie (1984).

In this study, it appears that those who are operating conventional and bio-dynamic farms are more likely to be doing so on a full-time basis. Organic and organic-conventional farmers and their spouses/partners are much more likely to have dual careers, even after controlling for the difference in farm size (acres in production). Given that the primary reason given for off-farm employment was financial, this might indicate that organic and organic-conventional farmers have a greater need to supplement their farm incomes from external income sources.

There are several alternative interpretations that could be derived from these findings. One is that organic and organic-conventional farmers are part-time or hobby farmers, and that their primary career interest lies elsewhere (as indicated by the number of farmers (3 of 36 employed off-farm) and spouses/partners (14 of 40) who cited this reason for their off-farm jobs). Thus the type and level of education may be related to whether one engages in off-farm employment. The positive relationship between off-farm employment and education levels found by Buttel and Gillespie (1984) and Ollenburger, Grana and Moore

(1989) is only partially supported in this study. While farmers and their spouses/partners with post-graduate university education were more likely to spend more time in off-farm employment, so too were those with only high school graduation. One explanation for this apparent anomaly could be that a large number of individuals who have completed formal agricultural training did so at the college level (eg., the two year diploma programme at Olds College) and would be more specialized in agriculture and thus less likely to seek other types of jobs.

Another explanation could be that organic farming is not sufficiently profitable (compared to conventional and bio-dynamic farming) to provide sufficient income to support the family or partner unit. In other words, conventional farming is the more economically viable approach to agricultural production. This conclusion is one which will be explored in more detail in Chapter 6 concerning perceptions of and experiences with organic farming.

A third explanation of these differences in off-farm employment concerns the stage in their farming careers that each production method group is currently in. As earlier presented, even though there are no significant differences in age between organic, organic-conventional and conventional farmers, conventional farmers have been farming significantly longer than organic farmers. This may indicate that as a group, organic farmers are more likely to be in the start-up stage in their farm operations which necessitate greater capital investment than established operations. Also, relatively fewer organic farmers have grown up on farms and therefore do not have the economic benefits enjoyed by those who have assumed responsibility for already established family farms or have bought a farm in the same area as their relatives. While this explanation appears viable for the organic farmer group, how would one explain the apparently anomalous findings for the organic-conventional group which has the same number of years farming experience and yet work the greatest time in off-farm employment? For this small sample of six, the majority have grown up on conventional farms and should have the same economic benefits as conventional farmers. However, a look at the situations of individual organic-conventional farmers reveals that two have experienced severe financial distress during the past five years and are only now in the process of fiscal recovery. For these persons, off-farm income is a necessity to pay off previous farm debts. Two of the organic-conventional farmers do not work off the farm but have established farms close to the ones they grew up on. One individual's off-farm job is in fact his primary occupation while the remaining one (as does one of the farmers recovering from financial distress) operates a retail store which sells farm produce as well as other commodities. This diversity in financial situations and need prevents any firm generalizations concerning the organic-conventional group in respect to off-farm employment activities.

In regards to the bio-dynamic farmer group which reported the least amount of off-farm employment a different picture emerges. Only one bio-dynamic farmer works off the farm and none of their spouses/partners do. Their financial situation is quite different than that of the other groups in that for they are much older (average age 58 years) and 6 of these individuals have started farming after long careers in other occupations (primarily professional). This is not to say that bio-dynamic farmers are "hobby" farmers -- the average number of years farming experience (at 18.0 years) is similar to that of conventional farmers and their operations are a full-time commitment. However, as a group, the bio-dynamic farmers have had the benefit of capital accumulation over a longer period of time, both in and outside of agriculture, and thus have an apparently lesser need for two employment income sources.

These explanations raise questions to be further explored in the analysis of the actual farm operations in Part B of this chapter. In any event, the dual careers of the large proportion of farmers and their spouses/partners may be a double-edged sword. On the one hand, off-farm employment augments farm income and provides a measure of financial security to offset the frequent price and production fluctuations inherent to agricultural production. On the other hand, the substantial time commitment required by off-farm jobs reduces the total time available for farm operations. One consequence may be the need to hire more agricultural labour to operate the farm. Another consequence may be the inability to devote the time to develop the farm's full production potential. We will revisit these possibilities as part of the analyses concerning farm operations and issues/problems in agriculture today.

Summary Discussion

To what degree then are organic and conventional farmers different in terms of their demographic and socio-economic characteristics? For this sample of farmers there was found to be no differences between organic and conventional farmers in terms of their age and marital status. In regards to gender, the organic farmer sample included more females than the conventional farmer sample. While organic farmers had higher general education levels than conventional farmers, their post-secondary education was more likely to be in nonagriculture disciplines. In contrast, conventional farmers reported that they had more post-secondary and technical training in agriculture. In addition, conventional farmers had more on-the-job training in agriculture. Compared to organic farmers, conventional farmers worked more likely to have grown up on a farm and to have always farmed for a living. Both of these factors contributed to conventional farmers' greater number of years of total farming experience. Another finding of this analysis of socio-economic characteristics was that organic farmers were more occupationally and geographically mobile. Organic farmers reported a greater number and variety of jobs in their careers.

The presence of a spouse or partner in the farm operating unit was also examined. In general, there were no differences in terms of level and type of education of spouses/partners of organic and conventional farmers. Relatively few spouses/partners (the majority of whom were female) had formal agricultural training.

Off-farm employment proved to be more frequent for those operating organic farms. Both organic farmers and their spouses/partners were more weeks and hours per year off the farm than were conventional farmers and their spouses/partners. The primary reason given for having a dual career was financial with a second reason being that the off-farm job was the individual's primary occupation.

In total, there were observed a number of differences in socio-economic characteristics between those who operate organic farms and those working on conventional farms. While comparisons of means for individual characteristics yield several insights, to what degree is there a difference in composite socio-economic profiles or organic and conventional farmers? Which individual socio-economic characteristics are the defining or differentiating variables in such profiles? To answer these questions, principal components factor analyses were conducted to first, ascertain whether there was a unitary socio-economic profile for the farmers sampled in this study and second, to explain composite variance differences attributable to different socio-economic characteristics.

Eight socio-economic characteristics were considered in the factor analyses: farmer age; farmer's years of farming experience; operator status (single operator versus joint operator (with spouse or partner); general education level (farmer and spouse/partner); off-farm employment (number of weeks per year employed off-farm) for farmer and his/her spouse/partner; and farmer job mobility (number of jobs held other than current one as a farmer). Three of these variables are categorical variables with two variables (education levels of farmer and spouse/partner) being on an ordinal scale and the operator status variable being dummy coded. While conducting a factor analysis using ordinal and ratio measurement scales may appear to be unusual, the purpose of the principal components factor analysis was primarily descriptive (i.e., to identify patterns of variance in the data) rather than inferring that variable factor loadings have statistical significance.

The factor analysis procedure involved three steps:

Step 1. An unrestricted factor analysis of the variables to determine how many different factors would emerge;

Step 2. Determining a 'factor profile' by forcing the variables into one (or two) factor;

Step 3. Conducting separate factor analyses of the variables (using the one or two factor solution) for organic and conventional farmer subgroups.

If the "factor profiles" differed between the organic and conventional farmer subsamples, then one could conclude that each group was substantively different in terms of these socio-economic variables. If their factor profiles are very similar, then one could conclude that there are few socio-economic differences between the two types of farmers.

As indicated in Table 4-18, the initial principal components factor analysis resulted in four factors being identified. Variables loading (at greater than .50) most highly on the first factor related to operator status, that is, whether or not the farm was operated by a single person or with a spouse/partner, and the incidence of spouse/partner off-farm employment and spouse/partner education level (Eigenvalue = 2.3720; percentage of variance explained = 29.7%). The second factor related to farmer's longevity, that is, his/her age and years of farming experience (Eigenvalue = 1.5657; % of variance explained = 19.6%). The third factor related primarily to current off-farm employment of the farmer (Eigenvalue = 1.0539; % of variance explained = 13.2%). The fourth identified factor related to a farmer's job mobility and general education level (Eigenvalue = 1.0065; % of variance explained = 12.6%).

To determine whether there was a more parsimonious socio-economic profile, a second principal components factor analysis was conducted forcing a one-factor solution. This proved not to be possible therefore a two-factor extraction was conducted. While the percentage of variance explained by these two factors was not higher than that of the four-factor model, there was observed a change in the loading of variables. The four variables loading most highly onto the first factor (Eigenvalue = 2.3720, % variance explained = 29.7%) related to operator status, spouse/partner off-farm employment and education level, and farmer off-farm employment (all positive loadings). It appears that the key factor defining similarities amongst the total sample of farmers concerns the presence of another person (either spouse or partner) within the farm production unit. These results suggest that there is a positive association between levels of spouse/partner education and their off-farm employment activity (as confirmed by correlation analysis, $r = .4616$, $p < .001$).

TABLE 4-18. PRINCIPAL COMPONENTS FACTOR ANALYSIS OF FARMERS' SOCIO-ECONOMIC VARIABLES

Step 1. Total Sample: Principal Components Factor Analysis

VARIABLES	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4
AGE	-.0118	.9379	.0831	.0438
OPERATOR STATUS[1]	.8468	.0120	-.0891	.0495
YEARS FARMING	-.2492	.7747	-.1879	-.1325
EDUCATION LEVEL	-.1665	-.3738	.4478	.5135
EDUC. (SP/PTR)	.5586	-.3288	.1018	-.0009
EMPLOYMENT(FRMR)[2]	.1858	-.0133	.9167	-.0812
EMPLOY.(SP/PTR)	.8671	-.0518	.2561	-.0912
JOB MOBILITY[3]	.0394	.0268	-.1159	.9376
Eigenvalue	2.3720	1.5657	1.0539	1.0065
% Variance Explained	29.7%	19.6%	13.2%	12.6%

Step 2. Total Sample: Principal Components Factor Analysis -- 2 Factors

VARIABLES	FACTOR 1	FACTOR 2
AGE	-.1866	.7596
OPERATOR STATUS	.7395	.1527
YEARS FARMING	-.4237	.7122
EDUCATION LEVEL	-.0237	-.6682
EDUC. (SP/PTR)	.6110	-.2014
EMPLOYMENT(FRMR)	.4614	-.1191
EMPLOY.(SP/PTR)	.8976	.0995
JOB MOBILITY	-.1551	-.3762
Eigenvalue	2.3720	1.5657
% Variance	29.7%	19.6%

Step 3. Farmer Sub-Groups: Principal Components Factor Analysis -- 2 Factors

	ORGANIC FARMERS		CONVENTIONAL FARMERS	
VARIABLES	FACTOR 1	FACTOR 2	FACTOR 1	FACTOR 2
AGE	.0511	.8408	-.8700	.3182
OPERATOR STATUS	.7282	-.0237	.4419	.5008
YEARS FARMING	-.3724	.6636	-.8585	-.0150
EDUCATION LEVEL	-.0156	-.5396	.4028	.3138
EDUC. (SP/PTR)	.6222	-.0952	.6409	.1066
EMPLOYMENT(FRMR)	.5634	.1477	.4214	.1769
EMPLOY.(SP/PTR)	.8870	.0833	.7669	.2691
JOB MOBILITY	-.2186	-.4924	-.0991	.8872
Eigenvalue	2.2110	1.7191	3.1056	1.2850
% Variance	27.6%	21.5%	38.8%	16.1%

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1 Operator Status -- Dummy coded: 0 = Single operator; 1 = Married or Operating with Partner.

2 Employment -- Number of Weeks Employed Off-Farm per Year

3 Job Mobility -- Number of jobs held prior to current employment as farmer.

The primary defining characteristics for the second factor (Eigenvalue = 1.5657, % variance explained = 19.6%) are related to farmers' age and years of farming experience (positive loadings, $r = .6150$, $p < .001$) and to farmer education level (negative loading). One interpretation of this second factor is that older and more experienced farmers are more likely to have lower education levels. Farmer off-farm employment and job mobility did not load highly on either factor.

To determine whether this two-factor model was representative of both the organic farmer and conventional farmer subsamples, separate principal components factor analyses were conducted. As shown in Step 3 of Table 4-18, factor loadings for the organic farmer subsample were essentially the same as that of the total sample of farmers. The first factor related most to operator status variables with high positive loadings on the presence of a spouse/partner and their education level and off-farm employment as well as the farmers' off-farm employment (Eigenvalue = 2.2110, % variance explained = 27.6%). One interpretation of the first factor is that in organic farm production units where there is a spouse or partner, there is a higher level of off-farm employment for both the farmer and spouse/partner. This is unrelated to a farmer's education level but positively related to spouse/partner's education level. Given that spouses/partners were less likely to have had specialized agricultural training this suggests that spouses or partners are more probably employed in a nonagricultural occupation/profession.

The second factor for the organic farmer subsample relates more to the farmer him/herself with positive loadings on age and years of farming experience and negative loadings on farmer education level and job mobility (Eigenvalue = 1.7191, % variance explained = 21.5%). This suggests that older and more experienced organic farmers have lower general education levels and have had more stable careers.

In contrast, the factor analysis for the conventional farmer subsample suggests a different socio-economic variable profile than that for organic farmers. Specifically, the majority of the percentage of variance was explained by one factor (Eigenvalue = 3.1056, % variance explained = 38.8%) which included negative loadings for farmer age and years of farming experience, and positive loadings for operator status and education level (for both farmer and spouse/partner). Only two factors loaded onto the less explanatory second factor (Eigenvalue = 1.2850, % variance explained = 16.1%), specifically, job mobility and operator status. The positive loadings for both characteristics suggest that if a conventional farmer has a spouse or partner, he/she is likely to have greater job mobility.

The similarity in factor loadings between age and years of farming experience, and between spouse/partner education level and off-farm employment indicates a high correlation between these pairs of variables for the total sample and the organic and conventional farmer subsamples. This observation was confirmed by the very high correlations between these pairs of variables (all at the $p < .001$ level). Therefore in the subsequent discussion, reference will be made only to farmer age and to spouse/partner employment.

Comparison of these factor analysis results offers several insights in regards to the socio-economic profiles of conventional and organic farmers. First, the similarity between factor loadings for the total sample and the organic farmer subsample suggests that the organic farmer differences define the variance for the total sample more than the conventional farmer differences do. In other words, there is less variability and more central tendency for conventional farmers in terms of these socio-economic characteristics.

A second observation is that the first factor for both subsamples is anchored around operator status (spouse/partner) related variables. However, the two subsamples are dissimilar in the relation between farmer age and spouse/partner employment. For the conventional farmer subsample, it appears that there is a negative relation between farmer age and spouse/partner off-farm employment. This suggests that spouses/partners of older conventional farmers are less likely to be engaged in off-farm employment. In contrast, farmer age was not a consideration in regards to off-farm employment of either the organic farmer or his/her spouse/partner.

Comparison of the second factor for each farmer subsample suggests dissimilar relations between job mobility and other socio-economic characteristics. In regards to the organic farmer subsample, older and more experienced organic farmers have lower education levels and more stable careers (i.e., fewer off-farm jobs). This suggests that older organic farmers may either have less need for off-farm income or that they come from more traditional agricultural backgrounds (i.e., grew up on a farm and have less post-secondary education in nonagricultural disciplines). In contrast, the defining characteristic for the conventional farmer subsample in regards to job mobility appears to be the presence of a spouse or partner. One interpretation of this finding is that conventional farmers with a spouse/partner have more job mobility. Given that 91% of the conventional farmers were married, this suggests that having a spouse provides a measure of continuity in maintaining farm operations while the farmer is engaged in off-farm employment. Thus marital status may either necessitate or allow for increased off-farm job mobility.

The primary conclusion which can be derived from these factor analyses is that organic farmers and conventional farmers are quite different in terms of their socio-economic factor profiles. However, this analysis does not permit inferences as to the statistical significance of factor loadings of individual socio-economic characteristics. To empirically test these observations, there would need to be developed a scale of socio-economic characteristics -- a task beyond the scope of the current investigation. Irrespective, the different socio-economic profiles of the organic and conventional farmer subsamples have implications for the nature of farm production in each type of operation. In particular, the different patterns of off-farm employment of organic and conventional farmers and their spouses/partners have implications for the agricultural labour requirements in farm production which are one focus of the next part of this chapter on farm operations and marketing.

PART B. FARM OPERATIONS AND MARKETING

The general research question to be investigated in Part B is: Are organic farms different from conventional farms? (Research Question 2) Of specific interest are the differences between organic and conventional farms which relate to: farm ownership; size of farm (as measured by acres); types of farm products; farm operating expenses; agricultural labour (family and hired); and marketing of farm products. For reasons identified in Section II, this analysis of farm operations does not include comparisons of farm income, profitability, fixed and variable costs of production.

As in Part A on the socioeconomic characteristics of respondents, comparisons will be made to the B.C. farm population as well as to other research studies. Comparisons between groups based on production method type are also conducted to determine whether there are any significant differences between organic, conventional, organic-conventional and bio-dynamic farms.

Farm Ownership

The majority (90%) of farms in this study were the traditional individual or family farm while only three (2.7%) were incorporated farms that were non-owner operated (2 conventional and 1 organic). For the purposes of this study, the family farm category also included incorporated farms if all partners were members of the same family. Organic and bio-dynamic farms were different in terms of farm ownership in that five of the farmers interviewed were part of intentional communities (spiritual or communal living). There were also three organic farms which were nonfamily partnerships, that is, there were two or three persons who lived and worked on the same farm who were biologically or legally unrelated but pooled their labour and/or financial resources. The one bio-dynamic farm in the nonfamily partnership was somewhat different in that the individuals did not live in the same household but the farm was organized under a trust arrangement with shares held by those working on the farm.

TABLE 4-19. FARM OPERATIONS: FARM OWNERSHIP STATUS

	TOTAL FARMERS No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONV. FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
1. Family Farm (Note 1)	99 (90.0%)	41 (82.0%)	45 (95.7%)	6 (100%)	6 (85.7%)
2. Non-family partnership	4 (3.6%)	3 (6.0%)	--	--	1 (14.3%)
3. Intentional community (Note 2)	5 (4.5%)	5 (10.0%)	--	--	--
4. Incorporated farm (non-owner operated)	3 (2.7%)	1 (2.0%)	2 (4.3%)	--	--
Total No. Farms	110 (100%)	50 (100%)	47 (100%)	6 (100%)	7 (100%)

Note 1. Includes incorporated family farms, i.e., all partners are within same biological family.

Note 2. Intentional community includes spiritual and communal living communities.

TABLE 4-20. FARM OPERATIONS: FARMLAND OWNERSHIP

	TOTAL FARMERS No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONV. FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
1. Own Land Only (Note 1)	68 (61.8%)	40 (80.0%)	20 (42.6%)	5 (83.3%)	3 (42.9%)
2. Rent Land Only	3 (2.7%)	2 (4.0%)	1 (2.1%)	--	--
3. Own & Rent Land	39 (35.5%)	8 (16.0%)	26 (55.3%)	1 (16.7%)	4 (57.1%)
Total No. Farms	110 (100%)	50 (100%)	47 (100%)	6 (100%)	7 (100%)

Note 1. Includes incorporated family farms, i.e., all partners are within same biological family.

In terms of ownership status of the farmland, 61.8% of the farmers interviewed operated on land that they wholly owned while only 2.7% were solely tenant farmers. A large percentage (35.5%) both owned and rented farmland. It appears that organic and organic-conventional farmers were more likely to own all of their farmland while conventional and bio-dynamic farmers were more likely to both own and rent farmland for their operations. This follows when one takes into consideration the fact (as will be detailed next) that organic farmers had smaller acreages than conventional farmers thus their land requirements (and investment in land) would be less.

Size of Farms

The number of acres was used as an indication of farm size. In total acres, the average size of the farms of those interviewed was 1009.54 acres (s.d. = 4864.02) with conventional farms having the largest average size (mean = 1772.37 acres, s.d. = 6169.54), organic farms being the next largest (mean = 512.90 acres, s.d. = 1831.29) followed by bio-dynamic farms (mean = 249.00, s.d. = 370.02) and organic-conventional farms (mean = 60.17, s.d. = 30.56). These acreage data include acres under cultivation, range (owned and private leased), pasture, undeveloped land, woodland but not government leased range. After examination of the data, it appeared to be appropriate to eliminate two outlier farms from subsequent analyses involving acreages. Both of these farms were very large corporate farms which were nonowner operated -- one organic ranch had 12,000 acres and one conventional ranch had 48,702 acres. The elimination of these two farms from the analysis reduced the average total size of the sample farms (as well as standard deviations) to: total group -- 466.19 acres (s.d. = 1190.12); organic farms -- 278.46 (s.d. = 786.36); conventional farms -- 752.16 acres (s.d. = 1593.30). A nonparametric median test on the amended group of farms revealed that organic farms had significantly fewer total acres than conventional farms (Chisquare = 4.5378, p = .0332, n = 97).

However, for the purposes of comparisons, it could be argued that a more appropriate comparison would be the number of farm acres used in production (i.e., excluding undeveloped land, woodland). This gives a better indication of the actual area which is being worked by the farmer. To minimize annual variations, the average acres in production was calculated by averaging the number of acres which had been in productive use over the past three years. If the farm had been in operation for less than three years, the average was based on the number of years that the farm had been in operation.

As before, the two extremely large corporate nonowner operated ranches were excluded from the analysis (the organic ranch had 3500 acres in production, the conventional ranch had 3737 acres in production). Using average acres in production as an indicator of farm size, the average number of acres in production for the total group was 208.2 acres (s.d. = 560.98), organic farm group was 89.7 acres (s.d. =229.23), conventional farm group was 372.2 acres (s.d. = 800.55), organic-conventional farm group was 46.5 acres (s.d. = 36.49), and bio-dynamic farm group was 99.4 acres (s.d. = 152.08). As with the group comparison of total farm acres, the conventional farms were significantly larger than organic farms at the p = .05 level [$F_{(3,104)}$ = 2.382, p = .074].

<u>Discussion</u>. The average size of B.C. farms in 1991 was 307.5 acres (Statistics Canada, 1992a, 1992b) which is significantly less than the mean for the farms in this study (which is 466 acres after excluding the two extremely large corporate farms). A comparison of the distribution of farms in the 1991 Census with the total farm acres of those in this study shows that for the total group, the 3-9 acre category is under-represented and the 1600 and over acres category is over-represented in this sample. Comparisons with farm sizes of organic and conventional farm groups shows that the size distribution of organic farms very closely approximates that of the B.C. farm population. The primary differences can be traced to the conventional farm group which has relatively fewer small farms (less than 10 acres) and proportionately more very large (1600+ acres) farms (17% compared to 3.4% in B.C. as a whole) in the sample. Given that the majority of the very large farms in this study are grain farms located in the Peace River region, this indicates a possible over-representation of this sector of B.C. agriculture in the study sample. More aggregated acreage statistics show a reasonably close approximation of the B.C. distribution of farm sizes with 16.3% with less than 10 acres (B.C. = 26.7%), 58.2% with 10-239 acres (B.C. = 54.1%), 9.9% with 240-759 acres (B.C. = 11.2%), and 15.4% with 760+ acres (B.C. = 8.0%).

TABLE 4-21. FARM OPERATIONS: AVERAGE ACRES IN PRODUCTION

Number of Acres (Note 1)	TOTAL FARMERS No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
under 3 acres	15 (13.6%)	11 (22.0%)	2 (4.3%)	1 (16.7%)	1 (14.3%)
3-9 acres	25 (22.7%)	19 (38.0%)	4 (8.5%)	--	2 (28.6%)
10-69 acres	33 (30.0%)	10 (20.0%)	17 (36.2%)	4 (66.7%)	2 (28.6%)
70-129 acres	7 (6.4%)	3 (6.0%)	3 (6.4%)	1 (16.7%)	--
130-179 acres	5 (4.5%)	--	5 (10.6%)	--	1 (14.3%)
180-239 acres	4 (3.6%)	--	3 (6.4%)	--	--
240-399 acres	4 (3.6%)	2 (4.0%)	2 (4.3%)	--	--
400-559 acres	5 (4.5%)	1 (2.0%)	3 (6.4%)	--	1 (14.3%)
560-759 acres	4 (3.6%)	2 (4.0%)	2 (4.3%)	--	--
760-1119 acres	1 (0.9%)	1 (2.0%)	--	--	--
1120-1599 acres	3 (2.7%)	1 (2.0%)	2 (4.3%)	--	--
1600+ acres	4 (3.6%)	--	4 (8.5%)	--	--
Total No. of Farms	110 (100%)	50 (100%)	47 (100%)	6 (100%)	7 (100%)
Total Group Means	222.7569	100.8817	393.2945	46.4722	99.3571
Total Group Std.Dev.	568.1326	240.3155	804.9378	36.4857	152.0824
AMENDED GROUP (Note 2)					
Means	208.2246	89.6752	372.1705	46.4722	99.3571
Std.Dev.	560.9769	229.2261	800.5527	36.4857	152.0824
Median	29.50	5.75	70.33	37.00	40.00
Minimum	.63	.63	2.47	2.00	1.00
Maximum	3766.67	1150.00	3766.67	110.00	410.00
No. of Farms	108	49	46	6	7

Note 1. Average acres in production (under cultivation, developed pasture) calculated as average of acres in production during last 3 year period. Acreage categories same as Statistics Canada 1991 Census.

Note 2. Reanalysis excluding the 2 very large corporate ranches (1 organic ranch with 3500 acres in production; 1 conventional ranch with 3767 acres in production)

In regards to the size of organic farms versus conventional farms, MacRae et al. (1990) note that organic farms tend to be of smaller size. This has also been found by Altieri et al. (1983) in their survey of 33 organic farms in California which had an average size of 32 acres. In contrast, Lockeretz and Wernick's (1980) survey of organic farms in the U.S. corn belt had a median size of 213 acres which was not significantly less than that of conventional farms in the same region. Thus it appears that although the organic farms in this B.C. sample are significantly smaller than conventional farms, in general they are larger than those in these two U.S. surveys. A more appropriate indicator may be a comparison of the median size which shows that organic farms in B.C. are small enterprises (30.75 total farm acres) with bio-dynamic farms (median = 50.00 acres) being somewhat larger but still considerably smaller than conventional farms (median = 155.00 acres). However in comparison to all B.C. farms of which 63.3% are less than 70 acres, the organic farms appear to be fairly representative of the provincial farm size distribution.

Farm Products

An examination of the types of farm products in this sample indicate that the majority are diversified operations. Farm product categories were divided into nine types: livestock, poultry, grains, hay, field crops, tree fruits, berries and grapes, vegetables, specialty crops (including herbs, garlic, flowers, etc). The number of types of farm products per farm was calculated as the average of the last three years in production in order to minimize individual year variations.

Only 19.5% of the sample were highly specialized operations producing only one type of product. The majority produced either two (33.6% of the total sample) or three (26.4%) types of farm products. On average, the B.C. farmers in this study were producing 2.6 product categories (s.d. = 1.47). Organic (mean = 2.59 product categories, s.d. = 1.54) and conventional (mean = 2.35, s.d. =

TABLE 4-22. FARM OPERATIONS: TYPES OF FARM PRODUCTS

Types of Food Products	TOTAL FARMERS (n=110) No. (%)	ORGANIC FARMERS (n=50) No. (%)	CONVENTIONAL FARMERS (n=47) No. (%)	ORGANIC-CONV. FARMERS (n=6) No. (%)	BIODYNAMIC FARMERS (n=7) No. (%)
Livestock	26 (23.6%)	13 (26.0%)	10 (21.3%)	2 (33.3%)	1 (14.3%)
Poultry	7 (6.4%)	4 (8.0%)	2 (4.3%)	--	1 (14.3%)
Grains/Hay	37 (33.6%)	21 (42.0%)	14 (29.8%)	1 (16.7%)	1 (14.3%)
Tree Fruits	31 (28.2%)	17 (34.0%)	12 (25.5%)	1 (16.7%)	1 (14.3%)
Berries/Grapes	14 (12.7%)	5 (10.0%)	7 (14.9%)	2 (33.3%)	1 (14.3%)
Vegetables	40 (36.4%)	24 (48.0%)	12 (25.5%)	3 (50.0%)	1 (14.3%)
Specialty	26 (23.6%)	18 (36.0%)	5 (10.6%)	2 (33.3%)	1 (14.3%)
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Mixed (Note 1)	18 (16.4%)	7 (14.0%)	6 (12.8%)	1 (16.7%)	4 (57.1%)

Note 1. Mixed = 5 or more farm product categories in production

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TABLE 4-23. FARM OPERATIONS: AVERAGE NUMBER OF FARM PRODUCT CATEGORIES IN PRODUCTION

Ave. number of Food Product Categories (Note 1)	TOTAL FARMERS (n=110) No. (%)	ORGANIC FARMERS (n=50) No. (%)	CONVENTIONAL FARMERS (n=47) No. (%)	ORGANIC-CONV. FARMERS (n=6) No. (%)	BIODYNAMIC FARMERS (n=7) No. (%)
1	21 (19.5%)	11 (22.0%)	10 (21.3%)	--	--
2	37 (33.6%)	14 (28.0%)	20 (42.6%)	1 (16.7%)	2 (28.6%)
3	29 (26.4%)	16 (32.0%)	10 (21.3%)	2 (33.3%)	1 (14.3%)
4	5 (4.5%)	2 (4.0%)	1 (2.1%)	2 (33.3%)	--
5	11 (10.0%)	4 (8.0%)	6 (12.8%)	--	1 (14.3%)
6	5 (4.5%)	2 (4.0%)	--	1 (16.7%)	2 (28.6%)
7	1 (0.9%)	--	--	--	1 (14.3%)
8	1 (0.9%)	1 (2.0%)	--	--	--
Total No. Farms	110 (100%)	50 (100%)	47 (100%)	6 (100%)	7 (100%)
	==========	==========	==========	==========	=========
Means	2.6318	2.5933	2.3475	3.5278	4.0476
Std.Dev.	1.4711	1.5420	1.2276	1.1852	1.8402

Note 1. Average number of product categories calculated as average for number of years in production within the last 3 years. Product categories include; livestock, poultry, grains, hay, field crops, tree fruits, berries and grapes, vegetables, specialty crops/products (e.g., herbs, garlic, flowers, bedding plants, etc.).

1.22) farms were comparable, with organic-conventional farms producing an average of 3.53 different types of products (s.d. = 1.19). Bio-dynamic farms were the most diversified operations with an average of 4.1 different product categories (s.d. = 1.84). Comparison of means test confirmed that bio-dynamic farms are significantly more diversified than either organic or conventional farms at the p = .01 level [$F_{(3,106)}$ = 3.7660, p = .0129]. This is consistent with the emphasis in bio-dynamic certification requirements that each farm be a diversified self-sufficient operating unit.

Interestingly, the correlation analysis failed to reveal any significant relationships between the average number of farm product categories and the average number of acres in production for either the total group or production method subgroups. Given this diversity in farm production, what specific types and amounts of products were being produced?

<u>Livestock and poultry production</u>. Thirty percent (30%) of the farms studied had livestock and poultry as part of their operations. The livestock category included dairy cows, beef cattle, sheep, goats, pigs, horses, bison, and rabbits. In terms of livestock production (organic = 19 farms; conventional = 15; organic-conventional = 3; bio-dynamic = 6), organic farms had a significantly greater number of different types of livestock (mean = 1.95, s.d. = .91) than conventional farms (mean = 1.13, s.d. = .35) [$F_{(3,39)}$ = 4.1872, p = .0116]. Organic-conventional and bio-dynamic farms each had an average of 1.33 different types of livestock in their operations (s.d. = .58 and s.d. = .52, respectively).

As an indication of size of livestock operations, a comparison of the number of head in each type of farm having livestock was conducted. Organic farms had an average of 140.9 head of livestock (s.d. = 295.77), conventional farms had an average of 559.8 head (s.d. = 1420.65), organic-conventional farms had an average of 45.3 head (s.d. = 47.38), and bio-dynamic farms had an average of 48.8 head (s.d. = 97.81). Despite the apparent large differences in the number of head of livestock, a comparison of group means failed to yield significant differences, most probably due to the small sample size [$F_{(3,39)}$ =

.879, p = .450).

There were 22 farms (6.4% of the sample) which had poultry in their operations (11 organic farms; 6 conventional; 1 organic-conventional; 4 bio-dynamic). Poultry types were: chickens (layers, fryers, roasters); ducks; turkeys; and geese. On average, the farmers surveyed had 1.8 different types of poultry (s.d. = 1.152) on their farms. In terms of scale of production, the average number of birds for the total group was 10872.7 birds (s.d. = 42272.26). For organic farms the average was 171.0 birds (s.d. = 198.97), the conventional farm average was 39471.1 birds (s.d. = 78456.60), the one organic-conventional farm had 27.0 birds, and the bio-dynamic farm average was 116.5 birds (s.d. = 73.53). While analysis of variance tests failed to yield statistically significant differences for either the number of different types of poultry or the number of birds on the farms, the primary reason for this may be the small number of farms in the analysis. In contrast to the other groups which were free range bird operations, three of the six conventional farms had large poultry operations with marketing board quotas of 100,000 or more birds per year.

<u>Grain/hay production</u>. There were 49 farmers who grew grain and/or hay in this sample (23 organic; 19 conventional; 2 organic-conventional; 5 bio-dynamic). These fell into two types of producers with the most common throughout the province being those who produced grain and hay as part of their livestock operation. In the Peace River region, large scale grain farms were the norm. In terms of the number of different types of grain/hay produced, the average was 1.96 (s.d. = 1.15) with no significant group differences.

Comparisons based on the number of acres in grain/hay production showed that conventional farmers (mean = 750.22, s.d. = 1083.53) had a significantly greater number of acres in hay/grain production than organic farmers (mean = 147.98, s.d. = 272.77) [$F_{(3,48)}$ = 3.0625, p = .0369]. Bio-dynamic farmers had an average of 127.35 acres in grain/hay production (s.d. = 174.53) while only two organic-conventional farmers grew these crops (mean = 40.25, s.d. = 27.93).

Given the dominance of grain production in the Peace River region, a comparison between those organic and conventional grain growers was conducted. Interestingly, there was no significant different between the two groups in terms of their grain acreages [t-value = -1.74, d.f. = 10, p = .113].

Tree fruit production. Tree fruits is one of the major crops in B.C. agriculture, especially in the Okanagan Valley. As shown in Table 4-24, a large proportion of the farmers in this study were engaged in tree fruit production. On average, farms produced 3.51 different types of fruit with no significant difference between production method groups in terms of the diversity of tree fruits produced ($F_{(3,31)}$ = .068, p = .977).

TABLE 4-24. FARM OPERATIONS: TREE FRUIT PRODUCTION DURING PAST 3 YEARS

Tree Fruit Production	TOTAL FARMERS (n=35)	ORGANIC FARMERS (n=14)	CONVENTIONAL FARMERS (n=17)	ORGANIC CONVENTIONAL FARMERS (n=2)	BIODYNAMIC FARMERS (n=2)
No. of Types (Note 1)					
Means	3.5143	3.4048	3.6667	3.5000	3.0000
Std.Dev.	2.2219	2.5958	2.1016	.7071	2.8284
No. of Acres					
Means	16.8565	3.8510	26.6645	30.8333	20.2500
Std.Dev.	23.6549	2.7076	29.6326	1.6499	27.9307
Okanagan Region Only	(n=22)	(n=9)	(n=10)	(n=2)	(n=1)
No. of Acres					
Means	23.0254	4.7519	36.8333	30.8333	40.0000
Std.Dev.	28.7694	2.8482	36.7564	1.6499	0.0000

Note 1. Tree Fruits categories include: Apples, Apricots, Cherries, Peaches, Pears, Plums and Prunes, Nectarines, Nuts, Kiwi.

A comparison of the number of acres in tree fruit production showed some significant differences between production method groups. Organic-conventional farmers had the largest tree fruit acreages with an average of 30.8 acres. They were followed closely by conventional farms with 26.7 acres and then bio-dynamic farms with an average of 20.3 acres. On average, organic farms had only 1.3 acres in tree fruits. Not surprisingly, statistical test results confirmed that conventional farms had significantly more acres in tree fruit production than did organic farms [$F_{(3,31)}$ = 3.6755, p = .0208, group difference significant at p = .01 level]. The acreage in tree fruits on conventional farms in this study also seem to be larger than the B.C. average of 9.2 acres (Statistics Canada, 1992d).

Included in these comparisons however are a large number of farms where tree fruit production is a very small component of farm operations. Given the dominance of the commercial tree fruit industry in the Okanagan Valley, a comparison of the 22 farms in tree fruit production in this region was conducted (9 organic farms; 10 conventional; 2 organic-conventional; 1 bio-dynamic). As expected, the average number of acres in tree fruit production rose significantly to 23.0 acres for the total group, 4.8 acres for organic farms, 36.2 acres for conventional farms, 30.8 acres for organic-conventional farms and 40.0 acres for the bio-dynamic farm. While the average number of types of tree fruits did not vary between groups, the number of acres in tree fruits did with conventional farm tree fruit acres being significantly greater than organic farm tree fruit acres [$F_{(3,18)}$ = 2.5293, p = .0897, group difference significant at p=.05 level].

<u>Berries and grape production</u>. Twenty-six (26) farms in the sample produced berries and/or grapes (7 organic farms; 12 conventional; 3 organic-conventional; 4 bio-dynamic). On average, these farmers grew 2.3 different types of berries (s.d. = 2.38) on an average of 14.5 acres (s.d. = 40.01). [The B.C. average acres for the 1650 farms which produced these products is 10.96 acres (Statistics Canada, 1992d).] The primary types of berries grown on these farms were blueberries, raspberries, strawberries, and currants (red and black).

While there were no significant differences in terms of either the number of types of berries/grapes or acreage in these crops, it appears that at 4.3 types of berries/grapes, the bio-dynamic farmers grow the greatest variety. Most probably due to the small sample size, statistical tests did not confirm the apparent difference in acreage between conventional berry/grape growers (mean = 28.72 acres, s.d. = 58.09) and other production method groups (organic farm mean = 3.09 acres, s.d. = 3.49; organic-conventional farm mean = 5.88 acres, s.d. = 3.38; bio-dynamic farm mean = .69 acres, s.d. = .24).

Vegetable production. Vegetable producers were well-represented in the study with 59 farms growing vegetables in commercial production (26 organic farms; 24 conventional; 4 organic-conventional; 5 bio-dynamic). The diversity in vegetable production is shown by the high average of 9.04 different types of vegetables produced on these farms.[See Table 4-25] The group growing the greatest variety of vegetables was the organic farmers who had one farmer growing 64 different types of vegetables, a far greater number than the maximum for conventional farmers at 20, the bio-dynamic farmers at 24 or the organic-conventionals at 7. While there was no significant difference between groups in the average number of different vegetables grown ($F_{(3,55)} = .326$, $p = .806$), there was a large difference in vegetable acreage. With an average of 71.4 acres in vegetable production, the conventional vegetable farmers proved to have a significantly higher average than organic farmers at 6.4 acres [$F_{(3,55)} = 3.950$, $p = .013$, group difference significant at $p = .01$ level]. This was also higher than the B.C. average acres of 13.4 acres for the 1532 farms which produced these products (Statistics Canada, 1992d).

TABLE 4-25. FARM OPERATIONS: VEGETABLE PRODUCTION DURING PAST 3 YEARS

	TOTAL FARMERS (n=59)	ORGANIC FARMERS (n=26)	CONVENTIONAL FARMERS (n=24)	ORGANIC-CONV. FARMERS (n=4)	BIODYNAMIC FARMERS (n=5)
Vegetable Production					
No. of Types (Note 1)					
Means	9.0424	9.5278	8.9493	3.9444	10.2000
Std.Dev.	9.4351	12.4871	6.0213	2.2381	8.1398
No. of Acres					
Means	33.1251	6.3654	71.4188	16.7917	1.5333
Std.Dev.	76.3078	13.1059	108.8812	17.2452	1.0176

Note 1. Vegetable categories include: Asparagus, Beans, Beets, Broccoli, Brussel Sprouts, Cabbage, Cantaloupes, Melons, Carrots, Cauliflower, Celery, Cucumbers, Lettuce, Onions (dry), Onions (green), Parsnips, Peas, Peppers, Pumpkin, Radishes, Rhubarb, Squash, Sweet Corn, Tomatoes, Zucchini, Other .

Miscellaneous specialty crop production. In B.C. agriculture, 23.2% of all farms are in specialty crop production, second only to livestock production in the province. This category is very diverse and includes garlic and herbs, flowers (cut and edible), bedding plants, bees (honey), nursery trees, Christmas trees, etc. A large number of the farmers in this study were involved in specialty crops however they were primarily the organic farmers (22 organic, 8 conventional, 3 organic-conventional, 3 bio-dynamic). Given the different area requirements required for each type of product, comparisons based on acres are not appropriate. It should be noted that many of the these organic farmers were involved in the production of herbs and garlic while conventional growers were more likely to be producing bedding plants, nursery trees, Christmas trees and cut flowers for sale. Organic farmers were also more likely to be involved solely in production for specialty markets whereas the other groups grew specialty crops as an adjunct to other farm products.

Discussion. As this analysis of farm products shows, in some respects, the study sample varies somewhat from that of the total B.C. farm population. In particular, grain growers are relatively over-represented and livestock (in particular beef cattle) are relatively under-represented. These discrepancies can be traced to the subject selection criteria in which the primary consideration was to obtain a good (typical) representation of organic and bio-dynamic farmers and then to obtain a matched sample (in terms of product type and geographic location) of conventional growers. This is essential in order that comparisons in scale and diversity of production, production methods (fertilization, pest control), production problems, production output, marketing and economies of production could be made. While not statistically significant (due to small sample sizes), it appears that livestock and poultry production on conventional farms is on a larger scale than on other types of farms in the study.

Both organic and bio-dynamic farming principles stress the need for diversified farms (Steiner, 1974; Lampkin, 1990; and others), but only the bio-dynamic farmers have significantly more diversified farm production. It is also noteworthy that there is no relationship between size (as measured by farm acres in total and in production) and the diversity of farm products. This would challenge the frequent assertion that conventional farms are more specialized operations than organic farms.

As evident in Table 4-26, the trend towards more diversified farm operations is common in all production method groups. While 29% of the farmers surveyed have diversified their operations since first starting on their current farm, only 19% have become less diversified and 23% have stayed the same. Organic farmers appear to have more stability in their farm operations (i.e., reported the "same") than conventional farmers ($F_{(3,106)} = 2.6932$, $p = .0498$).

TABLE 4-26. FARM OPERATIONS: INITIAL FARM PRODUCTION COMPARED TO CURRENT FARM PRODUCTION

Initial Farm Production	TOTAL FARMERS (n=110) No. (%)	ORGANIC FARMERS (n=50) No. (%)	CONVENTIONAL FARMERS (n=47) No. (%)	ORGANIC-CONV. FARMERS (n=6) No. (%)	BIODYNAMIC FARMERS (n=7) No. (%)
1. Same	25 (22.7%)	17 (34.0%)	5 (10.6%)	1 (16.7%)	2 (28.6%)
2. Less Diversified	21 (19.1%)	11 (22.0%)	8 (17.0%)	1 (16.7%)	1 (14.3%)
3. More Diversified	32 (29.1%)	12 (24.0%)	15 (31.9%)	2 (33.3%)	3 (42.9%)
4. Smaller Scale of Production	9 (8.2%)	3 (6.0%)	5 (10.6%)	1 (16.7%)	--
5. Larger Scale of Production	13 (11.8%)	4 (8.0%)	7 (14.9%)	1 (16.7%)	1 (14.3%)
6. Different Production Method	6 (0.9%)	1 (2.0%)	--	5 (83.3%)	--
7. Different Varieties (Note 1)	9 (8.2%)	2 (4.0%)	7 (14.9%)	--	--

Note 1. Different varieties -- majority have recently introduced new tree fruit varieties and/or dwarf root stocks.

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Like organic farmers, conventional farmers have diversified in order to offset the frequent variations in production output, market prices and demand (increases and decreases) of individual products. [The complaint of low market prices was a particularly forceful one for conventional vegetable and tree fruit growers who face the threat of cheaper imports from the U.S. and elsewhere.] For the relatively newer farmer, the search for a market niche has been an important force for change. While on the whole there are very few differences in terms of diversity of operations, group comparisons show many significant differences in terms of scale of operation in tree fruit and vegetable operation with conventional operations being larger than organic operations. Notably, organic versus conventional comparisons of grain/hay producers yielded no differences.

For the majority (87%), the scale of production has stayed the same over the years. Only 13 farmers (seven of whom are conventional) have expanded their scale of production while nine have reduced the scale of production, many of whom are doing so because they are at or approaching retirement age and wish to retire from farming.

TABLE 4-27. FARM OPERATIONS: REASONS FOR CHANGES IN INITIAL FARM PRODUCTION

Reasons for Changes	TOTAL FARMERS (n=110) No. (%)	ORGANIC FARMERS (n=50) No. (%)	CONVENTIONAL FARMERS (n=47) No. (%)	ORGANIC-CONVENTIONAL FARMERS (n=6) No. (%)	BIODYNAMIC FARMERS (n=7) No. (%)
1. Change in Market Demand					
- Decrease	16 (14.5%)	6 (12.0%)	9 (19.1%)	1 (16.7%)	--
- Increase	27 (24.5%)	12 (24.0%)	13 (27.6%)	--	2 (28.6%)
2. Low Market Prices	26 (23.6%)	9 (18.0%)	15 (31.9%)	2 (33.3%)	--
3. Change in Marketing/ Distribution					
- Problems	1 (0.9%)	1 (2.0%)	--	--	--
- New outlet available	3 (2.7%)	2 (4.0%)	1 (2.1%)	--	--
4. Search for Market Niche	12 (10.9%)	6 (12.0%)	4 (8.5%)	--	2 (28.6%)
5. Diversification to Balance Returns	9 (8.2%)	3 (6.0%)	5 (10.6%)	1 (16.7%)	--
6. Production Problems Related to:					
- Land	2 (1.8%)	1 (2.0%)	1 (2.1%)	--	--
- Pests/weeds	9 (8.2%)	3 (6.0%)	5 (10.6%)	1 (16.7%)	--
- Labour	17 (15.4%)	6 (12.0%)	7 (14.9%)	4 (66.7%)	--
7. Experimenting to See What Will Grow on Land	7 (6.4%)	1 (2.0%)	3 (6.4%)	--	3 (42.9%)
8. Change in Occupation					
- Retiring from farming	8 (7.3%)	3 (6.0%)	4 (8.5%)	--	1 (14.3%)
- Now farming full-time	3 (2.7%)	1 (2.0%)	2 (4.3%)	--	--

While the primary changes in farm production relate to market demand and prices, other important factors are problems encountered in production. Perhaps the most common complaint of farmers concerns the difficulty in hiring skilled and motivated labour to assist in farm operations. Problems with weeds and pests proved to be less important factors in changing the type of food produced for either organic or conventional farmers.

Farm Production

As discussed in Chapter 2, one of the controversies surrounding organic farming concerns volume of food production. Specifically, critics of organic farming often assert that production yields using organic agricultural methods are significantly less than those obtained in conventional agriculture. One way to measure the relative productivity of both production methods is to calculate product volume yields per acre.

In this study, farmers were asked to provide production volume data for the past three years for their major farm products. To minimize the effect of variations in annual weather conditions, an average of the production volume by acre was calculated for the three year period. Given the influence of soil conditions and climate on production yields, these variables also need to be controlled for in any such comparison. Therefore, production volume comparisons were conducted only within a bioregion rather than provincially. These methodological constraints severely limited the number of statistical comparisons which could be conducted. For example, production volume data from market garden operations (especially organic farms) were not suitable to this type of analysis in that a variety of different vegetables were often grown on the same area of land in one growing season (eg., lettuce in the spring then cole crops during the summer and autumn). Another problem encountered was the lack of detailed volume data records available for those operations selling products primarily through direct sales to consumers. The net result of these limitations on production data was that there were only four farm products (apples, wheat, barley, hay) for which there was an adequate number of subjects within a bioregion to conduct a statistical analysis.

Apple production. Within the Okanagan Valley region, there were 6 organic and 8 conventional orchards for which adequate apple production data was available. A t-test comparison of tons of apples produced per acre revealed that production volumes were slightly higher for conventional orchards (mean = 10.22, s.d. = 3.83) than for organic orchards (mean = 6.93 tons/acre; s.d. = 2.63) [$t = -1.80$, $df = 12$, $p = .097$]. The difference in production volume can be partly attributed to the fact that four of the conventional orchards had been converted to dwarf or semi-dwarf root stocks while none of the organic orchards had been converted to higher density plantings (one reason being that high density plantings often require the use of soluble chemical fertilizers and herbicides).

Another factor to be considered is that the majority of conventional farms which had converted to the newer root stocks were also producing the newer apple varieties (Gala, Jonagold, etc.) while many of the organic orchards were producing the more traditional apples (Red Delicious, MacIntosh, etc.). These two factors limit the degree of confidence one can have in any definitive conclusion that conventional orchard practices are superior to organic orchard practices in terms of volume of production.

Grain production. Within the Peace River region, there were 3 organic and 5 conventional farms which produced wheat. A t-test comparison of bushels of wheat produced per acre revealed that production volumes were higher on conventional farms (mean = 44.90 bushels/acre, s.d. = 5.78) than on organic farms (mean = 34.67 bushels/acre; s.d. = 4.84) [t = -2.56, df = 6, p = .043]. Also within the Peace River region, there were three organic and four conventional farms which produced barley. A t-test comparison of bushels of barley per acre revealed that production volumes were not statistically different for the two types of farms [organic: mean = 67.87 bushels/acre, s.d. = 29.33; conventional: mean = 60.38 bushels/acre; s.d. = 6.60; t = .51, df = 5, p = .632].

While the number of subjects in each comparison is very small, this analysis suggests that compared to organic methods, conventional grain production methods result in higher yields of wheat per acre while there is no significant difference in barley production yields.

Hay production. The larger number of hay producers in the study (28 in total; 13 organic; 3 bio-dynamic; 12 conventional) permitted an ANOVA test of production volume controlling for regional location. A preliminary examination of the means of tons of hay produced per acre suggested that yields were higher on conventional farms (mean = 2.91, s.d. = 1.87) than on organic (mean = 2.44, s.d. = 1.91) or bio-dynamic (mean = 1.14, s.d.= 1.41) farms. However, the ANOVA analysis revealed that the primary source of this difference was due to regional location ($F_{(6,13)}$ = 3.553, p = .026) rather than type of production method ($F_{(2,13)}$ = .823, p = .461)[interaction: location X production method, $F_{(6,13)}$ = 2.449, p = .083].

In summary, for the sample of farmers in this study, conventional production methods produced greater volumes of apples and wheat whilst there is no difference in regards to barley and hay production yields. However, the small number of subjects for which comparisons of production volume could be conducted restricts any definitive conclusions regarding the relative superiority of one production method over the other in terms of production yields. Other limitations to this analysis include a lack of detailed data regarding the amount of product lost to pests and weeds, controls for differences in fertilization and crop production practices, local soil fertility, etc.

Farm Production Operating Expenses

During the interviews, information regarding farm production operating expenses was obtained by asking farmers the percentage (for example, out of a pie of 100%) could be allocated to: labour; repairs and maintenance; crop expenses (agrichemicals, fertilizers, pest controls, crop supplies such as seeds); livestock (feed, yardage, veterinary); fuel and gas; rent of farmland and/or range; irrigation; packaging/containers; sales/marketing; and other expenses. The rationale for asking farmers to "divide up the pie" was to provide some measure of control for different scales of operation although obviously there may be economies and diseconomies of scale.

The data was based solely on their self-reports although a few farmers based their estimates on detailed farm records or their most recent federal income tax returns. However some of the farmers interviewed did not keep detailed expense records for a number of reasons, the most common one being a lack of interest in recordkeeping. Thus these data concerning production operating expenses may not be as accurate or reliable as desired but they do provide a general indication of the relative requirement of various costs of production.

Analysis of these data was conducted first for all types of farmers combined (see Table 4-28) and then by individual product groups (see Table 4-29). One caveat regarding the interpretation of the summary data is that a wide variety of farms (in terms of type and scale of production) are combined. As evident in Table 4-29 which presents data by product groups, there are significant differences in expense data between production method groups.

An initial examination of the summary data shows that the major expenses incurred by the farmers interviewed were labour (mean of 24%), crop input expenses (11%) and repairs and maintenance on equipment and buildings (11.35%). Production method group comparisons (all significant at the $p = .05$ level) indicate that organic farmers spend a greater proportion on repairs and maintenance in their operations even after controlling for acres in production [$F_{(3,105)} = 2.1541$, $p = .0978$]. Conventional farmers spend a greater proportion on crop input expenses than all other groups [$F_{(3,105)} = 8.261$, $p = .0001$], and in particular, more on agrichemicals than organic farmers [$F_{(3,105)} = 4.463$, $p = .005$] and more on pest controls than both organic and bio-dynamic farmers [$F_{(3,105)} = 3.362$, $p = .022$]. The organic-conventional farmers in the study spend proportionately more on livestock expenses than either organic or conventional farmers [$F_{(3,105)} = 1.9137$, $p = .1318$]. And finally, reflecting some of their more remote locations, it appears that the bio-dynamic farmers spend relatively more on fuel and gas than all other groups [$F_{(3,105)} = 4.965$, $p = .003$].

There are significant differences in the mean percentages of expenses spent on various items depending on the major type of farm product produced. Production method group comparisons for specialized operations revealed few statistically significant differences after controlling for acres in production. Two differences were found for livestock operations (14 in total, 7 organic, 6 conventional, 1 bio-dynamic) where bio-dynamic and organic livestock specialists

TABLE 4-28. FARM OPERATIONS: INDIVIDUAL PRODUCTION OPERATING EXPENSES (AS PERCENTAGES OF TOTAL OPERATING EXPENSES)

	TOTAL FARMERS (n=110)	ORGANIC FARMERS (n=50)	CONVENTIONAL FARMERS (n=47)	ORGANIC-CONV. FARMERS (n=6)	BIODYNAMIC FARMERS (n=7)
	Mean % (% Total)	Mean % (% Total)	Mean % (% Total)	Mean % (% Total)	Mean % (% Total)
Labour	24.00% (21.8%)	22.36% (22.5%)	25.06% (21.2%)	34.67% (20.6%)	19.57% (22.7%)
Repairs & Maintenance	11.35% (13.9%)	13.92% (17.6%)	7.98% (7.6%)	18.67% (16.5%)	9.43% (10.7%)
Crop Expenses -- Total	14.07% (16.0%)	9.06% (13.2%)	21.91% (17.0%)	7.67% (9.3%)	2.71% (3.7%)
- Chemicals	3.20% (9.2%)	0.40% (2.8%)	6.51% (13.0%)	4.33% (5.9%)	0.00% (0.0%)
- Fertilizers	4.80% (8.1%)	4.28% (7.4%)	6.59% (9.3%)	0.17% (0.4%)	0.43% (1.1%)
- Pest Controls	3.48% (6.6%)	2.44% (4.9%)	5.55% (8.2%)	0.00% (0.0%)	0.00% (0.0%)
- Crop Supplies	2.60% (6.2%)	1.94% (6.0%)	3.26% (6.9%)	3.17% (5.2%)	2.29% (3.9%)
Livestock -- Total	5.55% (14.8%)	4.76% (12.0%)	5.32% (14.0%)	18.50% (35.9%)	1.57% (3.7%)
- Feed, Yardage	5.40% (14.5%)	4.76% (11.9%)	4.98% (13.3%)	18.50% (35.9%)	1.43% (3.8%)
- Veterinarian/ Medicine	0.15% (1.0%)	0.00% (0.0%)	0.34% (1.5%)	0.00% (0.0%)	0.14% (0.4%)
Fuel/Gas	7.66% (10.9%)	7.78% (10.3%)	6.11% (8.6%)	3.00% (3.5%)	21.29% (20.7%)
Rent (Farmland/Range)	0.72% (4.1%)	0.70% (5.0%)	0.94% (3.6%)	0.00% (0.0%)	0.00% (0.0%)
Irrigation	0.36% (1.7%)	0.40% (2.0%)	0.40% (1.6%)	0.17% (0.4%)	0.00% (0.0%)
Packaging/Containers	1.47% (6.1%)	0.80% (3.1%)	2.58% (8.8%)	0.00% (0.0%)	0.00% (0.0%)
Sales/Marketing	0.55% (2.6%)	0.78% (3.5%)	0.46% (1.7%)	0.00% (0.0%)	0.00% (0.0%)
Other expenses	19.13% (18.7%)	16.94% (20.4%)	20.55% (17.3%)	17.17% (19.2%)	26.86% (15.7%)

TABLE 4-29. FARM OPERATIONS: COMMODITY GROUPS -- INDIVIDUAL PRODUCTION OPERATING EXPENSES (AS PERCENTAGES OF TOTAL OPERATING EXPENSES)

	LIVESTOCK SPECIALISTS (n=14)	GRAINS SPECIALISTS (n=7)	FRUIT SPECIALISTS (n=21)	VEGETABLE SPECIALISTS (n=18)	FRUIT & VEGETABLES (n=18)	MIXED OPERATIONS (n=18)
	Mean % (% Total)	Mean % (% Total)	Mean % (% Total)	Mean % (% Total)	Mean % (% Total)	Mean % (% Total)
Labour	13.14% (14.09)*	4.29% (6.07)	36.95% (22.89)	26.94% (24.73)*	33.17% (20.17)	15.50% (19.22)
Repairs & Maintenance	15.07% (12.33)	20.86% (15.71)	9.19% (9.90)	8.06% (14.48)	7.89% (8.01)	11.83% (13.55)
Crop Expenses -- Total	5.21% (8.33)*	28.86% (23.74)	16.76% (13.69)	14.83% (19.14)	19.04% (14.43)	6.39% (6.42)*
- Chemicals	--	11.43% (20.35)	4.38% (8.03)	0.83% (3.54)	7.5% (14.46)	0.56% (2.36)
- Fertilizers	3.14% (4.64)*	7.86% (13.50)	4.48% (8.02)	6.56% (10.07)	2.89% (3.92)	3.53% (5.06)
- Pest Controls	1.57% (4.36)	5.71% (10.18)	6.33% (8.75)	2.33% (4.87)	5.22% (7.74)	1.00% (1.97)*
- Crop Supplies	0.50% (1.87)	0.86% (2.27)	1.57% (4.59)	5.11% (10.71)	2.79% (4.90)	1.94% (4.05)
Livestock -- Total	23.21% (22.98)	--	--	--	--	4.50% (7.81)
- Feed, Yardage	22.21% (22.11)	--	--	--	--	4.44% (7.84)
- Veterinarian/ Medicine	1.00% (2.57)	--	--	--	--	0.06% (.24)
Fuel/Gas	7.71% (7.21)	13.29% (16.65)*	6.05% (8.94)	7.67% (9.54)	5.89% (10.62)	10.39% (15.75)*
Rent (Farmland/Range)	1.14% (4.28)	--	--	1.94% (8.25)	0.39% (1.65)	--
Irrigation	0.71% (2.67)	--	0.76% (2.32)	0.56% (2.36)	0.15% (.45)	--
Packaging/Containers	--	--	3.05% (11.02)	2.44% (5.93)	2.68% (7.09)	--
Sales/Marketing	--	--	1.81% (5.21)	--	0.14% (.59)	0.83% (2.57)
Other expenses	24.21% (22.67)	21.43% (19.09)	17.52% (14.06)	12.39% (15.15)	24.83% (21.39)	24.22% (21.56)

* Denotes statistically significant differences between production method groups at p = .05 level.

spent proportionately more than conventional livestock specialists on labour [$F_{(2,11)}$ = 5.285, p = .025] but significantly less on fertilizer [$F_{(2,11)}$ = 7.501, p = .009].

In operations specializing in grain production (7 in total, 2 organic, 5 conventional), organic farmers spend a significantly higher percentage on fuel/gas than conventional farmers. There were no significant differences in percentages allocated to different expense items for either fruit or vegetable specialists or for fruit and vegetable combined operations after controlling for acres in production. The only significant different in mixed operations (defined as producing 4 or more product categories) concerned fuel/gas expenses where bio-dynamic farmers spent proportionately more than either organic or conventional farmers [$F_{(3,13)}$ = 5.676, p = .010].

Discussion. In previous U.S. and European studies which compared the operating expenses of organic or bio-dynamic versus conventional farms, it has generally been found that organic/bio-dynamic farms have higher labour input requirements and costs (Lampkin, 1990; Lockeretz et al., 1976; MacRae et al., 1990; Oelhaf, 1978) but lower fertilizer and pesticide/pest control costs (Lockeretz, Klepper et al., 1976; Oelhaf, 1978). Based on total group comparisons, we find some support for these findings. In general, conventional farmers in this B.C. sample spend proportionately more on crop inputs (fertilizers, pest controls) but not on labour. This difference in crop input expenses appears to be only relevant to farm operations specializing in livestock production. On these farms, organic and bio-dynamic farmers spend proportionately more on labour costs than conventional farmers, unlike the livestock farmers studied in the U.S. Corn Belt by Lockeretz and Wernick (1980) for whom labour costs were generally equivalent. Fuel and gas proved to be the only consistently different operating expense for grain specialists and mixed product operations. In grain operations, organic farmers spend proportionately more on this item while in mixed operations, the bio-dynamic farmers spent more than the other groups.

One possible explanation for this lack of differences in operating expense proportions could be the fact that the majority of organic farms in this study have been under an organic regimen for a relatively long period of time. As noted by several observers (Lampkin, 1990; MacRae et al., 1990; Oelhaf, 1978; and others), the labour requirements on organic farms are especially high during the early years following conversion and tend to decline over time. Thus the large representation of "mature" organic farms in this sample would support the assertion that organic farms are not relatively more labour intensive than conventional farms. Support for this argument is also found in that the organic-conventional farmers in this study who had relatively less organic farming experience and therefore were more likely to be in the transitional stage, were more likely to cite labour as a problem in production.

Another moderating variable is that organic farms are, on average, smaller than their conventional counterparts therefore proportionately more labour can be done by members of the farm family thereby avoiding the necessity of hiring expensive agricultural labour. This explanation is addressed in the next section of this chapter which focuses on the labour (both family and hired) needed to perform farm operations.

Agricultural Labour

To determine the amount of labour needed for farm production, farmers were asked to estimate the hours and weeks which they and their families worked on the farm during the year (and if different, by season). They were also asked how many nonfamily workers were employed during the year and the number of weeks they were employed and for what purpose.

On average, there were 14 persons working in farm production on each farm for a total of 231 weeks per year.[See Table 4-30] Comparisons of production method groups show that there are more people (family and hired) involved in farm production on conventional farms (mean = 23.67 persons) and organic-conventional farms (mean = 20.83 persons) than on either bio-dynamic (mean = 6.00 persons) or organic (mean = 5.77 persons) farms ($F_{(3,106)}$ = 3.5242, p = .0175, group difference

TABLE 4-30. FARM OPERATIONS: AGRICULTURAL LABOUR

	TOTAL FARMERS (n=110)		ORGANIC FARMERS (n=50)		CONVENTIONAL FARMERS (n=47)		ORGANIC-CONV. FARMERS (n=6)		BIODYNAMIC FARMERS (n=7)	
	Means	(s.d.)	Means	(s.d.)	Means	(s.d.)	Means	(s.d.)	Means	(s.d.)
TOTAL LABOUR										
No. of Persons	14.25	(29.31)	5.77	(5.17)	23.66	(42.24)	20.83	(17.41)	6.00	(6.40)
Weeks per Year	231.21	(387.72)	100.16	(57.69)	393.22	(559.23)	211.50	(63.59)	142.71	(85.99)
Hours per Year	9955.65	(16009.36)	4180.70	(2593.72)	16965.89	(22841.42)	9171.33	(3132.27)	6811.71	(4785.11)
FAMILY/PARTNER LABOUR										
No. of Persons	2.15	(1.19)	2.10	(0.99)	2.09	(1.30)	3.00	(1.90)	2.29	(0.95)
Weeks per Year	82.26	(53.12)	76.84	(43.66)	83.40	(63.14)	95.50	(39.84)	102.00	(54.01)
Hours per Year	3984.82	(2977.65)	3247.90	(1888.74)	4520.53	(3741.11)	4531.33	(1866.91)	5183.14	(3603.65)
HIRED LABOUR										
No. of Persons	12.10	(29.50)	3.67	(5.17)	21.57	(42.51)	17.83	(18.71)	3.71	(5.62)
Weeks per Year	146.07	(384.46)	23.79	(39.08)	293.09	(552.17)	116.00	(73.18)	40.71	(33.72)
Hours per Year	5789.82	(15317.86)	932.80	(1553.17)	11723.40	(22086.81)	4640.00	(2927.28)	1628.57	(1348.72)
HIRED LABOUR (excluding 2 very large corporate farms)										
No. of Persons	11.73	(29.40)	3.66	(5.23)	20.74	(42.59)	17.83	(18.71)	3.71	(5.62)
Weeks per Year	136.98	(375.17)	23.14	(39.21)	275.63	(545.00)	116.00	(73.18)	40.71	(33.72)
Hours per Year	5479.26	(15006.81)	925.71	(1568.44)	11025.22	(21800.17)	4640.00	(2927.28)	1628.57	(1348.72)

significant at p = .01 level). Correlation analysis between the number of total persons engaged in farm work and the number of acres in production showed no significant relationships once the two very large corporate farms were excluded from the analysis. This lack of correlation was found for the total group and within each production method group. However there were significant positive relationships between farm size (acres in production) and the total number of weeks ($r = .2017$, $p = .018$) and hours ($r = .1938$, $p = .022$) of farm labour. Given these correlations, subsequent analyses concerning agricultural labour are conducted with acres in production included as a covariate.

After controlling for acres in production, conventional farms proved to have significantly more persons [$F_{(3,103)} = 3.713$, $p = .014$] working more weeks [$F_{(3,103)} = 4.504$, $p = .005$] for more hours [$F_{(3,103)} = 5.128$, $p = .022$] per year than organic farms (all significant at the p = .01 level). The question now is how much of this difference can be attributed to differences in family labour as opposed to differences in hired agricultural labour.

Family/partner labour. When the farmer respondent is included in the calculation, there were an average of 2.15 family members involved in farm production (note that this includes biological members of the family and non-related partners living on the same farm).[See Table 4-31] There are several differences in the type of family members working on the farms. Half of the spouses (51 of the 100 farms on which they were present) of farmers interviewed were actively involved in farm operations. Reflective of the greater incidence of nontraditional living arrangements on organic and bio-dynamic farms, there were more partners involved in farm operations on these farms. In contrast, the existence of extended family operations (i,e., including parents and siblings) was more evident on conventional farms than elsewhere. Children played a more prominent role in farm operations on organic-conventional and conventional farms.

Correlation analysis between hours of family labour and acres in production showed a positive relationship for farmers ($r = .1922$, $p = .023$) and their parents ($r = .1397$, $p = .075$). In contrast, there were negative relationships between acres in production and the time commitment (in hours) of farmers' spouses ($r = -.1857$, $p = .027$), farm partners ($r = -.0271$, $p = .390$) and children ($r = -.2050$, $p = .174$ on farms with children working).

Thus it would appear that the larger the farm operation, the greater the time requirements for farmers and their parents and siblings. Interestingly, farm spouses, partners and children were less involved on larger farms as compared to smaller farms. Farmers' spouses on bio-dynamic and organic-conventional farms worked significantly more hours per year in farm production than did those on organic or conventional farms, even after controlling for acres in production [$F_{(3,105)} = 3.9721$, $p = .0100$]. In contrast, the difference in weeks per year worked by farmers was not due to production method type [$F_{(3,105)} = .569$, $p = .637$] but solely due to acres in production [$F_{(1,105)} = 7.012$, $p = .009$].

TABLE 4-31. FARM OPERATIONS: FAMILY/PARTNER LABOUR

	TOTAL FARMERS (n=110)		ORGANIC FARMERS (n=50)		CONVENTIONAL FARMERS (n=47)		ORGANIC-CONV. FARMERS (n=6)		BIODYNAMIC FARMERS (n=7)	
	Means	(s.d.)	Means	(s.d.)	Means	(s.d.)	Means	(s.d.)	Means	(s.d.)
FARMER RESPONDENT										
Weeks per Year	43.57	(15.21)	42.16	(14.16)	42.62	(17.36)	51.33	(1.03)	46.29	(13.39)
Hours per Year	2362.00	(1210.94)	2180.58	(1105.47)	2518.11	(1290.61)	2605.33	(891.00)	2401.14	(1643.39)
No. of Farms	104		49		42		6		7	
SPOUSE										
Weeks per Year	17.17	(21.82)	17.10	(22.44)	13.89	(19.65)	30.00	(25.23)	30.29	(24.32)
Hours per Year	758.07	(1121.86)	569.32	(963.67)	696.89	(1050.14)	1557.33	(1360.54)	1832.00	(1723.94)
No. of Farms	51		22		20		4		5	
PARTNER										
Weeks per Year	5.64	(22.50)	9.36	(29.13)	1.11	(7.59)	0.00	(0.00)	14.29	(37.80)
Hours per Year	131.73	(620.61)	234.80	(827.73)	0.00	(0.00)	0.00	(0.00)	392.86	(1039.40)
No. of Farms	12		9		1		0		2	
PARENTS										
Weeks per Year	3.22	(15.85)	2.08	(14.71)	5.32	(18.86)	0.00	(0.00)	0.00	(0.00)
Hours per Year	128.36	(733.28)	112.32	(794.22)	180.94	(770.99)	0.00	(0.00)	0.00	(0.00)
No. of Farms	9		2		7		0		0	
SIBLINGS										
Weeks per Year	4.00	(16.22)	0.76	(4.02)	8.55	(23.85)	0.00	(0.00)	0.00	(0.00)
Hours per Year	248.98	(1012.17)	38.96	(192.82)	541.28	(1495.07)	0.00	(0.00)	0.00	(0.00)
No. of Farms	13		2		11		0		0	
CHILDREN										
Total Group										
Weeks per Year	8.56	(24.77)	4.38	(12.64)	11.91	(32.86)	14.17	(22.47)	11.14	(29.48)
Hours per Year	355.67	(1260.63)	111.92	(388.89)	483.32	(1778.43)	368.67	(564.56)	557.14	(1474.06)
No. of Farms	44		15		20		6		2	
No. of Children	0.38	(0.88)	0.30	(0.71)	0.38	(0.92)	1.17	(1.60)	0.29	(0.76)
For Farms With Children										
Weeks per Year	17.72	(15.73)	13.00	(8.00)	21.65	(20.22)	11.67	(12.90)	39.00	(0.00)
Hours per Year	733.39	(979.37)	311.11	(237.81)	1129.00	(1301.56)	276.00	(250.22)	1950.00	(0.00)

Hired agricultural labour. Eighty per cent (80%) of the farms surveyed hired labour to assist in farm production. Conventional farms had the greatest incidence of hired labour (85% of farms), followed by organics (74%) and bio-dynamic (71%) farms. The organic-conventional operations are unique in that all employed agricultural labour. Table 4-32 details the type of agricultural labour based on their employment status: full-time or part-time; regular (year round) or seasonal. Analyses were conducted for the total group as well as an amended group excluding the two extremely large corporate farms. (The impact of which can be seen from the differences in the number of regular and seasonal employees for each set of analyses. The very large conventional farm employed 14 FTR and 80 FTS employees.)

For the total group, conventional farmers employed the greatest number of agricultural labourers (mean = 21.47 employees) followed closely by organic-conventional farmers (mean = 17.83 employees) with bio-dynamic (mean = 3.71 employees) and organic (mean = 3.67 employees) farmers employing the least number. Conventional farmers were the most likely to employ regular and seasonal labourers on a full-time basis while organic farmers were more likely to employ part-time seasonal labour than other groups. A comparison of the total number of employees by production method type (excluding the outlier corporate farms) revealed that conventional farmers employed more agricultural labour than organic farmers [$F_{(3,103)} = 4.525$, $p = .005$, difference significant at $p = .01$ level] even after controlling for acres in production [entered as a covariate in the equation, $F_{(1,103)} = .104$, $p = .748$].

As apparent in Table 4-33, the purposes for which most of the hired labour were employed were: harvesting crops (average 10.2 employees, 96.1 weeks per year); crop preparation (average 2.6 employees for an average of 50 weeks per year); and crop maintenance (average 2.1 employees for an average of 24.1 weeks per year). To a lesser extent, employees were hired for all facets of production (average of 1.4 employees for 42.6 weeks); sales (primarily for farm gate or

TABLE 4-32. FARM OPERATIONS: HIRED AGRICULTURAL LABOUR

EMPLOYMENT STATUS	TOTAL FARMERS (n=110) Mean (s.d.)	ORGANIC FARMERS (n=50) Mean (s.d.)	CONVENTIONAL FARMERS (n=47) Mean (s.d.)	ORGANIC-CONV. FARMERS (n=6) Mean (s.d.)	BIODYNAMIC FARMERS (n=7) Mean (s.d.)
Number of Employees					
Full-Time Regular	0.6182 (2.8186)	0.0400 (0.1979)	1.3191 (4.2226)	0.3333 (0.5164)	0.2857 (0.4880)
Part-Time Regular	0.0364 (0.1880)	0.0400 (0.1979)	0.0213 (0.1459)	0.1667 (0.4081)	0.0000 (0.0000)
Full-Time Seasonal	9.6273 (28.0173)	1.4000 (2.0702)	19.5319 (40.7532)	7.8333 (9.9883)	3.4286 (5.3497)
Part-Time Seasonal	1.7273 (5.9307)	2.1000 (4.6959)	0.5957 (2.5847)	9.5000 (19.9775)	0.0000 (0.0000)
Total No. Employees	12.10 (29.50)	3.67 (5.17)	21.47 (42.51)	17.83 (18.71)	3.71 (5.62)
Number of Weeks per Year					
Total Group					
Regular Employees	32.09 (146.56)	2.04 (10.10)	68.60 (219.58)	16.67 (25.82)	14.86 (25.37)
Seasonal Employees	113.69 (281.40)	21.71 (37.57)	224.49 (401.58)	99.33 (56.23)	25.86 (24.33)
Total Weeks per Year	146.07 (384.46)	23.79 (39.08)	293.09 (552.17)	116.00 (73.18)	40.71 (33.72)
Amended Group (Note 1)					
Regular Employees	25.95 (131.56)	2.08 (10.20)	54.26 (198.53)	16.67 (25.82)	14.86 (25.37)
Seasonal Employees	112.08 (282.85)	21.50 (37.94)	221.37 (405.45)	99.33 (56.23)	25.86 (24.33)
Total Weeks per Year	136.98 (375.17)	23.14 (39.21)	275.63 (545.00)	116.00 (73.18)	40.71 (33.72)

Note 1. Amended group excludes two extremely large nonowner operated corporate farms (1 organic and 1 conventional).

roadside stand sales, average of .3 employees for 3.5 weeks) and farm improvements (average of .1 employees for .4 weeks per year).

Analysis of variance comparisons of number of employees with acres in production entered as a covariate to control for scale of production were conducted for the three most labour intensive facets of production. There proved to be no differences in hired agricultural labour by production method group for the crop production or all facets of production categories. Conventional and organic-conventional farms proved to utilize more labour for harvesting purposes than either organic or bio-dynamic farms even after controlling for acres in production [$F_{(3,105)} = 3.891$, $p = .011$].

Discussion. In the earlier analysis of farm operating expenses and problems, the issue of agricultural labour (in particular, hired labour) was identified. As stated by MacRae et al. (1990) and Oelhaf (1978), it is generally regarded that organic farms have higher labour requirements than comparable conventional farms. Whether or not this translates into higher labour costs due to the hiring of agricultural labour depends largely on the degree to which the labour requirements can be satisfied by family members. Compared to the general B.C. farm population (Statistics Canada, 1992c), the farms in this survey were more likely to utilize hired agricultural labour (45.3% of B.C. farms compared to 80% of the farms in this study). In respect to year round and seasonal hired agricultural labour, the farmers in this study were also more likely to use year round workers (19.1% compared to 15.5% for all B.C. farms) but less likely to use seasonal labour (75.5% compared to 82.1% for all B.C. farms). A comparison by production method type shows that organic farms were much more likely to have employed year round labour (only 8%) or seasonal labour (68%) than the B.C. farm population, conventional farmers (27.7% use year round labour and 80.9% utilize seasonal labour) or organic-conventional farmers (33% have year round labour, 100% utilize season labour). While 28.6% of bio-dynamic farmers employed year round labour, only 57.1% had seasonal labour. These statistics would tend to

TABLE 4-33. FARM OPERATIONS: PURPOSE OF HIRED AGRICULTURAL LABOUR

Purpose	TOTAL FARMERS (n=110) Means (s.d.)	ORGANIC FARMERS (n=50) Means (s.d.)	CONVENTIONAL FARMERS (n=47) Means (s.d.)	ORGANIC-CONV. FARMERS (n=6) Means (s.d.)	BIODYNAMIC FARMERS (n=7) Means (s.d.)
1. All Facets of Prod.					
- No. Employees	1.39 (3.47)	1.24 (2.89)	1.68 (4.37)	0.40 (0.84)	1.29 (1.11)
- No. of Weeks/Yr.	42.60 (149.50)	12.77 (35.15)	78.55 (221.56)	20.83 (33.23)	32.86 (22.97)
2. Crop Preparation					
- No. Employees	2.58 (7.65)	0.76 (2.09)	4.89 (11.04)	2.33 (4.41)	0.29 (0.76)
- No. of Weeks/Yr.	49.68 (203.61)	3.54 (11.16)	108.64 (302.59)	29.00 (51.25)	1.14 (3.02)
3. Crop Maintenance					
- No. Employees	2.13 (6.12)	1.42 (3.40)	2.70 (7.84)	6.00 (10.30)	0.00 (0.00)
- No. of Weeks/Yr.	24.03 (104.90)	5.18 (12.93)	45.91 (156.62)	37.67 (58.93)	0.00 (0.00)
4. Harvesting					
- No. Employees	10.15 (27.17)	2.16 (4.36)	18.96 (39.07)	16.50 (18.36)	2.56 (4.76)
- No. of Weeks/Yr.	96.05 (268.40)	5.95 (10.82)	207.47 (384.01)	70.67 (62.53)	13.29 (20.02)
5. Farm Improvements					
- No. Employees	0.07 (0.44)	0.10 (0.58)	0.02 (0.15)	0.00 (0.00)	0.29 (0.76)
- No. of Weeks/Yr.	0.44 (2.94)	0.76 (4.18)	0.02 (0.14)	0.00 (0.00)	1.29 (3.40)
6. Sales					
- No. Employees	0.25 (1.41)	0.09 (0.45)	0.45 (2.08)	0.33 (0.82)	0.00 (0.00)
- No. of Weeks/Yr.	3.49 (21.42)	0.96 (5.02)	6.64 (32.10)	4.00 (9.80)	0.00 (0.00)
7. Other					
- No. Employees	0.02 (0.13)	0.02 (0.14)	0.02 (0.15)	0.00 (0.00)	0.00 (0.00)
- No. of Weeks/Yr.	0.06 (0.51)	0.04 (0.28)	0.11 (0.73)	0.00 (0.00)	0.00 (0.00)

suggest that organic farms have less need to hire agricultural labour and may be less labour intensive than other types of farms.

As found in this survey of B.C. farmers, conventional and organic-conventional farms require a greater number of persons to met their labour requirements. This difference can be traced to their greater utilization of hired labour rather than family/partner members even after controlling for the number of acres in production. The analysis comparing hired labour requirements for different facets of production showed that conventional and organic-conventional farms had greater requirements for harvesting purposes irrespective of the number of acres in production. There were no significant differences between production method groups for any of the other facets of production such as crop preparation, crop maintenance, farm improvements or general assistance (all facets of production).

In total, the results of this analysis indicate support for Lockeretz and Wernick's (1980) finding that organic and conventional farms do not differ significantly in terms of their labour requirements. Again recognizing the fact that many of the organic farms in this study are long past the critical transitional period, these findings support MacRae et al.'s (1990) assertion that over time, the labour requirements of organic farms decline to a level similar to that of conventional farms. The incidence of the very high labour requirements of the organic-conventional group which has the highest family labour component and the second highest hired labour component would tend to support this assertion since many of these farms are currently in the more labour intensive organic transitional stage.

Marketing Farm Production

Once produced, how do the farmers get their products to market? As earlier identified, changes in market demand, low market prices and changes in marketing distribution channels have been the impetus for farmers' decisions to change the type of products they produce. This section provides a description of the number of different products farmers are sending to market, the types of marketing outlets they utilize as well as marketing problems they have experienced.

Types of farm products being marketed. On average, the farms surveyed are marketing 2.1 different farm product categories and shipping an average of 3.3 different individual farm products to market (see Table 4-34).[4] While there were no significant group differences in terms of farm product categories, reflecting their more diversified operations, bio-dynamic farmers are marketing a greater variety of individual products (mean = 5.33) than all other groups (organic mean = 3.25; conventional mean = 3.04; organic-conventional mean = 3.50 products) [$F_{(3,106)} = 2.3747$, $p = .0743$, group differences significant at $p = .05$ level].

Marketing outlets. The farmers in this study utilized a wide variety of marketing outlets to sell their products. In total, 74.5% were involved in direct sales with organic (76.5%), organic-conventional (100%) and bio-dynamic (100%) relying more on direct sales than conventional (66%) farmers. Within the direct sales category, there were three alternatives. The most frequently cited was farm gate sales (52% of farms) followed by sales through private roadside stores/stands (20%) and local farmers markets (17%). While organic farmers were less likely to have their own roadside store (12%), conventional (11%) and bio-dynamic (0.0%) farmers were relatively less likely to be participating in their local farmers markets. Most of those utilizing farmers markets were located in the Vancouver Island, Shuswap-Thompson and Cariboo regions where weekend farmers markets have proven to be popular venues.

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[4] Note that these figures are lower than farm products in production because not all of farm production was being sold. Some products are used as inputs to other parts of operations (eg., hay or grain grown for livestock) or for personal use.

TABLE 4-34. MARKETING FARM PRODUCTS: TYPES AND NUMBER OF PRODUCTS

	TOTAL FARMERS (n=110) No. (%)	ORGANIC FARMERS (n=50) No. (%)	CONVENTIONAL FARMERS (n=47) No. (%)	ORGANIC-CONV. FARMERS (n=6) No. (%)	BIODYNAMIC FARMERS (n=7) No. (%)
Number of Different Product Categories (Note 1)					
1	15 (13.6%)	10 (19.6%)	5 (10.6%)	--	--
2	68 (61.8%)	33 (64.7%)	28 (49.6%)	3 (50.0%)	4 (66.7%)
3	25 (22.7%)	6 (11.8%)	14 (29.8%)	3 (50.0%)	2 (33.3%)
4	2 (1.8%)	2 (3.9%)	--	--	--
No. of Farms	110 (100%)	51 (100%)	47 (100%)	6 (100%)	6 (100%)
Means	2.1091	1.9608	2.1915	2.5000	2.3333
Std.Dev.	.6953	.7736	.6128	.5477	.5164

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	TOTAL FARMERS (n=110) No. (%)	ORGANIC FARMERS (n=50) No. (%)	CONVENTIONAL FARMERS (n=47) No. (%)	ORGANIC-CONV. FARMERS (n=6) No. (%)	BIODYNAMIC FARMERS (n=7) No. (%)
Total No. of Products					
1	16 (14.5%)	9 (17.6%)	7 (14.9%)	--	--
2	33 (30.0%)	16 (31.4%)	16 (34.0%)	1 (16.7%)	--
3	21 (19.1%)	8 (15.7%)	9 (19.1%)	2 (33.3%)	2 (33.3%)
4	16 (14.5%)	7 (13.7%)	7 (14.9%)	2 (33.3%)	--
5	10 (9.1%)	5 (9.8%)	3 (6.4%)	1 (16.7%)	1 (16.7%)
6	6 (5.5%)	2 (3.9%)	3 (6.4%)	--	1 (16.7%)
7	3 (2.7%)	1 (2.0%)	1 (2.2%)	--	1 (16.7%)
8	2 (1.8%)	1 (2.0%)	--	--	1 (16.7%)
9	2 (1.8%)	1 (2.0%)	1 (2.2%)	--	--
10 +	1 (0.9%)	1 (2.0%)	--	--	--
No. of Farms	110 (100%)	51 (100%)	47 (100%)	6 (100%)	6 (100%)
Means	3.2909	3.2549	3.0426	3.5000	5.3333
Std.Dev.	2.0289	2.2436	1.7564	1.0488	2.0656

Note 1. Product categories include: Livestock, Poultry, Grains/Hay, Fruits, Berries, Vegetables, Herbs/Garlic and other Specialty Products.

Almost one-third (31.8%) of the farmers surveyed sold their products to wholesale distributors. This marketing channel was more often utilized by organic-conventional (67%), bio-dynamic (67%) and organic (35%) than by conventional (23%) farmers. For organic farmers, the most frequently mentioned wholesale distributors were Wild West Organic Harvest Cooperative and the more recently established Pro Organics Marketing Inc.

TABLE 4-35. MARKETING FARM PRODUCTS: MARKETING OUTLETS

Marketing Outlet	TOTAL FARMERS (n=110) %	ORGANIC FARMERS (n=51) %	CONVENTIONAL FARMERS (n=47) %	ORGANIC-CONV. FARMERS (n=6) %	BIODYNAMIC FARMERS (n=7) %
Direct Sales	74.5%	76.5%	66.0%	100%	100%
- Farm Gate	51.8%	58.8%	38.3%	66.7%	83.3%
- Own Roadside Store	20.0%	11.8%	27.7%	33.3%	16.6%
- Farmers Market	17.3%	25.5%	10.6%	16.7%	0.0
Wholesalers	31.8%	35.3%	23.4%	66.7%	66.7%
Retail Stores	30.9%	31.4%	27.7%	33.3%	50.0%
Farmers Co-operative	29.1%	7.8%	57.4%	16.7%	0.0
Processors	10.0%	3.9%	17.0%	16.7%	0.0
Auction	13.6%	7.8%	19.1%	16.7%	16.7%
Restaurants	10.9%	19.6%	2.1%	0.0	16.7%
Other	5.4%	3.9%	8.5%	0.0	0.0
TOTAL NO. MARKETING OUTLETS					
a. Excluding types of direct sales	1.8273 (1.25)	1.6078 (1.15)	2.0000 (1.29)	2.3333 (1.37)	1.83 (1.60)
b. Including types of direct sales	2.2091 (1.04)	2.0588 (.99)	2.3191 (1.09)	2.6667 (1.03)	2.17 (1.17)

An almost equal number of farmers sold their products directly to retail stores (31%), primarily locally. For organic and bio-dynamic producers, several were shipping their products to local health food stores and to specialty organic supermarkets located in the greater Vancouver area (the most frequently mentioned were Capers in West Vancouver, Hearts and the East End Co-op in Vancouver).

Farmers' cooperatives were also utilized by 29% of the respondents. This was most often mentioned by conventional farmers (56%) who grow grain (primarily in the Peace River region), vegetables (especially those in the Fraser Valley under supply management arrangements) and tree fruits (in the Okanagan region). The difference between conventional and all other farmer groups was significant at the p = .05 level [$F_{(3,106)} = 14.7477$, p = .000]. As yet there are no formal farmers' cooperatives specializing in organic or bio-dynamic products, however a number (8%) do ship through established conventional farmers' cooperatives.

Reflective of the decline in food processing in B.C., only 10% of the farmers utilized this marketing channel. 14% of the farmers surveyed sent their livestock to auction. And finally 11% of farmers (primarily organic and bio-dynamic farmers located in the Vancouver Island, Lower Mainland/Fraser Valley regions) sold directly to restaurants.

Obviously there are differences in marketing outlets depending on the type of farm product being sold. [See Table 4-36] Mixed operations (defined as those producing 3 or more product categories) utilize a wide variety of marketing outlets. Almost all of the mixed producers (91%) are involved in direct sales with almost half selling to wholesalers (47%) or retail stores (47%).

In livestock specialist operations, livestock is primarily sold through auction (50%) with fewer selling through direct sales (33%) or wholesalers (33%). The preferred means of selling grains is through farmers' cooperatives (86%) although a number (29%) also sell direct at the farm gate.

An examination of the vegetable and fruit producer data confirm that direct sales are an important marketing channel (73% for combined vegetable/fruit/herb operators; 60% for vegetable/herb specialists; and 72% for fruit specialists).

TABLE 4-36. MARKETING FARM PRODUCTS: MARKETING OUTLETS X PRODUCT CATEGORY

		Livestock & Hay/Grains			Vegetables/Fruits/Herbs		
	Mixed Operations (Note 1)	Livestock & Hay/Grains	Livestock Only	Grains Only	Vegetables/ Fruits/Herbs	Vegetables & Herbs	Fruits Only
No. of Farms	(34)	(13)	(6)	(7)	(26)	(15)	(18)
Marketing Outlets							
Direct Sales	91.2%	53.8%	33.3%	28.6%	73.1%	60.0%	72.2%
- Farm Gate	67.6%	53.8%	33.3%	28.6%	26.9%	40.0%	55.5%
- Own Roadside Store	29.4%	0.0	0.0	0.0	38.5%	26.7%	16.6%
- Farmers Market	23.5%	0.0	0.0	0.0	19.2%	6.7%	0.0
Wholesalers	47.1%	15.4%	33.3%	14.3%	23.1%	33.3%	27.8%
Retail Stores	47.1%	0.0	16.7%	0.0	26.9%	33.3%	27.8%
Farmers Co-operative	14.7%	61.5%	16.7%	85.7%	26.9%	20.0%	50.0%
Processors	2.9%	15.4%	0.0	28.6%	0.0	0.0	16.7%
Auction	17.6%	38.5%	50.0%	0.0	0.0	0.0	0.0
Restaurants	17.6%	7.7%	16.7%	14.3%	19.2%	33.3%	0.0
Other	2.9%	0.0	0.0	0.0	7.7%	13.3%	0.0

Note 1. Mixed operations = 3 or more product categories (Total = 34; organic = 18; conventional = 9; organic-conventional= 2, biodynamic = 5)

Several farmers with these non-livestock mixed operations also have their own roadside stores (39%) to sell farm products. The prominence of farmers' cooperatives for fruit specialists (50%) can be traced to conventional tree farmer sales through the Okanagan cooperatives (e.g., B.C. Tree Fruits, Sun-Rype, independent fruit packinghouses).

Discussion. Research studies to date have found that the primary marketing outlets for organic food products (in particular vegetables and fruits) have been direct sales and health food stores (Altieri et al., 1983; Hill & MacRae, 1990; Lampkin, 1990; Oelhaf, 1978; Saskatchewan Dept. of Agriculture and Food, 1990). The findings of this study would tend to confirm these findings in that direct sales and sales to specialty health food stores are the primary marketing channels for organic fruits and vegetables. However the presence of two B.C. wholesalers which specialize in organic foods has provided a welcome option for many of the organic farmers surveyed. For many conventional and organic farmers (especially in the Cariboo, Vancouver Island and Okanagan regions) the recent establishment of direct marketing associations which circulate newspaper flyers identifying the location of individual farms and the types of products they sell has helped in promoting farm gate sales.

While previous studies forecast that major retail supermarket chains will become a major force in the marketing of organic food in the future, they also identify a number of problems or obstacles with this marketing channel. The most often cited problems are a lack of understanding by the supermarket chains which result in marketing practices (in-store handling, separate displays, use of plastic packaging which accelerates deterioration and "turns off" environmentally conscious consumers) which place organic products at a disadvantage in large supermarkets. A study of Colorado supermarkets showed that many produce managers and corporate produce directors hold a negative attitude toward organic produce (Sparling et al., 1992). A 1990 survey of 31 supermarkets, grocery stores and health food stores in Victoria, B.C., found that 11 (35%) were not selling organic produce for reasons of lack of demand, prices too high and limited shelf life (University of Victoria P.I.R.G., 1990). In a Saskatchewan study of organic markets, a major concern for supermarket retailers and food processors was the inability of small organic producers to ensure a needed level of continuity of supply (Saskatchewan Dept. of Agriculture and Food, 1990). Anecdotal evidence from several of the organic and bio-dynamic farmers interviewed who have dealt with local supermarkets confirms that the often antagonistic attitudes of local supermarket produce managers as well as their centralized buying practices, has forced them to sell to Lower Mainland specialty stores and to the organic wholesalers even though they would prefer to sell their products locally.

While they are able to obtain a higher per unit price for their product through farm gate sales, two drawbacks to this marketing channel is that it is time consuming and disruptive if farmers are engaged in production activities. Many farmers said that they enjoyed the direct contact with consumers and higher profit margins but it comes at a price.

In regards to grain production, the majority of organic grain growers are selling their products through direct sales to export markets as well as the Canadian Wheat Board. Like conventional grain growers, organic grain growers primarily ship their grain to the local Canadian Wheat Board cooperative (5 ship 95%-100% of their grains this way). This is consistent with a Saskatchewan survey of organic grain growers which found that organic producers shipped 77% of their grain crop to the CWB elevators (Saskatchewan Dept. of Agriculture and Food, 1990). At the time of the interviews in the Peace River region, efforts were being made to set up a farmer marketing cooperative to sell organic grains in both Canadian and export markets. More recently, the Canadian Wheat Board has been examining the possibility of setting up a separate organic grain pool which should enlarge their marketing options further (Raine, 1993).

In summary, there appears to be few differences between organic and conventional growers. The high proportion of farmers in all groups who sell directly to consumers may be indicative of the B.C. farm population which has a large proportion of small farms which utilize direct marketing channels more.

<u>Changes in marketing and distribution channels</u>. To determine the changeability in their marketing and distribution, farmers were asked whether they had changed their methods of marketing within the past five years. A large proportion (41%) responded that they had changed. As an indication of what types of changes have occurred, a simple counting of whether they had utilized one marketing outlet more or less was conducted (see Table 4-37).

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TABLE 4-37. MARKETING FARM PRODUCTS: CHANGES IN MARKETING OUTLETS DURING LAST 5 YEARS

Changes in Marketing	TOTAL FARMERS (n=113)	ORGANIC FARMERS (n=51)	CONVENTIONAL FARMERS (n=47)	ORGANIC-CONV. FARMERS (n=6)	BIODYNAMIC FARMERS (n=9)
Yes	46 (40.7%)	22 (43.1%)	18 (38.3%)	3 (50.0%)	3 (33.3%)
No	64 (59.3%)	29 (56.9%)	29 (61.7%)	3 (50.0%)	6 (66.7%)

TYPES OF CHANGES IN MARKETING OUTLETS

	TOTAL FARMERS (n=46)		ORGANIC FARMERS (n=22)		CONVENTIONAL FARMERS (n=18)		ORGANIC-CONV. FARMERS (n=3)		BIODYNAMIC FARMERS (n=3)	
	More	Less	More	Less	More	Less	More	Less	More	Less
Direct Sales										
- Farm Gate	+8	-6	+3	-2	+4	-2	0	0	+1	-2
- Own Roadside Store	+11	0	+5	0	+4	0	+1	0	+1	0
- Farmers Market	+4	-5	+3	-3	+1	-1	0	-1	0	-1
Wholesalers	+5	-8	+3	-7	+1	-1	-1	0	0	0
Retail Stores	+8	-11	+4	-5	+3	-5	+1	-1	0	0
Farmers Co-operative	+5	-8	+2	0	+3	-7	0	-1	0	0
Processors	+1	-2	0	0	+1	-2	0	0	0	0
Auction	+2	-1	0	0	+1	-1	0	0	+1	0
Restaurants	+3	-4	+3	-4	0	0	0	0	0	0

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In many cases, the changes tended to cancel each other (farm gate sales, farmer markets, processors, auction, restaurants). However it appears that more farmers have sold more of their products through their private roadside stores and less through wholesalers (especially organic farmers), retail stores, and farmers' cooperatives (especially conventional farmers). Perhaps the most stable group are the bio-dynamic and organic-conventional farmers who primarily use direct sales channels.

Marketing problems. What types of marketing and distribution problems are being experienced by farmers for the different commodities which they are producing? It appears that farmers involved in livestock production are experiencing the greatest number of problems (only 65% stated they had no marketing/distribution problems). The major complaints for both organic and conventional livestock producers is that prices were too low (cited by 9 livestock farmers) and that competition from imports (particularly for sheep producers) were problems. Grain/hay producers appear to be relatively problem free in terms of marketing and distribution (only 7% cited problems).

Only 12% of the fruit and berry producers cited problems with the marketing and distribution of these commodities. In contrast, 24% of vegetable growers stated that oversupply due to competition from imported vegetables was a major concern, especially for conventional producers. Organic farmers also tended (more than conventional farmers) to have problems with a lack of distribution network for their vegetables. This latter problem was also the most often cited by the organic herb growers, coupled with the complaint that market prices were too low. Low prices and competition from imports were also problems mentioned by those in specialty product markets.

Discussion. In general, there appears to be relatively few marketing problems for the farmers surveyed in this study. Furthermore, the problems being experienced by these producers appear to be common to both organic and conventional growers. The most trouble free in terms of marketing and distribution are the bio-dynamic and organic-conventional farmers, most probably due to their greater self-reliance on direct sales. Not surprising, considering their protest demonstrations in the summer of 1992, the conventional vegetable growers were most concerned with the threat of cheaper imported produce. From the perspective of one large conventional vegetable grower on Vancouver Island, the prospect of lower tariffs on imports which may result from the G.A.T.T. negotiations would lead to a recurrence of the problems which he (and many other B.C. vegetable growers) experienced during the summer of 1991.

> "We plant lettuce every 6 days so when we start cutting lettuce, we get continuity for the guys. Every week we know we're going to have so many hundreds of boxes of lettuce. Last year, when we got into June we were cutting it for as low as $4.50 for a box of 24s. It's costing us $7.50 just to grow it. So for 2 months we lost a lot. The first 2 months of production last year we were making money and then the next 2 months we lost more than what we made on the first early crop. And cabbage was the same thing. And that was because of overproduction in the U.S. and the reason there was overproduction was because they all talked about the drought so as soon as you're told that there's an underproduction of vegetables, everybody overproduces. California overproduced last year, Washington, Oregon overproduced, the Fraser Valley overproduced. We didn't overproduce. We stayed the same yet were beat on the prices, no fault of ours. These types of things must be looked at. That's bad for the customers too because one week you get lettuce for 40 cents, come January and February, it's going to be $2 a head. Continuity of the price is really important."

Low prices are the major concern for many conventional and organic growers but less so for bio-dynamic farmers whose Demeter certified products often command a higher premium than certified organic products. With the exception of the grain growers in the Peace River and herb and garlic growers who often mentioned the 50% to 100% premiums they received once certified, when asked, many organic farmers said that they receive a minimal organic premium (less than 25%) with some stating that they received no organic premium at all. Thus the large price differential for organic products often observed elsewhere at the farm and retail levels (Lampkin, 1990; Saskatchewan Dept. of Agriculture and Food, 1990; Sparling et al., 1992) is not being realized at the farm gate for many B.C. organic farmers.

PART C. INNOVATIONS AND CHANGES IN FARM PRODUCTION AND MARKETING

This part of the chapter on the personal context of farmers investigates the following general research question (Question 3): Are organic farmers more innovative than conventional farmers? As earlier identified, the specific research questions which are investigated are as follows: Are organic farmers different from conventional farmers in respect to the number of new practices and/or products which they have adopted in their farm operations and in marketing farm products? Are they different in respect to the types of new practices and/or products which they have adopted in their farm operations and in marketing farm products? Are there differences in the sources of ideas for innovations and changes in farm operations and marketing? An additional research question to be investigated in this section concerns: What communication channels do farmers access for information concerning organic farming innovations? (Question 5) And in particular: Are the primary sources of information about organic farming innovations through interpersonal communication channels? (Question 5b)

Number and Types of Innovations

As evident in Table 4-38, there were no significant differences between production method groups in terms of the absolute number of changes in farm practices over the past five years. 90% of the farmers interviewed had changed some aspect of their operations with the average being 2.6 innovations or changes. With the exception of the age of the farmer, there were no significant relationships found between the number of innovations adopted and years of farming experience (total or organic), farm size (average number of acres in production), diversification of operations (average number of farm product categories) or geographic location. In terms of age, there was a negative relationship between age and the number of innovations within the last five years for all respondents ($r = -.2886$, $p < .001$). There was also no significant difference in the number of farming innovations and whether the farmer held a leadership or membership role in a farm organization. Unlike Rogers' (1983)

TABLE 4-38. INNOVATIONS: NUMBER OF NEW PRACTICES OR PRODUCTS TRIED IN PAST 5 YEARS

No. of Innovations	TOTAL FARMERS (n=109) No. (%)	ORGANIC FARMERS (n=50) No. (%)	CONVENTIONAL FARMERS (n=44) No. (%)	ORGANIC-CONVENTIONAL FARMERS (n=6) No. (%)	BIODYNAMIC FARMERS (n=9) No. (%)
0	11 (10.1%)	5 (10.0%)	4 (9.1%)	0	2 (22.2%)
1	21 (19.3%)	11 (22.0%)	5 (11.4%)	3 (50.0%)	2 (22.2%)
2	23 (21.1%)	7 (14.0%)	16 (36.4%)	0	0
3	30 (27.5%)	17 (34.0%)	9 (20.5%)	1 (16.7%)	3 (33.3%)
4	9 (8.3%)	5 (10.0%)	3 (6.8%)	0	1 (11.1%)
5	8 (7.3%)	3 (6.0%)	3 (6.8%)	1 (16.7%)	1 (11.1%)
6	4 (3.7%)	1 (2.0%)	2 (4.5%)	1 (16.7%)	0
7	1 (0.9%)	0	1 (2.3%)	0	0
8	1 (0.9%)	0	1 (2.3%)	0	0
9	1 (0.9%)	1 (2.0%)	0	0	0
Total No. Farmers	109 (100%)	50 (100%)	44 (100%)	6 (100%)	9 (100%)
Means	2.5700	2.5200	2.6818	2.8333	2.2222
Std.Dev.	1.7758	1.7290	1.8143	2.2286	1.7873

conclusion that those with more specialized operations were more innovative, there was no significant differences between farmers on this dimension.

The next question to be addressed is whether there are differences between production method groups in the types of changes being made in farm operations. Table 4-39 details the type of changes that have been made. For all production method groups, the most common changes have involved changes in crop protection (23%) and new types of plant varieties (22.2%). To a lesser extent, farmers were trying out new machinery/equipment (9.9%), methods of soil enhancement (9.9%), irrigation/drainage systems (7.7%), planting variations (5.6%), and new methods of marketing (5.6%). At this level of categorization, the only two significant differences between production method groups was that conventional farmers were the most likely to have implemented new management/bookkeeping methods (primarily computerization of farm records) than all other groups ($F_{(3,107)}$ = 2.760, p = .046). Organic-conventional farmers were the most likely to have converted to organic methods in the last five years ($F_{(3,107)}$ = 6.117, p = .001). In the

TABLE 4-39. INNOVATIONS: TYPES OF NEW PRACTICES OR PRODUCTS TRIED IN PAST 5 YEARS

	TOTAL FARMERS (n=111) No. (%)	ORGANIC FARMERS (n=52) No. (%)	CONVENTIONAL FARMERS (n=44) No. (%)	ORGANIC-CONVENTIONAL FARMERS (n=6) No. (%)	BIODYNAMIC FARMERS (n=9) No. (%)
1. Cultivation/Tree Maintenance	14 (4.9%)	10 (7.6%)	3 (2.6%)	1 (5.9%)	0
2. Planting Variations	16 (5.6%)	7 (5.3%)	6 (5.2%)	2 (11.8%)	1 (5.3%)
3. Soil Enhancement	29 (10.2%)	14 (10.6%)	13 (11.2%)	0	2 (10.6%)
4. Plant Nutrition	11 (3.9%)	5 (3.8%)	4 (3.4%)	0	2 (10.6%)
5. New Plant Varieties	63 (22.2%)	24 (18.2%)	33 (28.4%)	3 (17.6%)	3 (15.8%)
6. Crop Protection	68 (24.0%)	37 (28.0%)	18 (15.5%)	5 (29.4%)	8 (42.1%)
7. Animal Husbandry	7 (2.5%)	4 (3.0%)	3 (2.6%)	0	0
8. Irrigation/Drainage	22 (7.8%)	9 (6.8%)	10 (8.6%)	2 (11.8%)	1 (5.3%)
9. Machinery/Equipment	28 (9.9%)	9 (6.8%)	16 (13.8%)	0	3 (15.8%)
10. Marketing	13 (4.6%)	7 (5.3%)	4 (3.4%)	1 (5.9%)	1 (5.3%)
11. Office Management	5 (1.8%)	0	5 (4.3%)	0	0
12. Converted to Organic	4 (1.4%)	1 (0.8%)	1 (0.9%)	2 (11.8%)	0
13. Other	3 (1.1%)	2 (1.5%)	0	0	1 (5.3%)
No. of Innovations	283 (100%)	130 (100%)	116 (100%)	16 (100%)	21 (100%)

following sections, the specific innovations which were tried by farmers will be identified.

<u>Innovations in cultivation and planting</u>. In vegetable production, two organic farmers had implemented raised bed systems which provide the benefits of higher soil temperatures (thereby extending the growing season), better drainage and less compaction of soil. Two organic and one organic-conventional farmer had experimented with plastic row covers (on the soil and in tunnels) which although expensive and creating the problem of disposal of used plastic, served to raise soil temperatures and control weeds. Two organic farmers had amended their crop rotation systems; one organic and one organic-conventional farmer had experimented with intercropping vegetables to minimize pest problems. Two organic farmers had also increased their use of cover crops as a means of weed control. Two conventional farmers and one organic farmer were now buying their vegetable transplants rather than growing their own as a way of saving labour and greenhouse heating costs.

In tree fruit production, seven conventional farmers were replacing their apple orchards with high density plantings. For some, this involved the introduction of superspindle dwarf root stocks (for up to a density of 1000 trees per acre) while others were planting for a density of 300 to 500 trees per acre. Double and triple row variations with wire or single posts were used for supporting the trees. Many of the high density orchards are replacing traditional apple varieties (Red and Golden Delicious, Spartans, MacIntosh) with new apple varieties such as Gala, Jonagold, and Fuji. Much of the impetus for the conversion of apple orchards has been the availability of government funds for orchard replanting (administered through the Okanagan Valley Tree Fruit Authority and ARDSA grants).

Organic orchardists have not implemented the spindle or superspindle systems for two primary reasons. First, such orchards rely heavily on the use of herbicides as a means of weed control since mowing with traditional farm equipment is not feasible due to the small space between trees. Instead, the types of innovations being reported by organic orchardists involve renovation of large mature trees to allow for better light penetration, air circulation and easier access for picking. One organic orchardist is trying a zinc sulphate solution to spraythin his apples thus reducing labour costs for hand pruning. These ideas were developed by the farmers themselves.

Soil enhancement/nutrition. The establishment of Soil Conservation Societies in both the Fraser Valley (Cloverdale) and Peace River regions has led to a number of farmers participating in government managed experiments with cover crops and tillage methods. In the Fraser Valley, the primary soil problems involve water drainage and soil fertility while in the Peace River region, soil erosion and fertility are major concerns. Examples of soil conservation experiments include: introducing cover crops and green manure crops as part of crop rotations; clover plowdowns; the use of zero till seed drills; experimental seed trials; etc. While the majority participating in these experiments were conventional farmers (8), two of the organic farmers interviewed were also participating in soil conservation experiments. An additional six conventional farmers reported that in order to reduce chemical fertilizer expenses and soil erosion, they had independently experimented with cover crops, green manures or animal manures. One conventional farmer stated that he had tried ground rock powder instead of chemical fertilizer on a trial plot.

For organic farmers, cover crops and green manures were most often already part of their established practice. However six farmers reported that they were still trying new means of fertilization. Among the more unique products being tried out were the use of a glacial till soil enhancer and composted waste alfalfa pellets. In one organic greenhouse operation, the farmer was in his second year of experimenting with using organic fertilizer in a hydroponic medium. Another organic farmer was researching the possibility of using a product ("Terasorb") which would enhance soil water retention.

In terms of plant nutrition, two conventional orchardists had recently installed fertigation systems (trickle irrigation with injected soluble fertilizer). One conventional orchardist has experimented with phosphorous as a fertilizer which although expensive, he felt that it freed up boran and trace minerals better than alternatives.

Amongst the more unusual methods of plant nutrition being tried out by organic farmers are: the use of growth promoters ("Sonic Boom" and "EM4"); the use of leaf mulch purchased from residential areas; and crystallography research to test nutritional levels in plants (as part of a bio-dynamic programme).

<u>New varieties</u>. The current impetus in the B.C. apple industry has been to replace orchards of Red and Golden Delicious, MacIntosh and Spartan apples with exotic varieties such as Gala, Fuji, Jonagold, Granny Smith, Empire, etc. There were 14 conventional and one organic-conventional orchardists who had replanted their apples. As one orchardist stated, "you have to grow the varieties in vogue if you're going to make any money at all". In contrast, organic orchardists tend to have remained with the traditional varieties or, as is the case for many, to have produced a wide variety of rare heritage apple varieties. In terms of exotic fruits, two conventional and one organic farmer have started producing

kiwi fruit, a very new product in B.C. agriculture.

While the search for new and better vegetable varieties is common to both organic and conventional vegetable growers, organic growers were more likely to be trying new and exotic vegetables (edible flowers, exotic salad greens) rather than improved varieties of established vegetables (e.g., potatoes, tomatoes, onions, carrots, etc.). There was also a decided preference amongst organic growers for open-pollinated and heritage seeds rather than new hybrid seeds.

In grain production, several conventional farmers were trying new varieties of wheat. One was trying a new malting barley as part of a contract with the Wheat Pool for the U.S. Anheiser-Busch Brewing Co. One conventional farmer has been experimenting with overwintering fava beans which could be used as an animal feed as well as a cover crop to enhance soil quality.

In berry production, three organic farmers were experimenting with new varieties. As part of his farm's specialty focus for the restaurant trade, one farmer was experimenting with a diverse array of exotic berries which include yellow and white strawberries and raspberries.

Crop protection. The greatest number of new practices and products for all farmers involved dealing with pests and weeds in production. The availability of Integrated Pest Management Programmes and IPM consultants has enabled five conventional and two organic farmers to use this method to assist in their pest control efforts. All were positive about the results of their IPM programmes, especially the conventional farmers who reported that their pesticide costs were significantly reduced as a result. The use of biological controls (e.g., ladybugs as predators for aphids; Bacillus Thuringiensis in orchards and vegetables) were new practices for two conventional, two organic and two bio-dynamic farmers.

(a) Tree fruit production. The high economic costs resulting from insect damage in tree fruits have served as the impetus for a wide variety of changes in production. The most serious pest in orchards has been the codling moth which conventional farmers are able to control for by spraying a wide variety of synthetic chemicals (most often mentioned was the highly toxic azinphos-methyl, Guthion). Denied this alternative by their organic and bio-dynamic standards, these farmers have experienced significant losses due to codling moth damage. Traditionally, the only organic means of control was by picking the infected fruit (which resulted in the loss of over 50% of the crop for some growers). The introduction of pheromone confusion as part of an experiment conducted by Agriculture Canada (as a precursor to the government's newly established Sterile Insect Release programme) with the organic farmers proved to be very successful. Of the orchardists interviewed, 13 (11 organic, 1 organic-conventional and 1 conventional) had used pheromone confusion. In addition, two conventional orchardists had used pheromone traps in their orchards to monitor for levels of codling moth, spraying when numbers exceeded acceptable levels. Prior to the availability of the pheromone confusion, organic farmers had tried a wide variety of methods to control for the codling moth (many with mixed success). In addition to picking infected fruit, they tried cardboard bands around the tree trunks as traps (3 farmers), hanging blacklights and overhead sprinklers in their orchard (1 bio-dynamic farm), and spraying granulosis virus spray as part of an experiment with the Summerland Research Station (1 organic, 1 bio-dynamic).

Another pest problem in tree fruits is scab control for which two organic orchardists had experimented with new mixtures which are restricted substances under OFPANA organic standards. One tried a pure sulphur spray while another tried a copper-sulphur mixture for apple scab (which didn't work as well as pure sulphur). One organic blueberry farmer had developed his own homeopathic spray from a German recipe to deal with a chancre disease on his blueberries.

(b) Vegetable and grain production. New cultural methods of weed and pest control using involved the use of: hay mulch (2 organic); sawdust mulch (1 organic); buckwheat to crowd out couchgrass (1 organic); and 4 different cover crops (1 conventional). Several vegetable farmers (2 organic, 3 organic-conventional, 2 conventional) had started using plastic mulch (brown and black) to control for weeds. Other barrier methods reported for pest control in vegetables included: mesh crop covers (e.g., Remay) used by three organic farmers and one conventional farmer; plastic row covers (Agronet) by one conventional farmer; and plastic tunnels by one organic and one organic-conventional farmer.

There were generally positive reports concerning the use of flameweeding (burning weeds with propane torches) by three organic and one conventional farmers who had adapted their own machinery to implement this method of weed control.

Livestock/poultry production. There were few changes in livestock breeding other than one organic farmer trying to breed the brooding instinct back into their turkeys (breeding wild turkeys with domestic birds) and chickens (crossing leghorns with bantam). The time of breeding was altered by one organic farmer who had converted to a fall calving program and has found it to result in lower losses and disease.

In terms of animal nutrition and health, two conventional farmers identified changes in their nutritional practices. One conventional farm was now using a new silage mixture which was stored in plastic. Another dairy farmer was continuing to experiment with different feed mixtures to enhance milk production. In poultry production, one organic farmer was experimenting with organic rations. One conventional farmer reported that he had produced "organic" chickens one year as part of a contract with his poultry processor. The birds were fed only organic feed (but remained in high density buildings) and he reported that while the mortality rate was somewhat higher than normal, the experiment was profitable (however not profitable enough for the supermarket chain which had ordered the birds so the contract was discontinued after one year).

Two organic sheep farmers had been involved in a Ministry of Forests--Sheep Breeders Association project to use sheep to graze forest clearcuts with the objective being to reduce the use of herbicides in the forests. One organic farmer has since dropped out of the programme, citing that the sheep had returned with foot rot and abortion disease. Another conventional sheep farmer was currently involved in a BCMAFF project for sheepgrazing. This involved turnips and kale as part of a grazing rotation plan. As remarked by his organic neighbour who would have liked to have participated in the experiment, the requirement that the trial plots first be sprayed with a herbicide to eliminate quackgrass prevented him from being involved.

Irrigation/drainage. Both organic and conventional farmers had changed their methods of irrigation to reduce water consumption, an important consideration during drought seasons. Trickle or drip irrigation systems were installed in vegetable and berry production by nine farmers (6 conventional, 3 organic) and in tree fruit production by three farmers (2 conventional, 1 organic). The conventional orchardists also administered soluble fertilizer through their irrigation systems. Overhead sprinkler systems (microsprinklers, spinners) were installed by three orchardists and one blueberry farmer.

Machinery/implements. Many of the farmers interviewed had purchased new machinery or have made modifications to existing machines to increase the efficiency of their operations. Three conventional farmers had bought transplanting machines to reduce labour costs while two conventional farmers had tried new seed drills to reduce tillage (thus saving fuel and labour costs and reducing erosion).

In terms of new machines for cultivation, four organic farmers and one conventional farmer had either purchased or modified equipment. Two organic farmers had purchased new cultivating equipment which would minimize soil erosion or water loss (through deep tillage). One organic farmer had modified his cultivation equipment so that it could be horse drawn.

New crop protection machines were reported by five farmers (3 conventional, 2 organic). One conventional farmer had bought a computerized pesticide sprayer to reduce wastage, another conventional farmer had modified his pesticide sprayer to reduce pesticide drift. One innovative organic farmer had build his own

BugVac, a vacuum system for pests on strawberries and potatoes.

Other new machines being tried out by the farmers included: mechanical harvesters of berries to save labour costs (2 conventional farmers); cleaning, sorting and bagging equipment for potatoes (1 conventional farmer); and a machine (built by himself) to pick up black plastic mulch (1 conventional farmer).

Management/bookkeeping. There were five conventional farmers who had purchased computers and were using them to maintain financial records. One conventional farmer who was involved in purebred livestock production was using his computer to keep track of breeding bulls' lineage.

Marketing and sales. The introduction of an electronic livestock auction in Calgary was being tried out by three conventional ranchers. There were seven organic and one bio-dynamic farmers who were experimenting with new ways of selling their products. Amongst the more unique was a bio-dynamic farmer who was implementing the Community Supported Agriculture concept which involves having a client base which pays a sum of money at the beginning of the year to the farmer in return for a share of the food produced throughout the season. One organic farmer operates on a small incorporated vegetable farm where he is the operating partner who leases the land from a holding company which has 12 investors. As well as receiving a share of the farm's operating profits, the investors also receive a small portion of the food produced (the majority of food is sold to restaurants and specialty stores).

Summary Discussion. As this listing of the specific types of innovations which are being tried out by farmers illustrates, organic farmers are not the only ones who are trying out new products and practices that are supportive of environmental principles. As part of their involvement with local Soil Conservation Societies, many conventional farmers are experimenting with organic methods and products which are designed to reduce soil erosion and the use of synthetic fertilizers. As a result of the positive results of the experiment with pheromone disruption for codling moth control in organic orchards, the introduction of the government's Sterile Insect Release Programme in the South Okanagan should significantly reduce the use of the synthetic pesticides in the tree fruit industry. In vegetable production, barrier crop protection methods (plastic and organic mulches, crop covers) are being tried out by both organic and conventional farmers. Thus one cannot make the generalization that conventional farmers are not interested in organic methods, it appears that they are integrating these types of innovations into their existing systems of production for both economic and environmental reasons.

Another observation is that the requirements of organic farming certification standards serve to restrict the adoption of a number of agricultural innovations which are being promoted by industry and government. This is most evident in regards to the government subsidized orchard replanting programme which encourages high density orchards using dwarf root stocks. While such orchards are being promoted as a means to increase productivity and responsiveness to market demand for new tree fruit varieties, the ancillary production requirements for herbicides and synthetic chemical fertilizers in such orchards prevent their adoption by organic orchardists. Therefore, in this respect, there is less potential for a convergence between organic and conventional agricultural practices.

The Influence of Information Sources on the Adoption of Innovations and Changes in Farm Operations

To what extent have the farmers in this study accessed the same or different information sources in relation to the changes they have made in their farm operations? Following identification of the new practices and products which they had tried out in the past five years, farmers were asked where they got their ideas from. This offers one measure of the practical utility of an information source as well as giving an indication of an information source's influence in changing agricultural practices. Research Question 5b directs us to consider that the primary sources of information about organic farming innovations (for both organic and conventional farmers) would be through interpersonal communication channels due to the acknowledged lack of such information available through more formalized information channels. A corollary of Research Question 5b would be that information about other types of innovations would be more often available through nonpersonal information channels.

As earlier found, organic and conventional farmers did not differ significantly in terms of the total number of new products and practices they had tried out within the last five years. However, there appears to be a substantial difference in regards to the attributed sources of ideas for change.

It appears that organic farmers' primary sources of new ideas are: themselves (22.3%); the print media (publications--21.5%; books--6.9%); other farmers (16.2%); and their farm organizations (13.1%). Less important were

TABLE 4-40. INNOVATIONS: SOURCES OF IDEAS FOR NEW PRACTICES OR PRODUCTS TRIED IN PAST 5 YEARS

	TOTAL FARMERS (n=111) No. (%)	ORGANIC FARMERS (n=52) No. (%)	CONVENTIONAL FARMERS (n=44) No. (%)	ORGANIC-CONVENTIONAL FARMERS (n=6) No. (%)	BIODYNAMIC FARMERS (n=9) No. (%)
Source of Idea					
Self	48 (17.0%)	29 (22.3%)	13 (11.2%)	4 (25.0%)	2 (9.5%)
Other Farmers	36 (12.7%)	21 (16.2%)	10 (8.5%)	4 (25.0%)	1 (4.8%)
Farm Organization	28 (9.9%)	17 (13.1%)	11 (9.5%)	0	0
Government	37 (13.1%)	9 (6.9%)	24 (20.7%)	2 (12.5%)	2 (9.5%)
Education Courses	1 (0.3%)	0	1 (0.9%)	0	0
Conferences	8 (2.8%)	3 (2.3%)	4 (3.4%)	1 (6.3%)	0
Suppliers/Consultants	45 (15.9%)	14 (10.8%)	30 (25.9%)	0	1 (4.8%)
Media--Publications	63 (22.2%)	28 (21.5%)	22 (19.0%)	5 (31.3%)	8 (38.1%)
Books	17 (6.0%)	9 (6.9%)	1 (0.9%)	0	7 (33.3%)
No. of Innovations	283 (100%)	130 (100%)	116 (100%)	16 (100%)	21 (100%)

suppliers/consultants (10.8%); government sources (6.9%) and conferences (2.3%). This contrasts sharply with the pattern of sources of ideas for the conventional farmer group. For these farmers, the most often cited source of new ideas were: suppliers/consultants (25.9%); government sources (20.7%); and the print media (publications--19.0%; books--0.9%). Conventional farmers were less likely than organic farmers to give themselves ownership of new ideas (11.2%) or to attribute new ideas to their farm organizations (9.5%) or to other farmers (8.5%).

Organic-conventional farmers appear to rely most on publications (31.3% of new ideas), themselves (25%), and other farmers (25%). Bio-dynamic farmers were most likely to state print media sources (publications--38.1%; books--33.3%) as their source of ideas for the new practices and products that they have tried out in the past five years.

Despite these apparent differences, analysis of variance tests failed to yield any statistically significant differences in information sources between production method groups with the sole exception that bio-dynamic farmers cited media publications slightly more often than all other groups ($F_{(3,36)} = 2.5904$, $p = .0678$). Thus at this level of aggregation, there appears to be no overall differences in sources of information for new practices and products. This lack of differences remained even after excluding those innovations which are not directly related to farm production activities (i.e., marketing/sales, office management). In regards to Research Question 5b, the assertion that organic farmers rely most on interpersonal sources of information for new ideas concerning their practices cannot be fully supported. While organic farmers cite other farmers and farm organizations as important information sources (combined they represent 29.3% of innovation ideas), organic farmers also rely heavily on the organic and sustainable agriculture print media as sources of new ideas (28.4%) to implement in their operations. Bio-dynamic farmers rely primarily on the print media (71.4% of new ideas) as an information source for their innovations.

One reason why this finding differs from those who have conducted surveys of other organic farmers (Conacher & Conacher, 1983; Altieri et al., 1983) may be traced to the growth in publications relating to organic and sustainable agriculture over the past 10 years. While the B.C. organic farmer still complains about the lack of relevant advice offered by government sources (local extension agents and publications) and educational institutions (as will be elaborated on in Chapter 5 on communication channels), it appears that print media sources have served to fill this gap in information. What needs to be taken into consideration is that information from the print media often needs to be adapted and modified to suit local growing conditions thus requiring more effort on the part of the individual farmer in translating this information into practice.

In contrast, conventional farmers appear to have utilized information offered by sources which are located in their immediate areas, i.e., government sources, suppliers/consultants. For conventional farmers involved in soil conservation initiatives, their sources of information regarding sustainable agriculture practices were local government extension agents and local farm organizations -- two information sources which were less often cited by organic and bio-dynamic farmers as sources of ideas for changes in production and marketing. Thus relative to the organic and bio-dynamic farmers, conventional farmers appear to rely more heavily on interpersonal communication (albeit with those in advisory rather than peer relationships) for innovations which can be defined as falling within the sustainable agriculture category.

CHAPTER 5. COMMUNICATION CHANNELS, PERCEPTIONS AND BELIEFS

The role of information on attitude and belief formation and subsequent decision making and behaviours has been studied extensively in the social psychology and organizational behaviour literatures (Fishbein, 1967; Fishbein & Ajzen, 1975). Indeed, one premise of education and training is that information and knowledge will have an impact on how one thinks and behaves. The role of information has been seen as critical in the innovation literature as well. In his extensive review of the innovation literature, Rogers (1983) concluded that early adopters of innovations were: more active seekers of information; had greater exposure to interpersonal and mass media information channels; and generally had greater knowledge of innovations.

As earlier discussed in Chapters 2 and 3, Tait (1978), Lawson (1982), and Turpin and Maxwell (1976) all studied the role of information sources on farmers' pest control decisions. While their findings are somewhat contradictory (i.e., they arrived at different conclusions regarding the influence of commercial pesticide dealers), Lawson observed that farmers tended to rely on those sources of information which confirmed their pre-existing preferences. Tait (1990) also observes that the "rationality" of farmers' pest management decisions is often constrained by self-imposed restrictions on information input thus increasing the degree of subjectivity in farmers' decision making.

In their study of farmers' adoption of Integrated Pest Management practices, Thomas et al. (1990) found that contact with agricultural extension agents and university professionals, and attendance at group meetings were positively related to the adoption of IPM practices. Information sources such as neighbours, consultants, salespersons and printed material did not factor into their IPM adoption decisions. In a study of the adoption of soil conservation technologies, Nowak (1987) found that contacts with agricultural extension agents and attendance at field days facilitated the innovation adoption and diffusion process. Nowak also observed that information and knowledge serve to reduce perceptions of risk associated with new practices. In their study of the farmers' adoption of conservation practices in South Africa, McDowell and Sparks (1989) concluded that interpersonal and direct communication modes were the most effective.

However, information needs to be available before one can choose what information is to be attended to. The relative lack of both scientific and practical information regarding organic and sustainable agriculture has been identified by critics of traditional agricultural science (Altieri et al., 1983; Hill & MacRae, 1990; MacRae, Hill, Henning & Mehuys, 1989; Soule & Piper, 1992). In a survey of organic farmers in Australia, the most highly ranked problem was the lack of advice and information concerning organic farming (Conacher & Conacher, 1983). A survey of Saskatchewan organic farmers revealed that of the four alternative sources of farm management advice, other organic farmers and organic organizations were rated as the most important, organic agriculture magazines were somewhat important, and local extension agricultural representatives were rated as unimportant (Molder et al, 1991). Thus, compared to those practising conventional agriculture, the range and volume of relevant information for organic farmers is restricted and by necessity, of a more interpersonal and informal nature.

Part A of this chapter focuses on the general research question: Are organic and conventional farmers different in terms of their communication behaviour? (Research Question 4) In addition Part A seeks to answer the following research question concerning evaluation of different communication channels: Are there differences between organic and conventional farmers in terms of how they rank different information sources in terms of relevance, understandability and trustworthiness? (Research Question 6) Part A concludes with a discussion of findings regarding communication channels and behaviour of the farmers in this study.

The remainder of this chapter will explore what Tait (1984) and others have referred to as the "subjectivity" in farmers' decisions concerning their farm practices. One major focus of this study was to ascertain whether there were differences between organic and conventional farmers in regards to their values and beliefs regarding organic farming, the use of agrichemicals, and the natural environment.

Another area for investigation concerns the degree to which farmers' beliefs and attitudes are congruent or contradictory. Whereas organic farmers appear to have a close linkage between their values and beliefs and actual practice, studies conducted by Carr and Tait (1991), Tait (1982) and Lawson (1982) suggest that there is a more tenuous linkage for conventional farmers. Specifically, in regards to chemical pesticides, a farmer's economic concern outweighs his/her concerns regarding the health and environmental effect of these agricultural inputs. In their study of farmers and conservationists in the U.K., Carr and Tait (1991) found that while farmers express support for conservation practices (such as the retention of hedgerows), farm management decisions were informed by economic productivity and efficiency factors rather than environmental considerations. This suggests that there are significant differences between organic and conventional farmers in terms of the strength and effect of their values and beliefs on their behaviours. In addition, this chapter investigates the degree to which government extension agents and farm organization employees hold the same or different perceptions and attitudes as the farmers studied.

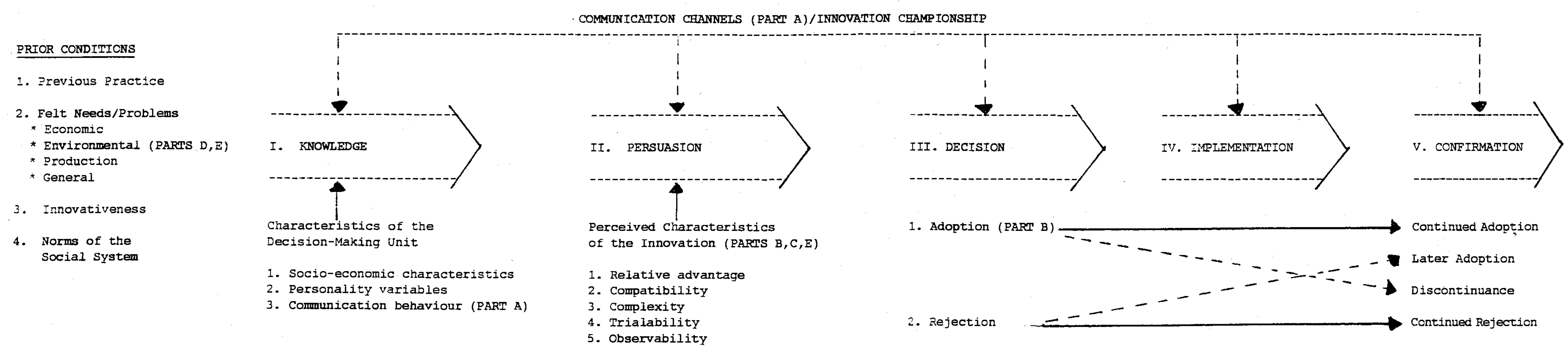
There are four parts to this exploration of farmers' perceptions, beliefs and evaluations of organic farming, synthetic agrichemicals and the natural environment. Part B focuses on organic farming in two ways. As reported in other studies of organic farmers (Blobaum, 1983; Conacher & Conacher, 1983; Saskatchewan Dept. of Agriculture and Food, 1990), the motivations to be an organic farmers are diverse. To what extent then, are organic farmers in B.C. similar or different in terms of their motivations to organic farmers in other locations? Therefore, the first general research question to be addressed is: What are organic farmers' motivations for choosing organic farming as a method of agricultural production?(Research Question 7) The second general research question regarding organic farming concerns farmers' perceptions and evaluations of organic farming, that is: Are there differences between organic and conventional farmers in how they perceive and evaluate organic farming?(Research Question 8) This question will be investigated through an analysis of farmers' definitions of organic farming and through an analysis of their evaluations of organic farming attributes.

Part C focuses on the use of agrichemicals in farming. The general question to be explored is: Are there differences between organic and conventional farmers in how they perceive and evaluate synthetic agrichemicals? (Research Question 9) Respondents' perceptions of agrichemicals as measured by their responses to the Use of Agrichemicals questionnaire are reported and then compared to their perceptions of organic farming attributes.

Part D addresses the level of environmental concern expressed by participants in this study. The general research question to be explored is: Are there differences between organic and conventional farmers in terms of their values and beliefs regarding the natural environment?(Research Question 10) To answer this question, farmers' and government representatives' responses on the Environmental Opinion Survey questionnaire are presented and compared.

Part E is an integrative analysis based on the results of the first three parts of this chapter to answer the following research question: What are the relationships between organic and conventional farmers' attitudes towards organic farming, synthetic agrichemicals and the natural environment? To answer this question, organic and conventional farmers' responses to the Environmental Opinion Survey are compared to their perceptions of organic farming and agrichemicals to determine whether there are consistent and significant relationships between the three sets of data.

FIGURE 5-1. ANALYSIS OF THE DECISION MAKING PROCESS REGARDING ORGANIC FARMING AND THE USE OF AGRICHEMICALS



2. Felt Needs/Problems
   * Environmental (PART D)
     - environmental values & beliefs (RQ# 10)

4. Norms of the Social System (Organic vs. Conventional Farming)

3. Communication behaviour (PART A)
   - agricultural information sources (no. & type) (RQ# 4) (organic: RQ# 4a, 5b) (conventional: RQ# 4b)
   - ranking of agricultural information sources (relevance, understandability, trust) (organic: RQ# 6a) (conventional: RQ# 6b)

Perceived Characteristics of the Innovation

* Organic Farming (PART B) (RQ# 8)
  - definitions of organic farming
  - perceptions of organic farming characteristics & risks

* Synthetic Agrichemicals (PART C) (RQ# 9)
  - perceptions of use of synthetic chemicals in agriculture

* Organic Farming X Agrichemicals (PART E) (RQ# 11a)
* Organic Farming X Environmental Values (PART E) (RQ# 11b)
* Agrichemicals X Environmental Values (PART 3) (RQ# 11c)

1. Adoption (PART B)
   - motivations to do organic farming (RQ# 7)

PART A. COMMUNICATION CHANNELS IN AGRICULTURE

The general research question addressed in Part A concerns whether organic and conventional farmers are different in terms of their communication behaviour. The two specific research questions which are investigated are: Organic farmers will attend to information from sources which support organic farming concepts and philosophy (Research Question 4a); Conventional farmers will attend to information from sources which support conventional approaches to agriculture (Research Question 4b).

Information Sources Regarding Agriculture

As an initial indication of which sources of information they access most often, farmers were asked to identify those sources they have utilized within the last 3 years. The numbers presented in Table 5-1 were calculated by a simple counting procedure where each mention of a different source was counted as 1 (no weighting of sources was conducted).

TABLE 5-1. INFORMATION SOURCES REGARDING AGRICULTURE

Information Sources	TOTAL FARMERS (n=111) Means (s.d.)	ORGANIC FARMERS (n=52) Means (s.d.)	CONVENTIONAL FARMERS (n=44) Means (s.d.)	ORGANIC-CONVENTIONAL FARMERS (n=6) Means (s.d.)	BIODYNAMIC FARMERS (n=9) Means (s.d.)
1. Other Farmers	.8468 (.94)	1.1346 (1.03)	.6136 (.81)	.3333 (.52)	.6667 (.71)
2. Farm Organizations	1.0901 (1.16)	1.0577 (1.04)	1.1364 (1.41)	1.0000 (1.10)	1.1111 (.60)
Organic	.5045 (.81)	.8077 (.91)	.0227 (.15)	.5000 (1.22)	1.1111 (.60)
Conventional	.5856 (1.06)	.2500 (.59)	1.1136 (1.38)	.5000 (.55)	--
3. Government	.8829 (.64)	.7500 (.59)	1.0682 (.59)	1.0000 (.89)	.6667 (.87)
4. Education Courses	2.1892 (1.88)	2.0192 (1.82)	2.5000 (1.81)	3.3333 (2.73)	.8889 (1.17)
5. Conferences	.8468 (1.08)	.7692 (1.02)	.9318 (1.11)	1.1667 (1.47)	.6667 (1.12)
6. Suppliers/Contr.	.3694 (.75)	.0952 (.30)	.7500 (1.01)	.5000 (.55)	--
7. Media					
Journals	4.4324 (2.50)	4.1731 (2.71)	4.8409 (2.32)	6.0000 (1.90)	2.8889 (1.45)
Books	.6306 (.85)	.9423 (.92)	.1364 (.46)	.6667 (1.03)	1.2222 (.67)
TV/Radio	.2252 (.46)	.3462 (.52)	.1591 (.43)	--	--

For the total sample, the most frequently cited information source was agricultural publications such as magazines, journals and newspapers (mean = 4.43) followed by education courses/workshops (mean = 2.19) and to a lesser extent, farm organizations (mean = 1.09), government sources (mean = .88), conferences (mean = .85), and other farmers (mean = .85). The least often mentioned information sources were books (mean = .63), industrial suppliers/contractors/consultants (mean = .37), and TV/radio (mean = .23).

An examination by production method group revealed several differences in regards to which information sources were being accessed. While agricultural journals/magazines/newspapers were the most often mentioned by all groups, organic-conventional and conventional farmers utilized these information sources more often than bio-dynamic farmers ($F_{(3,107)} = 2.6198$, $p = .0546$). The same conclusion can be drawn in regards to farmers' attendance at education courses and workshops ($F_{(3,107)} = 2.8700$, $p = .0398$).[1]

While there were no group differences in terms of farm organizations as a source of information, there were differences when the type of farm organization (organic vs. conventional) was considered. Organic and bio-dynamic farmers are more likely to use organic/bio-dynamic farm organizations as sources of information than conventional farmers were ($F_{(3,107)} = 12.2161$, $p < .001$). On the other hand, conventional farmers were more likely to mention conventional farm organizations than organic or bio-dynamic farmers were ($F_{(3,107)} = 7.4556$, $p < .001$). While organic farmers had some contact with conventional farm organizations as an information source, bio-dynamic farmers had no contact and organic-conventional farmers were just as likely to mention both organic and conventional farm organizations as information sources. Conferences (which are often sponsored by farm organizations) were mentioned with the same frequency by all production method groups.

Interpersonal contact with other farmers proved to be a more often mentioned source of information for organic farmers than for conventional farmers

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[1] Unless otherwise indicated, significant group differences are at the $p = .05$ level.

($F_{(3,107)}$ = 3.4819, p = .0185, group difference significant at p = .01 level). Conventional farmers were more likely than organic farmers to mention government sources as a source of agricultural information ($F_{(3,107)}$ = 2.4580, p = .0669). The next most often mentioned source of information was books on agriculture. Books proved to be more often consulted by bio-dynamic and organic farmers than by conventional farmers ($F_{(3,107)}$ = 11.1035, p < .0001, significant difference at p = .01 level).

Amongst the least mentioned sources of information by organic and bio-dynamic farmers were agribusiness suppliers/contractors/consultants. However, conventional farmers proved to rely on these sources of information to a much greater extent than others ($F_{(3,107)}$ = 8.2209, p = .0001, significant difference at p = .01 level). And finally, agriculture and nature shows on television and radio were a source of information for organic farmers to a greater extent than for conventional or bio-dynamic farmers ($F_{(3,107)}$ = 2.8226, p = .0423).

Group comparisons of relative rankings of each information source was conducted using the Kruskal-Wallis one-way analysis of variance by ranks nonparametric test which has a Chisquare distribution (Siegel & Castellan, 1988). In terms of relative rankings of information sources, organic farmers ranked other farmers, organic farm organizations, agriculture books and TV/radio higher than conventional farmers as information sources (Chisquare = 6.5712, p = .0104 for other farmers; Chisquare = 30.9398, p < .001 for farm organizations; Chisquare = 27.3359, p < .001 for books; Chisquare = 4.4402, p = .0351 for TV/radio). Bio-dynamic farmers were similar to organic farmers in their differences in rankings with the exceptions that they did not cite TV/radio any differently as an information source and mentioned education courses less often than conventional farmers (Chisquare = 6.3625, p = .0117). In contrast, conventional farmers rank conventional farm organizations (Chisquare = 17.3797, p < .001), government sources (Chisquare = 6.4788, p = .0109), and suppliers/contractors/consultants (Chisquare = 17.1239, p < .001) higher than organic and bio-dynamic farmers do. The only difference concerning organic-conventional farmers was in respect to print media (journals, magazines, newspapers) which they cited significantly more often than organic farmers did (Chisquare = 4.2099, p = .0402).

The next step in this evaluation of information sources involves an examination of the specific sources of information utilized within each category.

Farm organizations. While the majority of farmers surveyed mentioned at least one farm organization as a source of agricultural information, 36% did not. As expected, organic farmers most frequently (76.4%) referred to organic farm organizations (e.g., regional organic certifying associations) as sources of information while bio-dynamic farmers used only bio-dynamic (and sometimes organic) farm organizations as sources of information. The most commonly mentioned conventional farm organizations were those organized for different commodity groups (eg., B.C. Fruit Growers Association, B.C. Cattlemen's Association). These were a source of information for 66% of conventional farmers, 50% of organic-conventional farmers and 12.7% of organic farmers.

The next most often mentioned farm organizations (20% of conventional and 3.6% of organic farmers) were marketing co-operatives, all of which are currently in conventional agriculture (e.g., the Coast Vegetable Co-op, Canadian Wheat Board, local tree fruit packinghouses). Fewer farmers (10% conventional, 3.6% organic) mentioned general conventional farm organizations (eg., the B.C. Federation of Agriculture) as a source of agricultural information. Fewer still mentioned farmer unions (eg., National Farmers Union) as a source of agricultural information (only 1 conventional and 2 organic farmers).

Half (55%) of the farm organizations mentioned were local or regional in scope (primarily organic associations, marketing cooperatives and conventional commodity farm organizations), while 20% had provincial scope (primarily the conventional commodity farm organizations). 17% of the farm organizations that were mentioned were international organizations (11 organic and 9 conventional commodity organizations) while only 8% were national farm organizations (primarily conventional commodity farm organizations).

TABLE 5-2. INFORMATION SOURCES: FARM ORGANIZATIONS

	TOTAL FARMERS (n=111) No. (%)	ORGANIC FARMERS (n=52) No. (%)	CONVENTIONAL FARMERS (n=44) No. (%)	ORGANIC-CONVENTIONAL FARMERS (n=6) No. (%)	BIODYNAMIC FARMERS (n=9) No. (%)
No. of Farm Organizations					
0	40 (36.0%)	19 (36.5%)	18 (40.9%)	2 (33.3%)	1 (11.1%)
1	41 (36.9%)	17 (32.7%)	15 (34.1%)	3 (50.0%)	6 (66.6%)
2	18 (16.2%)	11 (21.1%)	5 (11.3%)	0	2 (22.2%)
3	6 (5.4%)	4 (7.7%)	1 (2.3%)	1 (16.7%)	0
4	4 (3.6%)	1 (1.9%)	3 (6.8%)	0	0
5	2 (1.8%)	0	2 (4.5%)	0	0
Means	1.0901	1.0577	1.1364	1.0000	1.1111
Std.Dev.	1.1642	1.0368	1.4075	1.0954	.6009
Types of Farm Organizations					
Organic/Biodynamic	56 (46.2%)	42 (76.4%)	1 (2.0%)	3 (50.0%)	10 (100%)
Conventional Commodity	43 (35.5%)	7 (12.7%)	33 (66.0%)	3 (50.0%)	0
Marketing Co-operative	12 (9.9%)	2 (3.6%)	10 (20.0%)	0	0
Conventional General	7 (5.8%)	2 (3.6%)	5 (10.0%)	0	0
Farmer Union	3 (2.5%)	2 (3.6%)	1 (2.0%)	0	0
Total Farm Organizations	121 (100%)	55 (100%)	50 (100%)	6 (100%)	10 (100%)

Government Sources of Information. The B.C. Ministry of Agriculture and Food was the most mentioned government source. As the data in Table 5-3 shows, conventional farmers (88.6%) most frequently mentions the BCMAFF as a source of information. Fewer organic (67.3%) and organic-conventional (66.7%) and still fewer bio-dynamic (44.4%) farmers mentioned BCMAFF representatives as a source of information. Farmers were asked the frequency of contact with BCMAFF representatives (primarily agriculturalists, horticulturalists, and technicians) to obtain a more accurate understanding of the nature of farmers' relationships with government representatives.

While the "frequent/ongoing" category is self-explanatory, allocation to the "occasional" category was made if the farmer said that he/she contacted a government representative infrequently when advice was needed regarding a production problem or the farmer had attended a BCMAFF organized field day within the recent past. Membership in the "very seldom" category was determined if the farmer said that it was on the rare occasion or as a last resort that he/she had contacted his/her government representative. Membership in the "past only/not helpful" category was determined if the farmer stated that he/she has never or no longer have any contact with government agents and did not consider their services to be of value to them.

TABLE 5-3. INFORMATION SOURCES: GOVERNMENT

GOVERNMENT SOURCES OF INFORMATION	No. of Farmers	FREQUENCY OF CONTACT WITH GOVERNMENT SOURCE			
		Frequent/ Ongoing	Occasional	Very Seldom	Past Only/ Not Helpful
TOTAL GROUP (n=111)					
BCMAFF	82 (73.8%)	29	26	14	13
Agriculture Canada	13 (11.7%)	9	4	0	0
Other Govt. Agency	2 (1.8%)	1	1	0	0
ORGANICS (n=52)					
BCMAFF	35 (67.3%)	12	11	6	6
Agriculture Canada	2 (3.8%)	1	1	0	0
Other Govt. Agency	2 (3.8%)	1	1	0	0
CONVENTIONALS (n=44)					
BCMAFF	39 (88.6%)	16	12	8	3
Agriculture Canada	7 (15.9%)	5	2	0	0
Other Govt. Agency	0	0	0	0	0
ORGANIC-CONVENTIONALS (n=6)					
BCMAFF	4 (66.7%)	0	2	0	2
Agriculture Canada	2 (33.3%)	1	1	0	0
Other Govt. Agency	0	0	0	0	0
BIODYNAMICS (n=9)					
BCMAFF	4 (44.4%)	1	1	0	2
Agriculture Canada	2 (22.2%)	2	0	0	0
Other Govt. Agency	0	0	0	0	0

Using this general categorization scheme, it appears that conventional farmers are in the most frequent contact with BCMAFF representatives (although 11 of the 39 who mentioned BCMAFF had no or very infrequent contact). Of those 35 organic farmers who mentioned BCMAFF as an information source, the relatively high number who stated that they were in frequent (35%) or occasional (31.4%) contact would appear to run counter to expectations. As mentioned by MacRae et al. (1990) and others, advice from government extension services have been most closely identified with conventional production methods (due in large part to the focus of agricultural education and research to date). One reason for this apparently anomalous finding can be traced to the presence of one horticultural technician located in the Fraser Valley who has been actively involved in the formation of that region's organic certifying association. A vocal proponent of organic agriculture, he has also travelled to meet organic growers in other regions of the province and has been available for consultation by farmers outside his immediate area. Another person in the BCMAFF who was regarded as very helpful by organic growers was located in the South Okanagan. Although she had left her job the year before interviews were conducted in the region, this person was frequently mentioned by organic and conventional farmers as an important source of information regarding IPM and alternative methods of pest control. In other regions, organic and bio-dynamic farmers' contact with BCMAFF extension agents was much less.

Analysis of the relationship between variables such as age, years of farming (total and organic), and size of operations and the frequency of contact with government extension agents was conducted. These demographic and experience variables proved only to be relevant for organic farmers (i.e., no significant differences for all other groups). Generally, organic farmers who indicated that they contacted their extension agents very seldom tended to be older than those in all other contact categories ($F_{(3,31)} = 9.8581$, $p = .001$). Organic farmers in the very seldom category also had significantly more years total farming experience ($F_{(3,31)} = 9.7134$, $p = .0001$) and organic farming experience ($F_{(3,31)}$ =

2.3562, p = .0910) as well as having more acres in production ($F_{(3,31)}$ = 5.7238, p = .0031). These results suggest that it is the younger and less experienced organic farmers operating larger farms who are the most proactive in seeking assistance from their local agricultural extension agent.

A much smaller number of farmers (13) mentioned that they had contact with Agriculture Canada employees. The majority of these contacts were with researchers employed at the Agriculture Canada research stations in Summerland, Agassiz and Vancouver. Several of the conventional farmers who mentioned AgCanada served as practitioner representatives on agricultural research committees or as is more the case for organic farmers, were participants in a research study (e.g., the pheromone disruption pilot experiment in the South Okanagan).

Education courses and conferences. Half of the farmers surveyed had attended an education course, seminar or workshop in the last three years. The most frequent setting (34%) was a workshop or instructional field day organized by the BCMAFF. Almost half of the conventional farmers, two-thirds of organic-conventional and one-quarter of organic farmers had attended such a session. Courses sponsored by conventional farm organizations were the next most mentioned education course/workshop attended. While nine conventional farmers had mentioned this information source, six organic farmers had also attended a course/workshop organized by a conventional farm organization. University and college courses were also mentioned, the most frequent being offered by local community colleges and at Olds Agricultural College in Alberta. Bio-dynamic farmers are perhaps unique in that they had not attended any such sessions in the past three years.

Correlation analyses showed positive relationships between conventional farmers' attendance at government courses/workshop and age (r= .3162, p = .018) and total years farming experience (r = .2650, p = .041). For organic-conventional farmers there was a negative relationship between age and attendance at government workshops (r = -.7398, p = .046). No significant relationships

TABLE 5-4. INFORMATION SOURCES: EDUCATION COURSES AND CONFERENCES

	TOTAL FARMERS (n=111) No. (%)	ORGANIC FARMERS (n=52) No. (%)	CONVENTIONAL FARMERS (n=44) No. (%)	ORGANIC-CONVENTIONAL FARMERS (n=6) No. (%)	BIODYNAMIC FARMERS (n=9) No. (%)
EDUCATION COURSES					
University/College	7 (6.3%)	5 (9.6%)	2 (4.5%)	0	0
Farm Organizations					
- Organic	2 (1.8%)	2 (3.8%)	0	0	0
- Conventional	15 (13.5%)	6 (11.5%)	9 (20.4%)	0	0
Government	38 (34.2%)	13 (25.0%)	21 (47.7%)	4 (66.7%)	0
Agribusiness	3 (2.7%)	0	3 (6.8%)	0	0
Number Attending Education Courses	56 (50.4%)	25 (48.0%)	27 (61.4%)	4 (66.7%)	0
Number Not Attending Courses	55 (49.5%)	27 (52.0%)	17 (38.6%)	2 (33.3%)	9 (100%)

	TOTAL FARMERS (n=111) No. (%)	ORGANIC FARMERS (n=52) No. (%)	CONVENTIONAL FARMERS (n=44) No. (%)	ORGANIC-CONVENTIONAL FARMERS (n=6) No. (%)	BIODYNAMIC FARMERS (n=9) No. (%)
CONFERENCES					
Organic	23 (20.7%)	18 (34.6%)	2 (4.5%)	0	3 (33.3%)
Conventional	40 (36.0%)	14 (26.9%)	22 (50.0%)	4 (66.7%)	0
Environmental	1 (.9%)	1 (1.9%)	0	0	0
Number Attending Conferences	53 (47.7%)	24 (46.2%)	22 (50.0%)	4 (66.7%)	3 (33.3%)
Number Not Attending Conferences	58 (52.3%)	28 (53.8%)	22 (50.0%)	2 (33.3%)	6 (66.7%)

were found for either organic or bio-dynamic farmers in respect to these variables.

Organic, conventional and organic-conventional farmers were equally likely to have attended a conference related to agriculture within the last three years.

While attendance was highest at conferences organized by conventional agriculture organizations (not surprising since they are much more numerous), a large number of farmers (18 organic, 3 bio-dynamic, 2 conventional) had also attended organic agriculture conferences. Several organic farmers (14) had attended conventional conferences as well. For organic farmers, there was a positive relationship between acres in production and attendance at a conference ($r = .5062$, $p < .001$). For conventional farmers, there was a negative relationship between age and conference attendance ($r= -.3179$, $p = .018$).

Industrial suppliers/contractors/consultants. Bio-dynamic and organic farmers were the least likely to have mentioned industrial suppliers/contractors/consultants as sources of information (90% of organic farmers and 100% of bio-dynamic did not mention them). However, these were more frequently cited information sources by conventional (45.5%) and organic-conventional (50%) farmers. The primary mode of contact was through salespersons in the local area and at agricultural trade shows. For conventional farmers there was a positive relationship between farm size (acres in production) and contact with local salespersons ($r= .3037$, $p = .024$).

TABLE 5-5. INFORMATION SOURCES: INDUSTRIAL SUPPLIERS, CONTRACTORS & CONSULTANTS

Industrial Suppliers, Contractors & Consultants	TOTAL FARMERS (n=111) No. (%)	ORGANIC FARMERS (n=52) No. (%)	CONVENTIONAL FARMERS (n=44) No. (%)	ORGANIC-CONVENTIONAL FARMERS (n=6) No. (%)	BIODYNAMIC FARMERS (n=9) No. (%)
Trade Shows	9 (8.1%)	1 (1.9%)	8 (18.2%)	0	0
Fieldmen	5 (4.5%)	0	5 (11.4%)	0	0
Salespersons	11 (9.9%)	1 (1.9%)	9 (20.4%)	1 (16.7%)	0
Consultants	6 (5.4%)	2 (3.6%)	2 (4.5%)	2 (33.3%)	0
Newsletters/ Publications	4 (3.6%)	1 (1.9%)	3 (6.8%)	0	0
Number Using These Sources	28 (25.2%)	5 (9.6%)	20 (45.5%)	3 (50.0%)	0
Number Not Using These Sources	83 (74.8%)	47 (90.4%)	24 (54.5%)	3 (50.0%)	9 (100%)

Publications and media. The most frequently mentioned information source was the media. This represented a wide variety of forms including: magazines, journals and newsletters; books; and radio and television. The categorization of the different publications was determined by their sponsorship, that is, organic/sustainable agriculture, conventional agriculture (commodity group, marketing cooperative, general), industrial suppliers of farm inputs and equipment, government publications, academic or scientific, and environmental.

(a) Organic/sustainable agriculture publications. The most frequently mentioned sustainable agriculture publications were Rodale's Organic Gardening (27), Harrowsmith (20), Rodale's New Farm (17), and COGnition (14). The next most frequently cited publications mentioned were those on soil conservation. Organic, bio-dynamic and organic-conventional farmers were significantly more likely to be referring to these publications than conventional farmers were ($F_{(3,107)}$ = 19.8726, $p < .001$, difference significant at $p = .01$ level). Organic farmers also referred more than conventional farmers to sustainable agriculture books ($F_{(3,107)}$ = 13.1510, $p < .0001$, difference significant at $p = .01$ level). The bio-dynamic farmers in the study most frequently mentioned the "Stirring Stick" (their B.C. society's newsletter) and a U.S. bio-dynamic quarterly publication. All bio-dynamic farmers had extensive libraries on bio-dynamic agriculture. Five organic and one organic-conventional farmer also had bio-dynamic agriculture books which they referred to.

(b) Conventional agriculture publications. There were two general types of conventional agriculture publications mentioned by farmers as sources of information -- those published by commodity groups and those which addressed all facets of agriculture. The most frequently referred to commodity group publications by orchardists were the Good Fruit Grower (13), the B.C. Orchardist (7), and the Western Fruit Grower (6). Grain farmers often referred to the Grain

TABLE 5-6. INFORMATION SOURCES: PUBLICATIONS AND MEDIA

	TOTAL FARMERS (n=111)	ORGANIC FARMERS (n=52)	CONVENTIONAL FARMERS (n=44)	ORGANIC-CONVENTIONAL FARMERS (n=6)	BIODYNAMIC FARMERS (n=9)
Magazines/Journals/ Newsletters	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)
Organic/Sustainable Agriculture	1.1622 (1.3317)	1.7692 (1.3227)	.2045 (.5937)	1.3333 (1.3663)	2.2222 (1.2019)
Conventional Agric.					
- Commodity Group	1.1261 (1.3424)	.4651 (.9174)	2.0000 (1.3977)	1.8333 (.7528)	.2222 (.4410)
- General	1.2162 (1.4796)	1.0962 (1.6480)	1.4773 (1.3380)	1.6667 (1.3663)	.3333 (.7071)
Industrial Suppliers	.0811 (.3340)	.0577 (.3076)	.1364 (.4087)	--	--
Government	.5495 (.5177)	.4038 (.4955)	.8409 (.4283)	.5000 (.5477)	--
Academic/Scientific	.1351 (.4765)	.2115 (.6367)	.0455 (.2107)	.3333 (.5164)	--
General Environmental	.1622 (.4581)	.1731 (.5134)	.1364 (.4087)	.3333 (.5164)	.1111 (.3333)
Books					
Organic/Sustainable Agriculture	.3063 (.4823)	.5577 (.5015)	.0227 (.1508)	.3333 (.5164)	.2222 (.6667)
Biodynamic Agric.	.1351 (.3434)	.1154 (.3226)	--	--	1.0000 (.0000)
Conventional Agric.	.1351 (.3434)	.1731 (.3820)	.0909 (.2908)	.3333 (.5164)	--
General Science	.0090 (.0949)	--	.0227 (.1508)	--	--
General Environmental	.0450 (.2083)	.0962 (.2977)	--	--	--
Audio-Visual					
Radio	.1261 (.3335)	.1923 (.3980)	.0909 (.2908)	--	--
Television	.0991 (.3002)	.1538 (.3643)	.0682 (.2550)	--	--

News (9) while vegetable growers most often referred to the American Vegetable Grower (7) as a source of information. As part of their membership in the B.C. Cattlemen's Association, livestock farmers received Beef in B.C. (8) and The Cattleman (8). Although a few organic farmers received commodity group publications (especially organic grain farmers), in general, conventional and organic-conventional farmers referred to these publications the most frequently ($F_{(3,107)}$ = 18.1773, $p < .001$, difference significant at $p = .01$ level).

The Western Producer was the most often mentioned general agriculture publication by all farmers (36 in total; 16 organic; 18 conventional, 1 organic-conventional; 1 bio-dynamic). B.C. publications such as B.C. Agriculture (16 total; 5 organic; 9 conventional; 2 organic-conventional), Country Life in B.C. (15 total; 3 organic; 10 conventional; 2 organic-conventional), and B.C. Farmer (12 total; 5 organic; 5 conventional; 1 organic-conventional; 1 bio-dynamic) were the next most often mentioned. Country Guide was mentioned by 13 farmers (5 organic; 6 conventional; 1 organic-conventional; 1 bio-dynamic). The only difference between groups in regards to general agriculture publications (journals, magazines, newspapers and books) was that organic-conventional farmers referred to these more often than did bio-dynamic farmers (at the $p = .05$ level). Otherwise organic and conventional farmers were equally likely to be reading publications of this nature.

(c) Industrial suppliers publications. Included in this category were magazines and newsletters published by farm equipment manufacturers such as John Deer, International Harvester, etc. Only 6% of organic farmers and 14% of conventional farmers referred to these publications as a source of information.

(d) Government publications. The government publications category included the B.C. Food Production Guide and the numerous reports pamphlets and booklets distributed by mail or available at the local Ministry of Agriculture offices. Conventional farmers were more likely than organic farmers to be utilizing this information source ($F_{(3,107)} = 12.3285$, $p < .001$, difference significant at $p = .01$ level). Bio-dynamic farmers did not refer to government publications at all.

(e) Academic and scientific publications. The academic/scientific publications category included reports of agricultural research which farmers had access to through contact with AgCanada or university researchers. Only 13% of farmers mentioned this information source and they were primarily those who were involved in research projects or were members of research review committees.

(f) General environmental publications. The most frequently mentioned publications which focused on the natural environment or environmental issues were National Geographic (6 total; 2 organic; 3 conventional; 1 organic-conventional) and Mother Earth News (4 total; 1 organic; 2 conventional; 1 organic-conventional).

(g) Radio/television. A particularly popular radio with some organic farmers (5) was the CBC Food Show, the cancellation of which was roundly condemned by its fans. Agricultural programming on television is limited but Country Canada (2 organic; 2 conventional) and Muck Magic (3 organic) were mentioned by a few.

Information sources and socioeconomic and experience backgrounds. The relationships between farmers' background and experience characteristics and the use of various types of media sources were examined through correlational analysis. Given the differences between production method groups in terms of which media sources they access, separate group analyses were conducted.

Positive relationships were found between an organic farmers' years of organic farming experience and their use of organic agriculture ($r = .2694$, $p = .027$), general conventional agriculture ($r = .5318$, $p < .001$), and agribusiness ($r = .3760$, $p = .003$) publications. A negative relationship was found between an organic farmer's acres in production and his/her mention of organic publications (books: $r = -.3418$, $p = .007$; other print media: $r = -.3960$, $p = .002$). Positive relationships were found between farm size and use of conventional agriculture publications ($r = .2446$, $p = .042$), commodity group publications ($r = .6019$, $p < .001$), agribusiness publications ($r = .3447$, $p = .007$), and radio ($r = .2386$, $p = .046$). The interpretation of these correlations could be that farmers with larger acreages refer more often to the conventional agriculture literature which is more focused on large scale production than the organic literature. Given the number of grain growers in the Peace River region who due to the nature of their operations have larger acreages and are members of commodity groups, could their presence in the sample be biasing these results? Excluding the organic Peace River region grain growers in a subsequent analysis reduced the significance levels drastically with the only remaining significant correlation being the one between acres in production and commodity group publications ($r = .2955$, $p = .023$).

Fewer significant relationships between publication information sources and background characteristics were found for the other groups of farmers. For conventional farmers, there was a negative relationship between years of farming experience and reference to sustainable agriculture publications ($r = -.2752$, $p = .035$). No significant relationships were found for organic-conventional farmers. For bio-dynamic farmers, the only significant relationship (positive) concerned acres in production and the use of conventional agriculture publications as an information source ($r = .9904$, $p < .001$).

While these figures are indicators of the frequency of contact that farmers have had with various sources of agricultural information, what can be said in regards to the degree to which each information source is judged to provide information which is relevant, understandable and trustworthy? That is the focus of the next part in this examination of information sources which farmers use.

Ranking of Agricultural Information Sources

The procedure by which a measure of how farmers regard agricultural information sources as providing relevant, understandable and trustworthy information followed a forced choice ranking procedure. During the interviews, farmers were asked to sort three sets (one for each criterion) of seven cards (one for each information source). Placing a card at the top of a pile indicated that information source had the highest ranking on a criterion (and scored as 1) while a card at the bottom of a pile indicated it was ranked the lowest (and was scored as 7). In the event of a tied ranking, ranking weights were allocated as instructed by Glass and Hopkins (1984).[2]

The mean scores of farmers' rankings for each of the seven information sources on each of the criteria are presented in Table 5-7. An initial examination of the means indicates that as a total group, other farmers are regarded as providing the most relevant (mean = 2.85), understandable (mean = 3.02) and trustworthy (mean = 2.71) information. The least regarded on all three criteria was the industrial suppliers and contractors (the lowest) and agribusiness (the second lowest). However an examination of the means for the different production method groups indicates that there are several variations in rankings depending on group membership.

In the following section, each information source was examined using a series of nonparametric tests which are the most appropriate statistical producers for rank order data (as per Siegel & Castellan, 1988). Differences in rankings by production method groups were tested using the Kruskal-Wallis one-way analysis of variance nonparametric test. [See Table 5-8 for summary of test results.] To determine whether an information source is ranked on one criterion higher than another, the Kendall rank-order coefficient of concordance (W) test (which has a Chisquare distribution) was utilized. [See Table 5-9 for summary of test results.] Correlation analyses between information source criterion rankings and farmer background characteristics such as age, years of farming experience (total and organic), farm size (average acres in production), and diversity of farm operations (average number of farm product categories) were also conducted to determine whether these variables were related to one's judgments regarding information sources.

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[2] The ranking of information on the criteria of relevance, clarity (understandability) and trust is similar to that done by Lawson (1982) in his study of farmers' sources of information regarding spray advice. However in that study, farmers were asked to score different sources on a scale of 1 to 5 and then mean scores were ranked.

TABLE 5-7. INFORMATION SOURCES: COMPARATIVE RANKINGS ON CRITERIA OF RELEVANCE, CLARITY AND TRUST

Information Sources	TOTAL FARMERS (n=102)	ORGANIC FARMERS (n=48)	CONVENTIONAL FARMERS (n=42)	ORGANIC-CONV. FARMERS (n=5)	BIODYNAMIC FARMERS (n=7)
	Means (s.d.)	Means (s.d.)	Means (s.d.)	Means (s.d.)	Means (s.d.)
Relevance					
1. Other Farmers	2.8480 (1.7559)	2.3021 (1.5324)	3.6190 (1.7208)	2.6000 (2.3022)	2.1429 (1.5999)
2. Farm Organizations	3.5882 (1.5974)	3.1667 (1.4452)	4.1429 (1.6278)	3.9000 (1.5969)	2.9286 (1.6183)
3. Government Sources	3.3382 (1.7165)	3.8229 (1.5419)	2.5833 (1.6377)	3.0000 (1.5811)	4.7856 (1.6036)
4. Education Courses	3.5147 (1.6642)	3.6771 (1.6389)	3.5952 (1.8221)	2.8000 (.8367)	2.4286 (.6075)
5. Agribusiness	4.7598 (1.8045)	5.4583 (1.2667)	3.5595 (1.8551)	6.6000 (.5477)	5.8571 (.5563)
6. Suppliers/Contractors	6.1765 (1.4188)	6.2188 (1.3405)	6.2619 (1.5151)	5.8000 (1.6432)	5.6429 (1.3452)
7. Media	3.7843 (1.8000)	3.3854 (1.8743)	4.2381 (1.7081)	3.2000 (1.6432)	4.2143 (1.4392)
Understandability					
1. Other Farmers	3.0245 (1.8487)	2.5521 (1.7572)	3.7381 (1.7849)	2.8000 (2.1679)	2.1429 (1.4639)
2. Farm Organizations	3.7745 (1.5915)	3.6979 (1.5903)	3.9524 (1.6410)	4.2000 (.8367)	2.9286 (1.6439)
3. Government Sources	3.2157 (1.7498)	3.6979 (1.6267)	2.5357 (1.6505)	2.8000 (1.4832)	4.2857 (2.0383)
4. Education Courses	3.2010 (1.6171)	3.1979 (1.6430)	3.4405 (1.7115)	2.4000 (1.1402)	2.3571 (.4756)
5. Agribusiness	4.6814 (1.8772)	5.1354 (1.7374)	3.7262 (1.8119)	6.4000 (.5477)	6.0714 (.5345)
6. Suppliers/Contractors	5.9412 (1.4930)	5.8750 (1.6161)	6.0119 (1.4587)	6.0000 (1.7321)	5.9286 (.6726)
7. Media	4.1422 (1.8353)	3.7604 (1.9241)	4.5952 (1.7258)	3.4000 (1.8166)	4.5714 (1.3671)
Trust					
1. Other Farmers	2.7108 (1.7806)	1.9792 (1.3207)	3.6071 (1.8130)	3.7000 (2.6833)	1.6429 (.6268)
2. Farm Organizations	3.3480 (1.4922)	3.2500 (1.3915)	2.4881 (1.5560)	2.9000 (1.8166)	2.7856 (1.5774)
3. Government Sources	3.4216 (1.7101)	4.1354 (1.3905)	3.6071 (1.6729)	3.3000 (1.5652)	4.2143 (1.5507)
4. Education Courses	2.8431 (1.4607)	2.7813 (1.5050)	2.9881 (1.5201)	2.7000 (1.4832)	2.5000 (.7638)
5. Agribusiness	5.1127 (1.7390)	5.7708 (1.4802)	4.1310 (1.7740)	6.0000 (.7071)	5.8571 (.6268)
6. Suppliers/Contractors	5.9951 (1.3266)	5.8854 (1.3770)	6.2500 (1.3031)	5.3000 (1.7176)	5.7143 (.3934)
7. Media	4.5588 (1.6157)	4.1979 (1.5903)	4.9048 (1.5897)	4.1000 (1.7464)	5.2857 (1.4679)

Note 1. Forced choice ranking (via card sort) of Information sources with 1=High and 7=Low for each criteria.

TABLE 5-8. INFORMATION SOURCES: KRUSKAL-WALLIS ONE-WAY ANOVA TESTS OF PRODUCTION METHOD GROUP DIFFERENCES IN COMPARATIVE RANKINGS

Information Sources	N	Chisquare	p	Order of Group Means (Note 1)
Relevance				
1. Other Farmers	109	14.9446	.0014	BD > ORG > ORG-CONV > CONV
2. Farm Organizations	106	12.1400	.0069	BD > ORG > ORG-CONV > CONV
3. Government Sources	109	19.6052	.0002	CONV > ORG-CONV > ORG > BD
4. Education Courses	108	6.4931	.0899	BD > ORG-CONV > CONV > ORG
5. Agribusiness	109	30.4903	.0000	CONV > ORG > BD > ORG-CONV
6. Suppliers/Contractors	103	3.7812	.2861	BD > ORG-CONV > ORG > CONV
7. Media	109	6.8148	.0780	ORG-CONV > ORG > BD > CONV
Understandability				
1. Other Farmers	109	11.1220	.0111	BD > ORG > ORG-CONV > CONV
2. Farm Organizations	108	5.2573	.1539	BD > ORG > CONV > ORG-CONV
3. Government Sources	109	13.8184	.0032	CONV > ORG-CONV > ORG > BD
4. Education Courses	108	4.1648	.2442	BD > ORG-CONV > ORG > CONV
5. Agribusiness	109	18.2399	.0004	CONV > ORG > BD > ORG-CONV
6. Suppliers/Contractors	103	1.5749	.6651	BD = ORG > ORG-CONV > CONV
7. Media	109	6.1847	.1030	ORG-CONV > ORG > BD > CONV
Trust				
1. Other Farmers	109	23.5754	.0000	BD > ORG > CONV > ORG-CONV
2. Farm Organizations	108	2.8301	.4186	BD > ORG-CONV > ORG > CONV
3. Government Sources	109	22.4032	.0001	CONV > ORG-CONV > BD > ORG
4. Education Courses	108	1.3748	.7115	BD > ORG-CONV > ORG > CONV
5. Agribusiness	109	22.5701	.0000	CONV > ORG > BD > ORG-CONV
6. Suppliers/Contractors	103	9.9569	.0189	ORG-CONV > BD > ORG > CONV
7. Media	109	7.4780	.0581	ORG-CONV > ORG > CONV > BD

Note 1. Abbreviations for Production Method Groups: BD = biodynamic; ORG = organic; CONV = conventional; ORG-CONV = organic-conventional

TABLE 5-9. INFORMATION SOURCES: COMPARISONS OF RANKINGS ON CRITERIA OF RELEVANCE, UNDERSTANDABILITY AND TRUST (KENDALL'S COEFFICIENT OF CONCORDANCE TESTS)

Information Sources	Kendall's W	Chisquare (df=2)	p	RANKINGS OF RELEVANCE, UNDERSTANDABILITY, TRUST OF INFORMATION SOURCE Sig. Differences in Criteria Rankings (* p<.05 ** p<.01 *** p<.001)
TOTAL GROUP (n=109)				
1. Other Farmers	.0216	4.7185	.0945	
2. Farm Organizations	.0357	7.5771	.0226	**Trust > Understandability
3. Government Sources	.0215	4.6853	.0961	*Understandability > Trust
4. Education Courses	.0968	20.9195	.0000	***Trust > Relevance; ** Trust > Understandability; * Understandability > Relevance.
5. Agribusiness	.0652	14.2180	.0008	***Understandability > Trust; **Relevance > Trust
6. Suppliers/Contract.	.0541	11.1543	.0038	**Understandability > Relevance; **Trust > Relevance
7. Media	.1348	29.3763	.0000	***Relevance > Trust; **Understandability > Trust; *Relevance > Understandability
ORGANIC FARMERS (n=51)				
1. Other Farmers	.0276	2.8108	.2453	
2. Farm Organizations	.0835	8.0846	.0167	**Relevance > Understandability
3. Government Sources	.0399	4.0746	.1304	
4. Education Courses	.2197	21.9704	.0000	***Trust > Relevance; ** Understandability > Relevance; *Trust > Understandability
5. Agribusiness	.1028	10.4870	.0053	**Understandability > Trust; *Relevance > Trust
6. Suppliers/Contract.	.0945	9.0732	.0107	*Trust > Relevance; *Trust > Understandability
7. Media	.1494	15.2388	.0005	**Relevance > Trust; *Understandability > Trust
CONVENTIONAL FARMERS (n=43)				
1. Other Farmers	.0055	.4733	.7893	
2. Farm Organizations	.0815	7.0087	.0301	*Trust > Relevance
3. Government Sources	.0086	.7381	.6914	
4. Education Courses	.0561	4.8254	.0896	*Trust > Relevance
5. Agribusiness	.0968	8.3226	.0156	*Understandability > Trust
6. Suppliers/Contractors	.0597	5.0154	.0815	*Understandability > Relevance
7. Media	.1224	10.5289	.0052	**Relevance > Trust

Other farmers. Other farmers proved to be the highest ranked agricultural information source for organic and bio-dynamic farmers in terms of relevance, understandability and trust. Conventional farmers were significantly less positive about other farmers and ranked them fourth in terms of relevance and understandability and third in terms of trust. Comparisons of mean rankings on each criterion showed that there were no significant differences for organic, conventional or organic-conventional farmers. Only bio-dynamic farmers tended to trust information from other farmers higher than they judged this information source as being relevant or understandable.

Total group comparisons of mean rankings of "other farmers" indicated significant group differences on all three criteria (relevance: Chisquare = 14.9446, $p = .0014$; understandability: Chisquare = 11.1220, $p = .0111$; trust: Chisquare = 23.5754, $p < .001$). Subsequent individual group comparisons showed that organic farmers rated other farmers higher than conventional farmers in terms of relevance ($p < .001$), understandability ($p < .001$), and trust ($p = .001$). Bio-dynamic farmers also ranked other farmers higher in terms of trust than conventional farmers did ($p < .01$).

In regards to relationships between rankings and background variables, there were no significant correlations for age and total years of farming experience. It appears though, that there is a positive correlation between mean rankings of information relevance and farm size for both organic ($r = .3726$, $p = .005$) and conventional ($r = .3696$, $p = .009$) farmers. This indicates that farmers on larger acreages rank the relevance of information from other farmers lower than those on smaller farms.

Farm organizations. In regards to farm organizations, farmers were asked to consider those farm organizations which they had the most contact with rather than speculate about those farm organizations which they were not knowledgeable about. Thus, organic farmers' rankings were primarily in reference to their organic organizations while conventional farmers' rankings were of their referent organizations.

Compared to other information sources, organic farmers ranked farm organizations second in terms of providing relevant information, third in terms of understandability and trust. Bio-dynamic farmers ranked farm organizations third on all three criteria. Conventional farmers ranked farm organizations fifth in terms of relevance and understandability and third in terms of trust compared to other information sources. Similarly, organic-conventional farmers ranked this information source fifth on relevance and understandability, and fourth on trust. Comparisons of rankings of criteria showed that organic farmers ranked the relevance of information from farm organizations higher than its understandability ($p < .01$). Conventional farmers ranked farm organizations higher in terms of trust rather than relevance ($p < .05$).

There were significant group differences concerning only the relevance (Chisquare = 12.1400, $p = .0069$) and understandability (Chisquare = 5.2573, $p = .1539$) of information provided by farm organizations. Organic and bio-dynamic farmers ranked farm organizations higher than conventional farmers on relevance ($p = .0002$) and understandability ($p = .0017$). Bio-dynamic farmers also ranked farm organizations higher than organic-conventional farmers on both criteria (relevance: $p = .0320$; understandability: $p < .05$).

For organic farmers, there were positive relationships between farmers' age and the understandability of information from farm organizations ($r = .2531$, $p = .041$) as well as between years of organic farming experience and relevance of farm organization information ($r= .3391$, $p = .009$). Thus it appears that younger and less experienced organic farmers rank information from farm organizations lower on these two criteria. However a negative relationship was observed between farm size and trust in information from farm organizations for both organic ($r = -.3214$, $p = .014$) and organic-conventional farmers ($r= -.9328$, $p = .01$). This suggests that organic and organic-conventional farmers with smaller acreages tend to trust their farm organization's information more highly than those on larger acreages.

Government sources. Government sources included personal contact with agricultural extension agents and researchers as well as information provided through government publications and workshops. Relative to other sources of information, organic farmers ranked government sources as fifth in terms of relevance, and third for understandability and trust. Conventional farmers were less positive in their relative rankings of government as an information source with rankings of fifth for relevance and understandability but third on trust. Organic-conventional farmers ranked government sources third on relevance and trust but fifth on understandability. The only difference in relative rankings on criteria was for the bio-dynamic farmers who ranked government sources higher on understandability than on relevance.

Production method group differences in mean rankings revealed that in terms of relevance, conventional farmers ranked government sources higher than either organic ($p = .003$) or bio-dynamic farmers ($p < .05$) on this criterion (Chisquare = 19.6052, $p = .0002$). Conventional farmers ranked government sources higher than organic farmers in terms of providing information that was understandable ($p < .001$) and trustworthy ($p < .001$). Organic-conventional farmers also trust government information sources more than organic farmers ($p < .05$). Bio-dynamic farmers trusted government sources less than conventional farmers did ($p < .01$). [Understandability: Chisquare = 13.8184, $p = .0032$; Trust: Chisquare = 22.4032, $p = .0001$]

The only significant correlation between mean rankings and background characteristics was found for bio-dynamic farmers. Those with smaller acreages tended to rank government sources higher on the relevance of their information ($r = -.8087$, $p = .014$).

Analysis of variance tests were conducted to ascertain the degree to which rankings of government sources are influenced by the frequency of contact a farmer had with government representatives. While production method type and frequency of contact with government were both significant explanatory variables in explaining differences in relevance rankings, there was no significant interaction between production method type and frequency of contact with government [Production method type: $F_{(3,68)}$ = 3.819, p = .014; frequency of contact: $F_{(3,68)}$ = 2.794, p = .047; production method type X frequency of contact: $F_{(6,68)}$ = .923, p = .484] Thus irrespective of production method type, those farmers who have the least amount of contact ("never/no longer") with government representatives ranked government sources as lower in relevance than those who have frequent contact with government representatives.

Education courses. Education courses were second only to print media sources of information in terms of frequency of mentions as a resource for agricultural information for all production method groups with the exception of bio-dynamic farmers. The education courses category included courses, seminars and workshops attended by farmers. The common dimension was that irrespective of the venue or sponsorship of the course/workshop, the flow of information was generally that of an expert disseminating information to the farmer.

Compared to other information sources, organic farmers ranked education courses fourth in terms of offering relevant information, second in understandability and trust. Conventional farmers' rankings were third in relevance, second in understandability and trust. Organic-conventional ranked education courses first on all three criteria while bio-dynamic farms ranked this source second in relevance, understandability and trust.

In regards to relative rankings, organic farmers ranked education courses lower in relevance than on trust ($p < .001$) or understandability ($p < .01$). Conventional farmers also ranked education courses higher on trust than on relevance ($p < .05$).

Between groups comparisons showed that bio-dynamic farmers feel that education courses are less relevant than organic farmers do ($p < .05$). Otherwise each group had similar judgements regarding the relevance, understandability and truthworthiness of the information offered at education courses.

Two significant relationships between organic farmers' background characteristics and education course criterion rankings were observed. Older organic and bio-dynamic farmers ranked education courses as having more relevance than their younger counterparts did (organic: $r = -.2972$, $p = .02$; bio-dynamic: $r = -.6756$, $p = .048$). In addition, organic farmers on larger acreages ranked education courses as providing more relevant information than those on smaller farms ($r = -.2765$, $p = .03$). Bio-dynamic farmers with larger acreages were also more likely to rank education courses lower on the trust criteria than those on smaller acreages ($r = .8672$, $p = .006$).

Agribusiness. The agribusiness category referred to industrial manufacturers of agricultural inputs, equipment and implements. The primary means of contact with this information source was through the use of their products, advertising literature, trade shows and industry sponsored workshops/seminars. When presented with this alternative, several farmers remarked on the interest of agribusiness in presenting information which was self-serving. Thus it is not surprising that both organic and conventional farmers judged information from agribusiness as being less trustworthy than understandable ($p < .05$). Organic farmers also felt that information from agribusiness was less trustworthy than relevant ($p < .001$). Organic farmers ranked agribusiness the lowest (seventh) of all information sources on the relevance of its information, and sixth on the criteria of understandability and trust. Both bio-dynamic and organic-conventional farmers ranked agribusiness the lowest on all three criteria. Conventional farmers ranked agribusiness information seventh on relevance, third on understandability, and fifth on trust.

This wide disparity in the views about agribusiness led to the large significant difference in the initial production method group comparisons (relevance: Chisquare = 30.4903, $p < .0001$; understandability: Chisquare = 18.2399, $p = .0004$; trust: Chisquare = 22.5701, $p < .0001$). Generally, conventional farmers ranked information from agribusiness higher than all other groups in terms of offering more relevant information (difference with organic, $p < .0001$; with organic-conventional, $p = .001$; with bio-dynamic, $p = .0016$), more understandable information (with organic, $p < .001$; with organic-conventional, $p < .01$; with bio-dynamic, $p < .01$), and more trustworthy information (with organic, $p < .001$; with organic-conventional, $p < .05$; with bio-dynamic, $p < .01$). Thus it would appear that relative to the other groups, conventional farmers hold agribusiness in higher esteem.

The only significant correlations between criterion rankings and background characteristics concerned farm size. For both organic and conventional farmers, those on larger farms ranked information from agribusiness higher in terms of its understandability (organic: $r = -.2855$, $p = .026$; conventional: $r = -.2749$, $p = .041$).

Suppliers/contractors/consultants. The category of suppliers, contractors and consultants referred to those individuals that farmers came in to contact on a more frequent interpersonal basis. These were persons who were readily available to provide advice in the event of a production problem. The most commonly referred to were the fieldmen with the local packinghouses or farmers cooperatives, IPM consultants, and local production input and equipment dealers. The relatively lower frequency of contact with these persons most probably contributed to their overall low rankings. Organic and conventional farmers ranked suppliers/contractors/ consultants seventh on all three criteria; organic-conventional and bio-dynamic farmers ranked them sixth (or second to last).

Thus it is not surprising that for the total group, suppliers/contractors/consultants were ranked lower on relevance than trust ($p < .01$) or understandability ($p < .01$). Between groups comparisons failed to yield any statistically significant differences. Only two correlations between mean rankings and background characteristics were observed. More experienced conventional farmers had lower rankings of this information source in terms of the trust criterion ($r = .3033$, $p = .025$). For bio-dynamic farmers, those with larger acreages ranked this information source lower in terms of understandability ($r = .7265$, $p = .032$).

Media. As measured by frequency, media (print, TV, radio) were the most commonly mentioned source of agricultural information. It is interesting then that media sources of information did not receive the highest ranking on the criteria in question. Organic farmers ranked media sources third on relevance, fifth on understandability and trust compared to other information sources. Conventional farmers ranked media sixth on relevance, understandability and trust. Bio-dynamic farms ranked media information sources fourth on relevance, fifth on understandability and trust. Organic-conventional farmers had rankings of fourth on relevance, fifth on understandability and trust.

Generally, farmers ranked media information sources higher in terms of relevance ($p < .001$) and clarity ($p < .01$) than in terms of trust. Group comparisons showed that organic farmers gave media sources higher rankings on relevance, clarity and trust than conventional farmers did (all at $p < .05$).

Significant relationships between background characteristics and mean rankings were only observed for organic and bio-dynamic farmers. Organic farmers with more years total and organic farming experience had higher mean rankings on the relevance of media information (organic: $r = -.2398$, $p = .05$; bio-dynamic: $r = -.3365$, $p = .01$). Those with more years organic farming experience also ranked media sources higher in terms of the understandability of their information ($r = -.2502$, $p = .043$). For their part, older bio-dynamic farmers gave lower trust rankings of media information than younger bio-dynamic farmers ($r = .7795$, $p = .019$).

Summary Discussion

To what degree are organic and conventional farmers different in terms of their communication behaviour? In his review of the innovation diffusion literature, Rogers (1983) concluded that early adopters of an innovation were more active seekers of information and had a greater exposure to interpersonal and mass media communication channels. To what extent do the different groups of farmers in this study match this profile? In terms of information seeking activity, both organic and conventional farmers appeared to be very similar -- both groups stated that they had accessed a wide variety of information sources. However, the biodynamic farmers were the least active seekers of agricultural information, relying primarily on bio-dynamic and organic farming literature for such information. This would suggest that bio-dynamic farmers would be less favourable candidates for adopting new innovations. In respect to exposure to interpersonal and mass media communication channels, organic farmers more closely fit the early adopter profile in that they more often cited interpersonal (other farmers) and radio/television (audio-visual mass media) as information sources. On the other hand, conventional farmers were just as likely to cited the print media and farm organizations as sources of information therefore no definitive conclusions regarding this characteristic can be made.

The results of the data analysis in this chapter suggest that there is significant support for the operation of selective exposure in communication behaviour for both organic and conventional farmers (as also found by Rogers, 1983; Lawson, 1982; Molder et al., 1991; Tait, 1990). This tends to be strongest for first, bio-dynamic farmers who almost exclusively relied on bio-dynamic and organic farming information sources and second, conventional farmers who had little contact with information sources identified with organic farming or sustainable agriculture. While they more often referred to information sources (publications, farm organizations) associated with sustainable agriculture, organic farmers also accessed (albeit to a lesser degree) several information sources associated with conventional agriculture (i.e., publications, farm organizations, conferences, government extension services). In addition, organic and bio-dynamic farmers were much less likely than conventional farmers to have referred to agribusiness suppliers as an information source.

A larger proportion of conventional farmers (89%) than organic farmers (67%) stated that they had contact with government agricultural extension services. Based on previous studies which found a positive relationship between contact with agricultural extension services and the adoption of Integrated Pest Management (Thomas et al., 1990) and soil conservation (Nowak, 1987), this would suggest that the conventional farmers in this study would be strong potential adopters for these types of agricultural innovations. In respect to the organic farmers in this study, a number of researchers (Altieri et al., 1983; Conacher

& Conacher, 1983; Hill & MacRae, 1990; MacRae, Hill, Henning & Mehuys, 1989; Soule & Piper, 1992) have found that one of the greatest problems facing organic farmers is the lack of extension advice regarding organic farming. Is this not a problem for B.C. organic farmers? Initially, it would appear that the situation for organic farmers in B.C. is better than that for farmers in other parts of Canada, the United States and Australia. However, a closer examination of the data reveals that extension advice regarding organic farming is not readily available throughout the province but instead is being offered by one region's extension agent. In addition, what advice is being offered by extension agents in the majority of the regions is often discounted as being irrelevant by those organic farmers who have asked for assistance. Therefore, it would appear that lack of organic extension services is also a problem for B.C. organic farmers.

These data offer substantial support for Research Questions 4a and 4b which propose that organic and conventional farmers attend to sources of information which support and confirm pre-existing practices and biases. For conventional farmers, there was relatively less attention paid to those information sources which would challenge conventional practices such as the utilization of synthetic chemicals. Very few conventional farmers have sought out alternative sustainable agriculture information sources (either interpersonal or print media).

In contrast, while organic farmers have a definite bias in seeking out information from sources which support their production method, there were some who were also attending to sources of information closely identified with conventional agricultural practices. Whether or not they utilized and applied this information in their farm operations is questionable as the data in Chapter 4 regarding sources of information for changes and innovations indicates. However, organic farmers were not like conventional farmers in that they attended to a wider variety of types of information sources which encompassed different approaches to agricultural practice.

Organic-conventional farmers had perhaps the widest range of information sources. They were equally attending to both organic and conventional information sources and appear to be playing out their betwixt-and-between role, as would be expected.

The most insular group proved to be the bio-dynamic farmer group which attended almost exclusively to information from those sources which supported their method of production. Very few bio-dynamic farmers sought out information from conventional agriculture information sources or from government sources. This indicates the strength of their commitment to the bio-dynamic method of agriculture as well as their belief (as often stated) in the adequacy of the longer established bio-dynamic literature to satisfy their information needs.

Therefore if one excludes the bio-dynamic farmer group, one could conclude that there is relatively stronger support for Research Question 4b than for Research Question 4a. However, one cannot entirely reject Research Question 4a given the stated preference of the majority of organic farmers to solicit information from sources supportive of their chosen production method.

To what degree are Research Questions 6a and 6b supported by these data? As earlier established in the first part of this chapter and in Chapter 4, each group of farmers attend primarily to information sources which are supportive of their production method. Thus the other farmers, farm organizations and media sought out as information sources by organic and bio-dynamic farmers were largely those involved in organic or sustainable agriculture. Similarly, conventional farmers sought out those information sources which supported conventional agricultural practices. Where there appear to be a number of differences is the degree to which each group views the information provided by their referent group as relevant, understandable and trustworthy. Organic and bio-dynamic farmers view their organic counterparts (as individuals, in organizations and in the media) more positively on all criteria than conventional farmers did.

Given the close identification of agribusiness, suppliers/contractors, and government sources with conventional agriculture, it is the findings regarding these information sources that provide substantial support for Research Question 6a. The rankings for agribusiness clearly indicate that organic, organic-conventional and bio-dynamic farmers regard this information source as one of the least relevant, understandable and trustworthy. In contrast, while conventional farmers doubt the relevance of agribusiness information, as a group they were much more positive about this information source than the other groups. There were no differences in groups' perceptions regarding suppliers/contractors, a finding which can be attributed to their very low utilization by all groups as an information source.

It is in respect to government sources that we find further support for Research Question 6a. As earlier discussed, organic farmers generally regard government extension services to be closely aligned with conventional agriculture. While organic farmers ranked government sources relatively high on understandability and trust (third compared to other information sources), the low ranking (fifth) on relevance reflects their judgment regarding the low utility of government information. Compared to conventional farmers, government sources were ranked significantly lower by non-conventional farmers on all three criteria thus supporting Research Question 6a. Taken together, the relative rankings accorded to agribusiness and government sources by organic and by conventional farmers suggest that Research Question 6a is valid.

In regards to Research Question 6b, there is less direct support. The way in which the ranking exercise needed to be conducted prevented a direct test of this research question. Instead there is a need to return to the data concerning which information sources are attended to. Returning back to the first section of this chapter, we learned that there were very few conventional farmers who had contact with organic farming information sources (either as individuals, organizations, or print media). Thus one could take this to indicate that conventional farmers do not seek out these information sources because they do not see them as offering information which is relevant to their needs. One could also impute that conventional farmers may not trust alternative agriculture information sources to the degree that they question the validity of the basic premises of organic agriculture (as will be addressed more directly later in this chapter). In this manner, there could be construed to be limited support for Research Question 6b.

PART B. ORGANIC FARMING -- MOTIVATIONS, PERCEPTIONS AND EVALUATIONS

Motivations to do Organic Farming

> "Ecologically sustainable agriculture is both a philosophy and a system of farming. It is based on a set of values that reflects an awareness of both ecological and social realities and empowerment that translates into responsible action." (Hill & MacRae, 1990, p. 2)

Previous surveys of organic farmers have addressed the question of what motivates these individuals to practise alternative agriculture methods. MacRae et al. (1990) report that the decision to convert to organic farming involves a radical shift in values and awareness which involve adopting a new holistic perspective on the relationships between farming and the natural environment. In their survey of Australian organic farmers, Conacher and Conacher (1983) found that the primary motivations of organic farmers involved concerns regarding the detrimental effect of synthetic chemicals as well as a number of philosophical factors such as ecology, working with nature, food quality, and human health. They noted that these concerns are especially strong for organic farmers even though they are also held by conventional farmers. The strong linkage between ecological beliefs and organic farming has also been observed by Altieri et al. (1983) in their study of organic farmers in California and by Lockeretz and Wernick (1980) in their study of organic farmers in the U.S. Corn Belt. In the latter study, the decision to convert to organic farming was found to be informed by both specific problems or concerns (livestock health, soil problems, cost of chemicals, human health) and ideological concerns (dislike of chemicals, environmental concern, religious concern). Lockeretz and Wernick found that organic farmers were most likely to see organic farming as being: healthier (for the farmer and his family, for livestock); "more wholesome and more in harmony with nature"; better for the soil; less environmentally damaging; "closer to the way of farming described in the Bible"; having lower production costs; higher net income; higher quality product; and easier tillage.

TABLE 5-10. ORGANIC FARMING: REASONS FOR CHOOSING TO BE AN ORGANIC FARMER

REASONS FOR BEING ORGANIC	TOTAL FARMERS (n=66) No. (%)	ORGANIC FARMERS (n=53) No. (%)	ORGANIC-CONVENTIONAL FARMERS (n=5) No. (%)	BIODYNAMIC FARMERS (n=8) No. (%)
Environmental				
1. Greater awareness of environmental/ sustainable agriculture issues	31 (47.0%)	30 (53.6%)	1 (20.0%)	--
2. Production of "safe" food (no chemical residues)	13 (19.7%)	13 (24.5%)	--	--
3. Concern over soil/water pollution	5 (7.6%)	5 (9.4%)	--	--
4. Concern over poor soil conditions (tilth, productivity)	5 (7.6%)	5 (9.4%)	--	--
Personal				
5. It's a way of life/spiritual reasons	25 (37.9%)	18 (34.0%)	--	7 (87.5%)
6. Born into organic/biodynamic family	12 (18.2%)	4 (7.5%)	--	8 (100%)
7. Self/family experience with chemical poisoning	10 (15.2%)	9 (17.0%)	1 (20.0%)	--
8. Encouragement of friend/relative	4 (6.1%)	3 (5.7%)	1 (20.0%)	--
Economic				
9. Higher market price of organic products	6 (9.1%)	3 (5.7%)	3 (60.0%)	--
10. High costs of synthetic agrichemicals	4 (6.1%)	4 (7.5%)	--	--
11. Lack of effectiveness of synthetic agrichemicals	4 (6.1%)	4 (7.5%)	--	--
Information				
12. Information from books/media	3 (4.5%)	3 (5.7%)	--	--
13. Attendance at organic farming meeting	1 (1.5%)	--	1 (20.0%)	--

==

Two recent surveys of Canadian organic farmers (Molder et al, 1991; Weymes, 1990) confirm these findings regarding motivations to practise organic farming. For the 110 Canadian organic farmers surveyed by Weymes, the most important motivations were the use of chemicals (33%), the environment (29%), own health or safety (27%) and profitability (9%). For the 69 Saskatchewan organic farmers surveyed by Molder et al, their goals (in decending order of ranked importance) were: maintain and/or improve soil quality, reduce chemical residues in food, avoid being forced out of business, avoid years of low profits or losses, improve family's standard of living, produce your own food, increase net worth, make the most profit each year and increase time off from farming. As concluded by these researchers, profit maximization goals are relatively less important to organic farmers than environmental concerns. The low ranking given the goal of increasing time off from farming indicates that organic farmers enjoy farming as a lifestyle.

When asked why they had decided to practice organic or bio-dynamic farmers, many of the farmers in this study cited many of the same reasons as those in other surveys. A content analysis of their answers often showed a combination of environmental, personal, economic and informational reasons.

Environmental and personal reasons. For many organic farmers, their choice was informed by a greater awareness of environmental and sustainable agriculture issues as the following quotes illustrate.

> "For me, personally, on the surface what I do is grow vegetables. That's the material aspect of it. But underneath, what I feel I'm doing is growing hope. It's a hope in an environmental sense, in a planetary sense that somebody is doing something and that there's good food being produced and you know that you're doing the right thing as well as you can. It's also an attempt to create an alternative agriculture. That's the important thing. That's the thing that impels me to do what I'm doing." (Organic vegetable farmer)

> "I started to see that just as in social issues, in agricultural and environmental issues we are building deficits by not addressing problems, in looking for quick fixes. So if I turn that around to a sustainable community, sustainable culture, sustainable agriculture then you have to start looking at becoming a part of things rather than sitting on top of things and in that frame of working things. So the big message there is for me, whether it's social, environmental, political, economic is to empower people to change and then embrace change. A very holistic approach to things." (Organic vegetable farmer)

Several farmers (especially those who had farmed in the Prairie provinces) were motivated to convert by their observations of deteriorating soil conditions resulting from conventional agricultural practices.

> "The soil structure was changing. The organic matter in Saskatchewan had gone from 6% or 8% depending on where you were, it's about 3% in some areas. And that's the bank account and we have squandered that bank account and it's like dust. I can remember standing in the springtime in the barn and you couldn't see 4 feet ahead of you it was blowing dust that badly. And I thought, this isn't right." (Organic vegetable farmer)

> "When I grew up on the farm [in Alberta], when I first started 30 years ago, we were basically organic, very few chemicals. I've seen over those years as we've changed to chemicals, we've changed the land. The soil's getting harder and lumpier and not as fertile. We're actually getting bigger crops, more production but the only reason is that we're putting chemicals in and the plants are taking the chemicals. So we're getting

> the production but the soil is getting worse. We have to go back to organics otherwise the soil keeps deteriorating and will continue to." (Organic livestock farmer)

Another environmental concern expressed by farmers was the desire to produce food that had no chemical residues.

> "The essential thing for me in organic farming is that the food that is produced is not tainted with anything that could be harmful to anyone. It's just that there's no question about the quality of the food." (Organic vegetable farmer)

The next most often cited reasons were those of a personal nature. For example, almost all of the bio-dynamic farmers had grown up in families which followed Rudolph Steiner's anthroposophic philosophy of which bio-dynamic farming is a key part. For bio-dynamic and organic farmers whose parents had practised non-conventional agriculture, the choice was easy. There was one bio-dynamic farmer who had grown up on a bio-dynamic farm related how as a result of his experience in agricultural college, he had been temporarily converted to conventional methods.

For 38% of the farmers interviewed, the choice to farm using alternative methods involved a commitment to a way of life. Many also mentioned the spiritual connection they feel with their practices. For bio-dynamic farmers this stems from their anthroposophic beliefs as expressed by these two bio-dynamic farmers.

> "Bio-dynamic farming, it is the nearest to nature, ecologically speaking that you can do...It's for the regeneration of the soil. It's putting life back into the soil, life back into our whole environment. Rudolph Steiner said that it was necessary for the healing of the earth that bio-dynamic farming should be practised. That the earth organism was being so badly damaged and that was in 1923!" (Bio-dynamic mixed farmer)

> "We're bio-dynamic farmers and what stands behind that is a worldview. And a part of that worldview is that I see my task, my calling as a human being to be of service to humanity." (Bio-dynamic mixed farmer)

For some organic farmers, the spiritual connection to farming is just as strong.

> "I didn't want to be a lawyer like my father. There was something magical about growing stuff and mystical. At the time, I felt I had to find something in that area that appeals to my soul." (Organic garlic/vegetable farmer)

When I asked the question: "What is the land dedicated to?", although expecting an answer that detailed how many acres were in which crops, one organic farmer reinterpreted the question and answered,

> "Dedication is an interesting word! It would be dedicated to the Creator. We feel we are stewards and that makes a very different flavour on the work ownership. Because most people would say they are dedicated to staying in business...From my standpoint, in honouring the stewardship aspect we are basically here to do what's right on the land." (Organic livestock farmer)

Stories about negative experiences with synthetic pesticides were common amongst those who had conventional agriculture experience. Some had personally experienced the negative health effects of exposure to pesticide sprays in the tree fruit industry.

> "Well, _____ was picking conventional pears and his nose started bleeding. Well, he didn't know why his nose was bleeding but then it was reoccurring each day." (Organic tree fruit/herb farmer)

> "It's for the health. We have a history in my family, on my father's side, most of the family is dead from cancer. And we don't know if there's a link. All the family grew up orcharding but it's hard to say...
>
> So I took an applicators course before I got into this. I said no way I'm handling this stuff not knowing what I'm doing. So I suit up with a respirator and gloves and helmet and suit before I bring out the pesticide. In the first year I did an organophosphate, there's a count they can do in your blood where they can check to see if you're getting poisoned. And even with all that, it went up a little bit, even with all the protection. So if I can get away from all this poison stuff, I'm happy." (Organic tree fruit farmer)

For tree fruit farmers in particular, the close proximity of the family home to the orchard was a major impetus to seek out alternative methods of pest control.

Those farmers with grain farming experience related the most problems with negative health effects from pesticide spraying. One current organic-conventional farmer related the effect of using synthetic pesticides while grain farming in Saskatchewan as follows,

> "Chemicals are hard on people. I know what it's all about because there are times when I can't breathe, the chemicals have gotten to me so much in Saskatchewan. Oh yea, we used chemicals like you wouldn't believe. Especially in rapeseed you have flea beetles and after a day's spraying, you're in it for about 14 hours, you get off the tractor and it's like you've killed yourself. And that's wearing a dust mask and goggles and everything. You still get some of it, you can feel it even with a chemical mask. So like now, my chest isn't what it should be." (Organic-conventional vegetable/berry farmer)

And another former grain farmer, now growing organic vegetables related,

> "Well, with things like using sprays, my tongue would go numb, my lips would go numb. Thinking it wasn't like that this morning. Now I've been spraying all day, why is it like this? We were spraying things like Avadex, herbicides for wild oat control. We didn't use any insecticides,

> all we used were herbicides. But pretty powerful stuff...There seemed to be a higher degree recently of a lot more younger people coming down with cancer, I've had two very close friends die from cancer. They were farming. My age [40 years]. Several years ago. Lympathic cancer." (Organic vegetable farmer)

Accidents with herbicides were related by a number of farmers. One organic grain farmer told of the time he accidentally spilled concentrated herbicide on the ground and 10 years later, it is still bare ground. His neighbour had extensive burns on her hands and arms as a result of herbicide spillage. One organic-conventional farmer related how some of a granular herbicide (Casoran -- Dichlobenil) which he had spread along a fence line for poison oak had spilled into the neighbouring pasture. The following spring all the calves of the livestock herd that had been in that pasture were born dead.

> "We had never had that ever happen before and when that happened, that was a shock to us. When you see what should have been a newborn calf full of life and it wasn't, it makes you realize that these chemicals we are using can have some effects on us." (Organic-conventional tree fruit/vegetable farmer)

In addition to specific examples of the negative effects of pesticides, other farmers related more general impressions of their impact on the natural environment.

> "In 1979 and 1980, I put one spray on each year and that was enough to discourage me from ever doing it again. All the time I was sitting on the sprayer putting it on the trees I had a really strong feeling that what I was doing was wrong. Not only wrong but stupid...There is a certain level of activity, it is a subliminal level of activity, you sense it when you are in the orchard. I didn't ever know about it until after I put the spray on and it wasn't there anymore. The orchard really felt dead. I felt like whatever was still living in the orchard was really pissed off with me for having done this. The feeling lasted for 10 days. That was enough to convince me that I had better do something else." (Organic tree fruit farmer)

> "All I know is that there weren't any birds around, I would notice. In the springtime, it just didn't _feel_ the same. These are very subjective kinds of things. It was just something in me that said, _this is not right_. I don't want to be doing this. Why would I want to be pouring _poisons_ all over my land? I just came to a place where it didn't make any sense." (Organic vegetable farmer)

Economic reasons. While economic reasons were only mentioned as motivating factors by a relatively small number of organic and organic-conventional (but no bio-dynamic) farmers, the prospect of higher market prices was an incentive. For one organic-conventional farmer in transition, it is his primary motivation.

> "For me, I hope there will be an economic benefit for it in the long and short time. The strategy I have and the reason I've only converted the acreage that I have is it's all yuppie type product. If people are willing to spend extra for that unique new variety, they're also probably willing to spend a certain percentage more for it being organic." (Organic-conventional tree fruit farmer)

Minimizing high input costs were a consideration for four organic farmers. Others had noted that there were minimal productive returns on the use of synthetic chemicals such as fertilizers. This was the case for the four organic farmers in the Peace River region who had conducted their own experiments with synthetic and organic fertilizers on field plots. Their conclusion was that synthetic fertilizers did not raise yields enough to justify the added expense.

Information reasons. The least mentioned reason for conversion was information from either books, media or organic farming organizations. This may change as both sources of information grow but for the current group of farmers, other considerations were more important.

Summary Discussion

It was interesting to find conventional farmers who had considered but rejected converting to organic farming. For several, the primary reasons were that they felt that organic farming methods were inadequate in terms of pest control and/or fertilization. Others had concluded that it was just not feasible given the scale of operation they were committed to as the following quote illustrates.

> "We looked at switching to organic. We looked at it very very hard because we are a large fresh market operation. We can see the concern from the public as far as pesticides. We looked at the crops that we grow and the ability to grow those crops organically with some degree of quality and to turn a profit. It didn't matter which way we sliced it there wasn't a hope in hell. We would have been out of business in less than 24 months. There was no way around it for a farm of our size. If you want to run a little backyard market garden operation that is only 5 acres, you could probably do it. I don't know if you'd make a living at it, but you wouldn't lose any money at it." (Conventional berry/vegetable farmer)

Still, there were two conventional farmers who were currently investigating converting part of their land to organic production on a trial basis and several others who were integrating organic methods (e.g., biological controls, green manures) into their farm practices. For one former organic farm family which had started out as an organic operation and are now practising low-input sustainable agriculture, the production problems proved to be overwhelming.

> "There are some people who are very strictly organic and we tried to be that but we could not make any money at it in a small market like we have...I think that just the intensity of labour that you need for a strictly organic process, and like _____ said, we tried valiantly for at least 10 years. I think that on a small scale, it can be done very effectively. But for our particular situation, for our labour pool, for our own marketing situation, it wasn't working."
>
> [Question: At what point did you make the decision to alter your production method?]
>
> "I think it was that one time when we had about 2000 or 3000 cabbages that we basically went into the ground and picked the maggots out of the roots. I think that was probably it!" (Conventional vegetable/berry farmer)

It appears that the organic and bio-dynamic farmers interviewed in this study are no different than those in other studies in terms of their motivations to practice organic agriculture. The primary motivations to convert to organic farming are those that are of a subjective or philosophical nature as well as concern over personal health. Many seemed to arrived at their decisions independently, through their own experiences with agrichemicals or through an enhanced personal awareness of the need for change. In contrast, it is economic reasons (labour, profits) that appear to be preventing sympathetic conventional farmers from converting.

As will be illustrated in the following sections on beliefs and attitudes regarding organic farming, agrichemicals and environmental issues, it is the organic and bio-dynamic farmers' subjective rather than economic perceptions which are the most important.

Definitions and Perceptions of Organic Farming

The open-ended question, "How would you define organic farming?" resulted in a wide variety of responses. Each response was content analyzed according to which themes or facets of organic farming were identified. The nature of responses ranged from short definitions of organic farming practices (primarily by conventional farmers) to very extended discussions of the philosophy of organic farming. The results of the qualitative analysis are presented in Table 5-11. There were significant differences between production method groups for 13 of the 20 identified themes or categories of responses.

Production characteristics. In terms of production characteristics, the identification that organic farming does not use synthetic chemicals for pest control or fertilizers were the most common themes. While mentioned often by all groups, conventional and organic-conventional farmers were the most likely to mention this production characteristic in their definitions (pest control: $F_{(3,113)} = 6.9245$, $p = .0003$; fertilizer: $F_{(3,113)} = 3.3089$, $p = .0227$). Bio-dynamic farmers were the only ones to refer to the use of bio-dynamic preparations.

Farmers' definitions of organic farming were often framed as how it is different from conventional agriculture. As the following excerpts from their definitions of organic farming illustrates, there were substantial differences between farmers in terms of the distinction made between synthetic chemical and organic inputs in agricultural production. As often remarked by conventional farmers,

> "Organic farming would be farming without the use of pesticides. I'm not a big fan of a lot about organic farming. As far as I'm concerned, chemical fertilizers are organic. Most of it is from the ground in Saskatchewan. How more organic can you get than a bunch of rock that has been dug out of Saskatchewan? It's just put in a way that makes it readily available to the plant." (Conventional vegetable/poultry farmer)

> "I take exception to dry or artificial fertilizer use because I can't see what the difference is between compost and artificial fertilizer because artificial fertilizer is still nitrogen, phosphate and potash and I can't see why that part of it shouldn't be classed as organic. It's maybe a little bit hard on soil organisms, they say, because the regular granular fertilizer is too quick of a release so that affects them because of the burning. But if you have a slow release fertilizer, I can't see any difference." (Conventional vegetable/berry farmer)

In contrast, those who were using organic methods view the role of fertilizers in a substantially different way.

> "Probably the most important thing is going back to using some of the good practices like crop rotation and feeding your plants not on a shock basis but more on a natural basis. I'm thinking now of manures. Putting manures in so that you're adding fibres, micronutrients. Whereas the

> other way, you're going out there and supershocking or superinjecting your trees at a certain period with a blast of nitrogen to give them growth." (Organic-conventional tree fruit/vegetable farmer)

> "And then to get down to the chemicals part. Because you care for the soil and because you respect the life in the soil and you recognize that the fertility of the soil is because of the life in the soil, you do not use chemicals. Because they hurt the life in the soil. There is plenty of research, even though there are a lot of researchers who will say, 'No, they have minimal effect', There is plenty of good research to say how long certain chemicals do have a very real effect on different microorganisms which are absolutely essential to the health of the soil." (Organic vegetable farmer)

The development of integrated pest management as a means of reducing the use of synthetic pesticides was regarded by both conventional and organic farmers as being progressive. While organic farmers viewed IPM as an interim step towards organic farming, conventional farmers were more likely to equate IPM with organic farming as the following statement illustrates.

> "I think, for the most part, there is very little difference between integrated pest management and organic farming. We still use the pesticides in IPM but they've been substantially reduced over the last 10 years. We probably spray less than half now than we used to, and we'll probably cut that in half again by the year 2000." (Conventional berry/vegetable farmer)

A common theme which emerged for organic and bio-dynamic farmers is that in organic farming, one takes production cues from the natural environment ($F_{(3,113)} = 9.0815$, $p < .001$). Several characterized conventional agriculture as less responsive to local situations.

> "Recipe farming, or chemical farming where you follow the handbook and put your seeds in at such and such a time and hit them with chemicals at so much per acre, NPK, etc., and if you have this problem, you hit them with that and if you have that problem you hit them with something else." (Organic vegetable farmer)

> "Well I think other ways of farming [not organic] can be done without any active understanding of how nature works. It can basically be done by applications of fertilizers and pesticides, insecticides, fungicides. You don't necessarily have to have knowledge of the fungus, you don't necessarily have to have knowledge of the weeds to do it." (Organic tree fruit farmer)

TABLE 5-11. ORGANIC FARMING: CONTENT ANALYSIS OF DEFINITIONS OF ORGANIC FARMING

ORGANIC FARMING....	TOTAL FARMERS (n=117) Mean (s.d.)	ORGANIC FARMERS (n=57) Mean (s.d.)	CONVENTIONAL FARMERS (n=45) Mean (s.d.)	ORGANIC-CONVENTIONAL FARMERS (n=6) Mean (s.d.)	BIODYNAMIC FARMERS (n=9) Mean (s.d.)
Production Characteristics					
1. Does not use synthetic chemicals for					
a. pest control	.5299 (.5182)***	.3860 (.4911)	.7111 (.4584)	1.000 (.6325)	.2222 (.4410)
b. fertilizer	.4872 (.5189)*	.3860 (.5263)	.6444 (.4841)	.6667 (.5164)	.2222 (.4410)
c. growth regulators/ feed additives	.0513 (.2215)	.0351 (.1856)	.0889 (.2878)	--	--
2. Uses biological pest controls	.0256 (.1587)	.0526 (.2253)	--	--	--
3. Uses biodynamic preparations	.0427 (.2031)***	--	--	--	.5556 (.5270)
4. Uses cultural controls for weeds and pests	.0855 (.2808)	.0877 (.2854)	.0667 (.2523)	.1667 (.4082)	.1111 (.3333)
5. Is little different from IPM	.0513 (.2215)	--	.1333 (.3438)	--	--
6. Minimizes use of off-farm inputs	.1709 (.3781)	.2281 (.4233)	.0667 (.2523)	.1667 (.4082)	.3333 (.5000)
7. Is a low-cost production system	.0171 (.1302)	.0351 (.1856)	--	--	
8. Takes production cues from natural environment	.1966 (.3991)***	.3333 (.4756)	--	--	.4449 (.5270)
Outcome Characteristics					
9. Is an ecologically sound production system	.2991 (.4599)***	.4561 (.5025)	.0222 (.1491)	.5000 (.5477)	.5556 (.5270)
10. Is a healthy production system (safe/no residues)	.1709 (.3781)***	.2632 (.4443)	.0222 (.1491)	.5000 (.5477)	.1111 (.3333)
11. Builds the soil	.2906 (.4560)***	.4737 (.5037)	.0222 (.1491)	.1667 (.4082)	.5556 (.5270)
12. Produces low quality/ quantity of food	.1453 (.3539)***	.0175 (.1325)	.3556 (.4841)	--	--
13. Creates pest problems for others	.0171 (.1302)	--	.0444 (.2084)	--	--
14. Is impractical	.2479 (.4336)***	.0175 (.1325)	.5778 (.4995)	.3333 (.5164)	--
15. Is only a marketing tool (scam)	.0855 (.2808)***	--	.2222 (.4204)	--	--

Note 1. Asterisks (*) denote statistically significant intergroup differences based on ANOVA comparison of means tests.
* $p < .05$ ** $p < .01$ ***$p<.001$

TABLE 5-11.(continued) ORGANIC FARMING: CONTENT ANALYSIS OF DEFINITIONS OF ORGANIC FARMING

ORGANIC FARMING....	TOTAL FARMERS (n=117) Mean (s.d.)	ORGANIC FARMERS (n=57) Mean (s.d.)	CONVENTIONAL FARMERS (n=45) Mean (s.d.)	ORGANIC-CONVENTIONAL FARMERS (n=6) Mean (s.d.)	BIODYNAMIC FARMERS (n=9) Mean (s.d.)
Philosophical Characteristics					
16. Is a lifestyle	.0855 (.2808)	.1579 (.3679)	.0222 (.1491)	--	--
17. Is working in harmony with Nature	.2564 (.4385)***	.4035 (.4950)	.0222 (.1491)	.1667 (.4082)	.5556 (.5270)
18. Is a philosophy of farming	.1538 (.3624)***	.1579 (.3679)	.0444 (.2084)	.1667 (.4082)	.6667 (.5000)
19. Is a spiritual endeavour	.0598 (.2382)***	.0526 (.2253)	--	--	.4444 (.5270)
Other					
20. There are several different types of organic farming	.0513 (.2215)*	--	.0889 (.2878)	--	.2222 (.4410)

Note 1. Asterisks (*) denote statistically significant intergroup differences based on ANOVA comparison of means tests.

* $p < .05$ ** $p < .01$ *** $p < .001$

This caricature of conventional farming is contrasted by the organic farmers' perception that their practice requires a higher level of craftsmanship.

> "Organic farming is not a job of last resorts. It's a highly skilled job and the requirements are very extensive because you're mainly on your own....We've noticed amongst our friends that don't farm organically that they're so heavily into believing what they're told by researchers and agribusiness. And I feel sorry for them because they've never been really trained to think for themselves because they get the [production] guide and they are told what to spray." (Organic tree fruit/vegetable farmer)

> "Organic farming is going back and using some of the original practices that our forefathers used before the science of chemistry came into play for controlling the insects. It's learning to manage things more closely to the way Mother Nature wanted us to manage them. It means without the use of manmade chemicals. With the use of modern technology in monitoring insect populations, predators, understanding their different life cycles, understanding what real economic damage is." (Organic-conventional tree fruit/vegetable farmer)

Outcome characteristics. While conventional farmers were more likely to identify negative outcomes of organic farming, organic, bio-dynamic and organic-conventional farmers focused on the positive benefits. The theme of organic farming as being an ecologically sound agricultural production system was especially prominent ($F_{(3,113)} = 5.6474$, $p = .0012$).

> "The basic principle of organic farming is ecological balance and not trying to produce 100% of a perfect product because nature doesn't do that. Conventional methods are basically, their focus is technology and technological solutions so therefore rather than looking for a software solution, they look for a hardware solution if you want to computer terminology. They're interested in using more technological force to fight against the forces of nature. It's a confrontation rather than a synthesis. Less than one-tenth of 1% of chemicals you apply do what they're supposed to do and the rest, 99% goes into the environment. And we cannot continue to put tons and tons of manmade chemicals into the environment." (Organic tree fruit farmer)

> "Organic methods of farming are methods that you use that will sustain, and perhaps enhance, but I believe you don't need to enhance so much as to sustain soil fertility and have a minimal impact on the environment at large. And not forget that every aspect of the environment is joined to each other. It is all interdependent. You cannot work in isolation." (Organic vegetable farmer)

> "I refer to organic farming as ecological farming. I think that defines itself, fitting into the local environment. I don't see much ecological about conventional farming, it's more of a mining, it's resource extraction as opposed to working with it. There's no emphasis on rebuilding, on using the natural processes in the areas, it's a forced process. We're back to the adversarial relationship with Mother Nature which seems to be an ongoing problem, not just with agriculture but with all industries." (Organic mixed farmer)

For organic farmers, perhaps the foremost factor in achieving environmental sustainability involves building the soil as the foundation for growing. Many focused solely on this aspect of organic farming, i.e., that achieving a healthy soil was the most important aspect of their work, not the production of food per se.

> "I like to talk about regenerative [agriculture] and how I define that is practices which build soil structure, build and enhance soil structure and vitality. What I mean by that is the amount of microorganisms that are living in the soil, the life in the soil. It's removing your focus from maximizing crop production to feeding the soil, to building the soil. Just focusing on the soil structure rather than on the plants' specific needs." (Organic vegetable farmer)

> "An organic farmer is someone who tries to farm walking lightly on the earth without the addition of things that can be dangerous or toxic to either the people or to the ground. I think the soil is a resource that should be preserved. That is what I mean by walking lightly on the ground." (Organic sheep farmer)

> "Organic methods are methods of growing food by which the care of the soil is the ultimate concern. Recognizing the soil is an environment. Recognizing the soil is a living, or many many living environments. And taking care to nurture that because farming is not a natural occurrence...Our own observance here is that when you have a healthy soil, you do not have disease problems. As soon as you start killing off organisms in the soil, either disease causing organisms and usually you start trying to kill something off because it's a disease causing organism, you also kill off the organisms that control the disease causing organism. And that is one thing that we have observed here year after year. We have literally never had a disease problem. Disease is uncommon." (Organic vegetable farmer)

Whereas organic and bio-dynamic farmers stressed the environmental benefits to be derived from organic farming, conventional farmers focused on the "impracticality" of these methods. Many felt that the widespread conversion to organic farming would not produce enough food to meet the needs of the population. For example,

> "Organics is an admirable idea and there's probably a minor role for it to play, but the bottom line is that we have a food supply in this country that is second to none in the world. Probably less than 2% of the population is involved in producing food for the 100%. The way that is done is because of the type of intense concentration of farming that is done now. Because we have a land base that is shrinking we have to get a high production out of our land and we don't do that if we let diseases and pests run rampant." (Conventional berry/vegetable farmer)

> "Right now I would say that if every farmer in the world were forced to go organic, our food supply would be cut in half. That's now." (Conventional vegetable/berry farmer)

Another aspect of organic farming which was targeted by conventional farmers was that they viewed it to be not economically viable, especially on a commercial scale.

> "I think it's [organic farming] something that is nice. It's not something that can be done on a commercial scale. It would be nice to be able to have production without chemicals. On the scale that we're on, it's not possible. That's the bottom line." (Conventional vegetable/tree fruit farmer)

> "I think it's a very good idea but not practical. For farming nowadays you have to have such a large amount of everything that growing organically, it's almost impossible to handle very much. I would love to do that if I was a hobby farmer." (Conventional grain farmer)

> "But the perception of organic farming as it sits right now, the labour required to produce the product and the returns from that produce do not make economic sense." (Conventional tree fruit/vegetable farmer)

> "They [organic farmers] had problems with weeds, what do they do? Handpick them. That's fine if you have 40 acres or 70 acres. What if you have 1700 acres? How would you handpick 1700 acres of obnoxious weeds?" (Conventional grain farmer)

One aspect concerning scale of production expressed by conventional growers was that the high market price differential for organic products would disappear if organic production levels were to rise significantly.

> "Unfortunately it's a lot of niche markets now so if there is a lot of production, we can't be sure how it will be marketed or if the price structure will remain there. You certainly would have to be paid more for your organic grown material because you're not going to get the yields that you would normally get." (Conventional grain farmer)

Still others question the willingness of consumers to pay a higher price for organic products.

> "You know the people go into the store and see the organic price and they're not going to touch it. Organic you can grow but who is going to pay the price?" (Conventional vegetable farmer)

> "Right now they're [organic grain farmers] looking at double the price for wheat. Canadian producers traditionally like good, safe, uniform product cheap. Cheap is the big one. Some people in the cities will pay that. It's great that they're going that way but I don't think they will." (Conventional grain farmer)

> "Everybody wants organic until they see the price and the quality then all of a sudden they look over their shoulder when nobody's looking and they buy the radishes that have been sprayed instead of the ones that haven't. Who wants to pay $1.49 for a bunch of radishes when you can buy it for 29 cents?" (Conventional berry/vegetable farmer)

One defense of the market price premium for organic products is that it reflects the true cost of production as explained by this organic livestock producer.

> "One of the things that defines organic farming by and large is the policy of point of purchase costing. In other words, product is fully costed at point of purchase, there is no hidden or unassessed cost whereas in conventional farming, we are constantly subsidizing the cost of production and in the same way we have a national debt, we have an agricultural debt, we have a pollution debt." (Organic livestock farmer)

The debate over safe food was an important theme. More organic farmers contended that food produced by organic methods was safer than that produced by conventional farmers ($F_{(3,113)} = 5.6474$, $p = .0012$). The theme of poisoning the land and humans was often mentioned.

> "To me, it's a sustainable means of producing food. It's something we committed ourselves to so that our children could have clean food and water to tell you the truth!...I am personally convinced that a lot of the illness, a lot of the sickness, the health care costs, the reason is the food that people eat, and I know that people are being poisoned." (Organic mixed farmer)

> "I see the difference between organic as the food is theoretically supposed to be nutritional and should have medicinal value. It should keep us healthy. Conventional wisdom seems to be that if a product looks good, it doesn't matter if it has nutritional or medicinal value. I for one, don't believe that. That chemically oriented view of things is very industrial and the value of the endproduct doesn't seem to have any bearing on what they're doing. Whereas for me, I think the most important thing is the value of the endproduct." (Organic specialty/vegetable farmer)

In contrast, several conventional farmers defended the safety of their food and cited as evidence the negative tests for pesticide residues on their fruits and vegetables.

> "Both 1990 and 1991 the environment department took samples of a bunch of crops and in both years we got reports back that there are no residues in the product. That's nice and we've put a photocopy of that letter up and prominently display it at the stand." (Conventional vegetable/berry farmer)

However there was concern about pesticide residues in food expressed by some conventional farmers.

> "And you find that most blueberry farmers don't really spray very much. The issue of whether there are chemicals on the berries doesn't bother me. But I am concerned with cherries or strawberries or raspberries. I've eaten lots of cherries that smelled of Captan, tasted of Captan. I could actually see it, taste it, smell it. That does bother me." (Conventional berry farmer)

There were a number of criticisms about the quality of organic food that was in the marketplace.

> "Because of the high quality standards set by the government of Canada as far as the allowable levels of pests in the processing industry, you can't

> get away without spraying. It's impossible. It's physically impossible. You can take the best organic grower in the world and they cannot make processing grade. I've seen their farms and there's no way. If I showed up with a truckload of product that looked like theirs I would be rejected at the dock. They would say 'Go dump it'." (Conventional vegetable/berry farmer)

> "Their [organic] vegetables that I see in the stores, I don't think I'll eat. Some of it looks more dangerous to eat than if it had chemicals on it. Some of it's mouldy and stuff like that. Is that safe to eat? If it's mouldy and rotting?" (Conventional vegetable/poultry farmer)

Several conventional farmers (22%) expressed extreme skepticism about the marketing of organic products, even going to the extent of discounting it as only a marketing tool or a fraudulent scam. (Notably this point was not raised by those who practice organic or bio-dynamic farming methods.) As these comments by two vegetable/tree fruit farmers illustrates, there is a high level of distrust amongst some conventional farmers.

> "I don't know what organic farming is. I don't think the public knows what it is. I think that organic food when it gets to the retail level or when it is actually sold to the public is strictly a marketing scam. The few people I know who sell organic, I know that a good percentage of them will spray in the late evenings or at other times when it's not too public. Or when the crunch is on, not all the time. When it gets to the point when you are losing your strawberry crop because it is full of disease, you go out and spray it." (Conventional vegetable/tree fruit farmer)

> "I think it is a marketing tool, it is a fabulous tool because it works on fear. Fear is a great thing. You can get elected on it, fight wars with it. Now you can market fruit, vegetables, products with it." (Conventional tree fruit/vegetable farmer)

Reports of personal knowledge of market fraud involving organic products was made by at least two other farmers.

> "There are some that profess to be somewhat organic but they're not organic farmers and they say it themselves but they like the sign to be there...I saw a fellow in the Okanagan with a sign up that said organic fruit that's been sprayed 5 times every year and he'll tell you he does. But he's got organic fruit because the spray was put on there before a certain time. Anyway, it wasn't on the skin of the apple was his attitude towards it. But he sells a lot of fruit though. He's got a big handmade sign up, 'Organic fruit'. He will, if you get into a conversation say, 'Oh yes, I spraythinned, I sprayed for codling moth twice but no spray on the fruit'. I got mad at him one day. A man came in and he bought some apples. He charged him a horrendous amount, something like 75 cents a pound. And I said, 'Gosh I wish I could get that for my apples'. He said, 'Oh you can. You don't spray as much as I do. Why don't you?' At that time we were charging 59 cents for all our apples." (Conventional tree fruit/vegetable farmer)

> "I'm very cynical about the term organic because they do spray certain things. And there's other ones that call products organic that we know

> aren't organic product. So I think there's a lot of deception in the marketplace so that's where my cynicism is directed at...Because there are so many organizations, they have their different definitions of what organic is. Unless the government comes down and says specifically you can use this and you can't use that, then they don't have much credibility as yet." (Conventional berry farmer)

Philosophical characteristics. While a very few conventional farmers mentioned the philosophical aspect of practising organic farming, this was one of the main points made by many organic (and especially bio-dynamic) farmers. Organic and bio-dynamic farmers were equally likely to mention that organic farming was working in harmony with nature ($F_{(3,113)} = 9.6647$, $p < .0001$, significantly more than conventional and organic-conventional farmers at $p = .01$ level). However, reflecting their anthroposophic roots, bio-dynamic farmers were more likely than all others to speak of their farming practices as being a philosophy ($F_{(3,113)} = 8.8865$, $p < .001$) or spiritual endeavour ($F_{(3,113)} = 11.2819$, $p < .0001$).

The following quotes give an indication of the strength of the philosophical underpinnings of organic and bio-dynamic farmers thoughts on their work.

> "Organic farming is a philosophy of stewardship with the land. That's the bottom line, it is a commitment to maintaining and enhancing the productivity of the land, the health of the soil. It is a commitment to being aware of the manner in which you interact with your particular environment and it is a way of being." (Organic tree fruit farmer)

> "It's kind of a philosophical background, we try to overcome the materialistic view. We don't deny the material but the matter is a fact of this world but we see behind this matter what moves this are forces. This is very difficult to observe and understand but we only see, we might understand the relationship of all the life forces and help them and help the harmony between the three kingdoms, mineral, plant and animal we are responsible for." (Bio-dynamic tree fruit farmer)

> "Bio-dynamic farming integrates the plant life with your life so that you are a part of growing. Not just that the plant is a product but that you are part of the plant and at the same time, to maintain the quality of the soil and not to deplete or take away from the soil." (Bio-dynamic mixed farmer)

And perhaps the most eloquent description of how organic farming is working in harmony with nature is offered by this organic farmer.

> "It is to take Mother Nature as your guide, she makes no mistake whatsoever. However, Mother Nature has all the time and you as farmers have not much time, you are only here for a short time so she allows you

to bend and stretch, curve but not break her rules. If you do that, you will do well. So that means, you should never stop observing because then you learn her laws. If we go hand in hand with her, the time element is the only thing we have to do something about, and that's where your skill comes in and that applies to every aspect of farming or growing. And if you observe closely you will see that Nature has a balance and if you could weight it, you would see that the little bit of damage that is done, that you have to tolerate but that is less than your extra cost if you try to prevent all damage. If you try to prevent all the damage, you pay in material, extra labour, health risk and also you injure, but you don't see that because it's over the years." (Organic mixed farmer)

Perceptions of Organic Farming Attributes

After farmers provided their definitions of organic farming, they were asked to respond to what extent they agreed or disagreed with a number of statements regarding organic farming. The items in the "Perceptions of Organic Farming" questionnaire (11 items on a 5 point Likert-type scale) were developed from other surveys in the innovation literature which examined the relationship between the attributed benefits (economic and productive), complexity and compatibility of an innovation and its adoption and diffusion. Both sets of data were obtained during the interview sessions. As summarized by Rogers (1983), an individual's perception of an innovation's attributes is somewhat predictive of the innovation's rate of adoption. Positively related to the rate of innovation adoption are: (a) the perceived relative advantage (i.e., economic and production benefits); (b) the compatibility (with existing values, experiences and needs of the adopter); and trialability (degree to which experimentation is possible). Perceived complexity (difficult to understand and use) is negatively related to the rate of innovation adoption.

Farmers' responses to the Perceptions of Organic Farming survey are used to answer the general research question of: Are there differences between organic and conventional farmers in how they perceive and evaluate organic farming?(Research Question 8). The specific research questions which will be explored in this analysis are the following:

Research Question 8a. Compared to organic farmers, conventional farmers will hold more negative beliefs about the economic advantages of organic farming innovations.

Research Question 8b. Compared to organic farmers, conventional farmers will attribute higher complexity to the incorporation of organic farming innovations into their existing agricultural practices.

Research Question 8c. Organic farming innovations will be perceived by conventional farmers to require radical changes to their existing work practices.

Research Question 8d. Organic farming innovations will be perceived by organic farmers to require incremental changes to their existing work practices.

Research Questions 8a and 8b are directly tested in the analysis of farmers' responses to the Perceptions of Organic Farming questionnaire while initial evidence to test Research Questions 8c and 8d is provided. In this study, six scales of innovation attributes were developed: OF1 -- Economic Benefits (7 items); OF2 -- Pest/Weed Control (Production benefits -- 2 times); OF3 -- Complexity (2 items); OF4 -- Trialability (1 items); OF5 -- Compatibility (1 item); Global Perception of Organic Farming (11 items). Two items (7 and 9) were reverse scored such that high scores on all items reflected a positive attribute evaluation. [Perceptions of Organic Farming questions are provided in Appendix E.]

In total 130 individuals (farmers, government representatives and farm organization staff) completed the perceptions of organic farming questionnaire (see Table 5-12 for group means and standard deviations).

As expected, there were significant group differences on all of the organic farming scales and 10 of the 11 individual items. The only one which all groups agreed on was trialability, i.e., that organic farming is not easy to try out (mean = 2.93, s.d. = 1.20). The results of analysis of variance tests of group differences in scale means are provided in Table 5-13.

As the adopters of organic farming, it is not surprising that organic, bio-dynamic and organic-conventional farmers have significantly more favourable global perceptions of organic farming than other groups ($F_{(5,124)} = 20.2601$, $p < .0001$). In regards to specific organic farming attributes, organic and bio-dynamic farmers were more positive than conventional farmers, government representatives and farm organization staff on: economic benefits ($F_{(5,124)} = 21.3601$, $p < .0001$); production benefits (pest/weed control) ($F_{(5,124)} = 6.7726$,

$p < .0001$); and compatibility with work preferences ($F_{(5,124)} = 15.604$, $p < .0001$). In regards to the complexity attribute, bio-dynamic and organic farmers perceived organic farming to be less complex (i.e., easy to understand and easier to do) than did conventional farmers, government representations and farm organization staff ($F_{(5,124)} = 4.5041$, $p = .0008$). There were no significant group differences in evaluations of the trialability of organic farming.

One observation from this analysis is the congruence in perceptions between government extension agents and conventional farmers. This lends credence to the statements made by the organic and bio-dynamic farmers who were interviewed that government extension agents did not understand organic farming as they did. The boundary spanning status of the organic-conventional farmers resulted in their being more positive than their conventional counterparts on only the economic benefits and global evaluation.

To determine whether there were relationships between perceptions of organic farming attributes and farmers' backgrounds (age, education level and type, farm size, diversity of farm operations), correlation analyses were conducted for each group. For the organic farmers, there were positive relationships between the number of years of organic farming experience and perceived economic benefits ($r = .3196$, $p = .009$), lower complexity ($r = .2731$, $p = .022$), and global evaluations ($r = .3327$, $p = .007$). A positive relationship was found between the average number of farm production categories (as a measure of diversity of farm operations) and complexity scores ($r = .2288$, $p = .048$). In contrast, for bio-dynamic farmers there was a negative relationship between the number of product categories and complexity attribute scores ($r = -.7396$, $p = .018$). The negative relationship between number of acres in production and compatibility ($r = -.4575$, $p = .001$) would indicate that organic farmers on smaller acreages are more comfortable with organic farming. In general, it appears that more experience with organic farming enhances the positive perception of organic farming.

TABLE 5-12. PERCEPTIONS OF ORGANIC FARMING: ITEM AND SCALE MEANS

ORGANIC FARMING IS...	TOTAL SAMPLE (n=130) Mean (s.d.)	ORGANIC FARMERS (n=56) Mean (s.d.)	CONVENTIONAL FARMERS (n=45) Mean (s.d.)	ORGANIC-CONVENTIONAL FARMERS (n=6) Mean (s.d.)	BIODYNAMIC FARMERS (n=8) Mean (s.d.)	GOVT. REPS (n=11) Mean (s.d.)	OTHER (n=4) Mean (s.d.)
1. Profitable way to farm	3.2154 (1.161)	3.7570 (1.022)	2.6000 (1.009)	3.1667 (1.169)	3.5000 (1.195)	2.9091 (1.045)	2.5000 (1.291)
2. Saves time and effort	2.0308 (.978)	2.4464 (1.143)	1.6889 (.557)	1.8333 (.408)	2.1250 (.835)	1.5455 (.688)	1.5000 (.577)
3. Easy to understand	3.0154 (1.168)	3.0536 (1.285)	2.8889 (.982)	3.5000 (.837)	4.0000 (.926)	2.1818 (1.079)	3.5000 (1.000)
4. Improves food quality	3.6308 (1.420)	4.5893 (.654)	2.6222 (1.230)	4.1667 (.753)	4.8750 (.354)	2.3636 (1.433)	1.7500 (.957)
5. Has low operating costs	2.6000 (1.039)	2.9464 (.980)	2.1778 (.861)	1.8333 (.983)	3.3750 (1.060)	2.4545 (1.214)	2.5000 (1.000)
6. Easy to try out	2.9308 (1.202)	3.0000 (1.236)	2.7333 (1.195)	3.3337 (1.211)	3.7500 (.886)	2.5455 (1.036)	3.0000 (1.414)
7. Increases crop losses (R)	3.1154 (1.185)	2.7679 (1.191)	3.5111 (1.014)	2.6667 (1.033)	2.6250 (1.188)	3.3636 (1.286)	4.5000 (.577)
8. Gets quick results	2.1308 (.811)	2.1071 (.928)	2.1778 (.716)	2.8333 (.753)	2.0000 (.535)	1.7273 (.647)	2.2500 (.500)
9. Is hard to do (R)	3.1538 (1.074)	2.7857 (1.124)	3.4889 (.869)	3.1667 (.983)	2.6250 (.916)	3.7273 (.905)	4.0000 (1.414)
10. Reduces weed problems	2.5385 (1.079)	2.9643 (1.095)	2.1556 (.928)	1.8333 (.753)	3.2500 (.886)	2.0000 (.894)	2.0000 (.817)
11. The way I like to work	3.8077 (1.188)	4.5179 (.763)	2.9556 (1.107)	3.6667 (1.366)	4.6250 (.517)	3.4545 (.934)	3.0000 (1.414)
Organic Farming Scales							
OF1: Economic Benefits	2.7346 (.653)	3.1607 (.528)	2.3028 (.450)	2.7292 (.527)	3.2344 (.440)	2.2386 (.498)	2.0000 (.102)
OF2: Pest/Weed Control	2.7115 (.923)	3.0982 (.897)	2.3222 (.813)	2.5833 (.736)	3.3125 (.651)	2.3182 (.783)	1.7500 (.646)
OF3: Complexity	2.9308 (.876)	3.1339 (.932)	2.7000 (.710)	3.1667 (.683)	3.6875 (.799)	2.2273 (.607)	2.7500 (1.041)
OF4: Trialability	2.9308 (1.202)	3.0000 (1.236)	2.7333 (1.195)	3.3337 (1.211)	3.7500 (.886)	2.5455 (1.036)	3.0000 (1.414)
OF5: Compatibility	3.8077 (1.189)	4.5179 (.763)	2.9556 (1.107)	3.6667 (1.366)	4.6250 (.518)	3.4545 (.934)	3.0000 (1.414)
OF6: Global Perception	2.8755 (.632)	3.2597 (.518)	2.4545 (.444)	2.9394 (.544)	3.4773 (.415)	2.3719 (.464)	2.3182 (.216)

Note 1. Item responses on 5-point Likert-type scale: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree.
Items (7 & 9) with "R" designation were reverse coded, therefore high score indicates positive evaluation/perception of organic farming.

Note 2. Organic Farming Scales developed from following items:
OF1: Economic Benefits = [1 + 2 + 4 + 5 + 7(R) + 8 + 9(R) + 10]/8.
OF2: Pest/Weed Control = [7(R) + 10]/2.
OF3: Complexity = [3 + 9(R)]/2.
OF4: Trialability = [6].
OF5: Compatibility = [11].
OF6: Global Perception = [1 + 2 + 3 + 4 + 5 + 6 + 7(R) + 8 + 9(R) + 10 + 11]/11.

TABLE 5-13. PERCEPTIONS OF ORGANIC FARMING: SUMMARY OF ANOVA TESTS FOR BETWEEN GROUPS DIFFERENCES

PERCEPTIONS OF ORGANIC FARMING		d.f.	Means Squares	F-ratio	prob.	Significant Group differences (at p<.05 level)
Organic Farming Scales						
OF1: Economic Benefits						
	between groups	5	5.084	21.3601	.0000	[BD, ORG] > [CONV, GOVT, OTHER]
	within groups	124	.238			ORG > O-C; O-C > [CONV, OTHER]
OF2: Pest/Weed Control						
	between groups	5	4.716	6.7726	.0000	[BD, ORG] > OTHER
	within groups	124	.696			BD > [CONV, GOVT]
OF3: Complexity						
	between groups	5	3.040	4.5041	.0008	[BD, O-C] > [CONV, GOVT]
	within groups	124	.675			O-C > GOVT
OF4: Trialability						
	between groups	5	2.003	1.409	.2258	
	within groups	124	1.422			
OF5: Compatibility						
	between groups	5	14.073	15.604	.0000	[BD, ORG] > [GOVT, OTHER, CONV]
	within groups	124	.902			BD > O-C
OF6: Global Perception						
	between groups	5	4.6391	20.2601	.0000	[BD, ORG, O-C] > [CONV, GOVT, OTHER]
	within groups	124	1.422			

Note 1. Abbreviations for groups: ORG = Organic Farmers; CONV = Conventional Farmers; O-C = Organic-Conventional Farmers; BD = Biodynamics Farmers; GOVT = Government Representatives; OTHER = Conventional Farm Organization Staff Members.

Means of groups within brackets are not significantly different from each other.

TABLE 5-13. (continued). PERCEPTIONS OF ORGANIC FARMING: SUMMARY OF ANOVA TESTS FOR BETWEEN GROUPS DIFFERENCES

PERCEPTIONS OF ORGANIC FARMING		d.f.	Means Squares	F-ratio	prob.	Significant Group differences (at p<.05 level)
1. Profitable way to farm						
	between groups	5	7.800	7.166	.0000	ORG > [CONV, OTHER]
	within groups	124	1.088			
2. Saves time and effort						
	between groups	5	3.792	4.851	.0004	ORG > OTHER
	within groups	124	.782			
3. Easy to understand						
	between groups	5	3.710	2.922	.0158	[BD, O-C, OTHER] > GOVT
	within groups	124	1.270			
4. Improves food quality						
	between groups	5	28.628	30.306	.0000	[BD, ORG, O-C] > [OTHER, CONV, GOVT]
	within groups	124	.945			
5. Has low operating costs						
	between groups	5	4.669	4.998	.0003	BD > [O-C, CONV]
	within groups	124	.934			ORG > O-C
6. Easy to try out						
	between groups	5	2.003	1.409	.2258	
	within groups	124	1.422			
7. Increases crop losses (R)						
	between groups	5	5.058	4.021	.0020	OTHER > [GOVT, ORG, O-C, BD]
	within groups	124	1.258			
8. Gets quick results						
	between groups	5	1.015	1.580	.1706	O-C > GOVT
	within groups	124	.643			
9. Is hard to do (R)						
	between groups	5	4.272	4.153	.0016	GOVT > [ORG, BD]
	within groups	124	1.029			OTHER > BD
10. Reduces weed problems						
	between groups	5	5.627	5.711	.0001	[BD, ORG] > O-C
	within groups	124	.985			BD > [CONV, OTHER, GOVT]
11. The way I like to work						
	between groups	5	14.073	15.604	.0000	[BD, ORG] > [GOVT, OTHER, CONV]
	within groups	124	.902			BD > O-C

Note 1. Abbreviations for groups: ORG = Organic Farmers; CONV = Conventional Farmers; O-C = Organic-Conventional Farmers; BD = Biodynamics Farmers; GOVT = Government Representatives; OTHER = Conventional Farm Organization Staff Members.

Means of groups within brackets are not significantly different from each other.

Analyses for the conventional farmer group showed that the only significant relationships between perceived attributes and background characteristics concerned diversity of farm operations. It appears that more diversified conventional farmers have more positive perceptions regarding the trialability ($r = .3572$, $p = .008$) and total benefits ($r = .3642$, $p = .01$) of organic farming.

There were no observed differences within groups based on education level. However there were several differences within each production method group based on the type of post secondary education that had been completed. Organic farmers who had arts, education and agriculture post-secondary education perceived greater economic benefits than did those who had applied sciences or business education ($F_{(6,34)} = 3.0148$, $p = .0180$). In regards to perceptions regarding the effectiveness of organic farming in controlling for pests and weeds, organic farmers with Arts education were more positive than those with post-secondary education in agriculture, natural and applied science ($F_{(6,34)} = 2.8756$, $p = .0224$). And in terms of total perceived benefits, organic farmers with Arts education were more positive than those with business and natural sciences education ($F_{(6,34)} = 2.2905$, $p = .0569$).

Comparisons within the conventional farmer group indicate that those farmers with post-secondary education in agriculture had less favourable perceptions about organic farming than those who had Arts education. This contrast was observed in regards to total benefits of organic farming ($F_{(6,17)} = 1.8208$, $p = .1546$) and its compatibility attribute ($F_{(6,17)} = 2.7304$, $p = .0481$).

Discussion. This analysis of perceptions of organic farming attributes confirms that organic and bio-dynamic farmers hold generally more positive perceptions of their production method than do conventional farmers of organic and bio-dynamic production methods. Based on this evidence and the content analysis of farmers' definitions of organic farming, there is substantial support for Research Question 8a which proposes that compared to organic farmers, conventional farmers will hold more negative beliefs about the economic advantages of organic farming innovations. Conventional farmers and government extension agents were significantly less positive than bio-dynamic farmers regarding the economic and production aspects of organic farming.

In contrast, there is limited support for Research Question 8b which stated that compared to organic farmers, conventional farmers will attribute higher complexity to the incorporation of organic farming innovations into their existing agricultural practices. On the one hand, organic and bio-dynamic farmers perceived organic farming to have lower complexity (i.e., high scores on complexity scale) than conventional farmers did. A closer examination of the individual items which constituted the complexity score reveals that while organic, organic-conventional and bio-dynamic farmers perceived that organic farming was easier to understand, conventional farmers perceived it to be easier to do. Another measure was trialability for which there were no significant difference between production method groups. Thus while conventional farmers are less confident in their understanding of organic farming, they perceive it to be easier (than organic and bio-dynamic farmers) to practise.

A partial test of Research Questions 8c and 8d which address groups' perceptions of whether organic farming would require radical or incremental changes to their existing work practices is offered by the compatibility scores on the Perceptions of Organic Farming instrument. Conventional farmers had significantly less favourable perceptions regarding the compatibility of organic farming with the way they like to work. Coupled with the higher complexity (in particular, actual practice) they attributed to organic farming, one interpretation would be that they perceive organic farming to require more radical changes to their operations. Obversely, organic farmers see it as representing incremental changes. This research question will be explored further in the section on perceptions of agrichemicals by comparing the complexity attributed to organic farming to the complexity attributed to the use of agrichemicals. At that point, a more complete discussion which integrates the findings in regards to the types of innovations being adopted by both organic and conventional farmers will yield a better exploration of this research question.

Perceptions of Risk Associated with Organic Farming

Perceptions of risk is a part of one's perception regarding the perceived benefits or costs associated with an innovation. To ascertain whether organic, bio-dynamic and organic-conventional farmers' overall risk perceptions had changed over time, these farmers were asked how risky they perceived organic/bio-dynamic farming to be when they first started out and how risky they perceived it to be currently [as measured on a 5 point scale (1 = no risk; 1 = very little risk; 2 = moderate risk; 3 = considerable risk; 4 = very risky)]. They were then asked to evaluate their initial and current risk levels for a number of identified individual risk factors (however some farmers added risks not on the list). Due to time constraints during some of the interviews, not all of the organic and bio-dynamic farmers were asked these questions thus there is a reduced sample of 46 farmers.

An examination of the overall and specific risk means in Table 5-14 shows that in general, farmers practising organic or bio-dynamic methods perceived there to be little risk when they first started out (mean = 1.33, s.d. = 1.16) and even less risk currently (mean = 1.28, s.d. = 1.09). A paired t-test between initial and current overall risk perceptions revealed no significant difference. It is noteworthy that in general, bio-dynamic farmers reported the lowest levels of perceived risk (either initially or currently) and the organic-conventional farmers reported the highest risk levels. This difference can be traced to the relatively large proportion of bio-dynamic farmers (and no organic-conventional farmers) who did not consider this method to be risky at all.

The most frequently identified risks associated with organic farming were problems with pests and weeds (initial risk: mean = .28; current risk: mean = .11) which appeared to decline with experience (paired t-test results: $t = 2.70$, $p = .01$). Another risk associated with production was more variable yields with organic farming methods which was only cited as a perceived risk at the time the farmer first started using alternative agriculture methods. Identification of financial risks, lack of information and antagonistic neighbours have remained at a relatively low level over time. In contrast, there appears to have been in

TABLE 5-14. ORGANIC FARMING: INITIAL AND CURRENT RISK ASSESSMENTS OF ORGANIC FARMING

	TOTAL FARMERS (n=46) Mean (s.d.)	ORGANIC FARMERS (n=36) Mean (s.d.)	ORGANIC-CONVENTIONAL FARMERS (n=4) Mean (s.d.)	BIODYNAMIC FARMERS (n=6) Mean (s.d.)
RISK ASSESSMENTS (Note 1)				
Initial Risk Level	1.3261 (1.156)	1.3611 (1.199)	2.0000 (1.155)	.6667 (.516)
Current Risk Level	1.2826 (1.089)	1.2778 (1.085)	1.7500 (.957)	1.0000 (1.265)

Note 1. Risk Assessments based on 5-point scale:
0 = No Risk; 1 = Very Little Risk; 2 = Moderate Risk; 3 = Considerable Risk; 4 = Very Risky.

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TABLE 5-15. ORGANIC FARMING: REGRESSION ANALYSIS OF RISK ASSESSMENTS OF ORGANIC FARMING

	Initial Risk Assessment		Current Risk Assessment	
Individual Risk Variables	Beta	t	Beta	t
1. Small market for organic products	.122292	1.627	.179737	2.187*
2. Hard to reach customers	-.088644	- .779	.070898	.818
3. Market prices	--	--	.216191	2.939**
4. Pest/Weed problems	.476440	5.155	.188865	1.930
5. More variable yields	.113731	1.569***	--	--
6. Availability of organic fertilizer	--	--	.080748	1.098
7. Financial	-.072498	- .952	.217426	2.562*
8. Lack of information	.123961	1.274	.140004	1.242
9. Lack of experience	.123961	1.274	--	--
10. Antagonistic neighbours	.152900	2.051*	-.083163	- .910
11. Lack of organic certifying agency	.242951	3.705***	--	--
12. Do not consider organic/ biodynamic farming risky	-.420852	- 5.816***	-.599934	-7.469***
Adjusted R squared	.81315		.76399	
F-ratio	20.58396***		17.18536***	

* p < .05 ** p < .01 *** p < .001

Note 1. Regression analysis conducted using 46 subjects.

increase over time in risks associated with marketing organic farm products (but not bio-dynamic products). For example, there was an increase in risks associated with a small market for organic products (paired t-test: $t = -2.07$, $p = .044$). While not significantly different, there was more current identification of reaching customers and the current (but not initial) identification of low and variable market prices as risks.

One conceivable component of financial risk perceptions would be the availability of funds from financial institutions. As reported by MacRae et al. (1988), given their relatively smaller size and relative novelty, organic farmers tend to have a more difficult time borrowing money for farm purchase and operation. Of the 13 farmers who had dealings with traditional financial institutions, only two reported having any problems borrowing money from financial institutions. Many reported financial self-sufficiency with 20 farmers (of the 43) stating that they have not needed to borrow money for their farms. Five noted that they have not had any problems because they had a private mortgage and an additional five farmers stated that their organic or bio-dynamic status had actually been a positive feature (or condition) of their loans.

Regression analyses were conducted in an effort to identify which specific identified risks may have contributed to overall risk evaluations of organic farming. In the equation with overall initial risk assessments the dependent variable, the primary contributing risk factors appeared to be: more variable yields in production ($t = 1.569$, $p < .001$); lack of organic certifying agency ($t = 3.705$, $p < .001$); and the presence of antagonistic neighbours ($t = 2.051$, $p < .05$). A variable which lowered the overall risk perception level was the belief that organic/bio-dynamic farming was not risky ($t = -5.816$, $p < .001$).

A slightly different picture emerged when current risk level was the dependent variable. It appears that the current contributing factors in risk assessments are: low and variable market prices ($t = 2.939$, $p < .001$); small markets for organic products ($t = 2.187$, $p < .05$); and financial risks ($t = 2.562$, $p < .01$). Again the belief that their method of farming was not risky had a negative effect on perceptions of risk level ($t = -7.469$, $p < .001$). It should be noted that the small sample in the regression analysis moderates the degree of confidence that can be placed on how definitive these conclusions are.

Relating back to the perceptions of organic farming instrument, analysis of variance tests between overall risk levels and organic farming attribute scale scores showed several significant relationships. Those individuals who stated that they saw no risk associated with organic/bio-dynamic farming ("0" on the scale) were found to have the most positive evaluations regarding: the economic benefits of organic farming ($F_{(3,42)}$ = 8.3724, p = .002); the ability to control for pest and weeds ($F_{(3,42)}$ = 7.5498, p = .0004); lower complexity ($F_{(3,42)}$ = 4.2261, p = .0107); and global perception ($F_{(3,42)}$ = 7.5408, p = .0004). For this group of farmers as a whole, there were negative relationships between all organic farming attribute scales and initial and current risk levels (i.e., the lower the perceived risk level, the more positive the perception of organic farming attributes).

PART C. PERCEPTIONS AND EVALUATIONS OF SYNTHETIC AGRICHEMICALS

As found in the analyses of organic farmers' motivations to convert and of organic and conventional definitions of organic farming, the use of or rejection of synthetic agrichemicals is a major issue. While it is clear that organic and bio-dynamic farmers hold negative perceptions of these agricultural inputs, conventional farmers are not unanimously positive about them either. Conventional farmers also related stories of negative health and environmental effects of chemical pesticides and fertilizers. Many, for health and economic reasons, are reducing their use of agrichemicals and experimenting with integrated pest management methods to reduce their use of pesticides as well as trying out nonchemical means of fertilization (eg., crop rotations, cover crops, green manures). However, in continuing to use these inputs to production it is conceivable that their evaluation of the risks (to the environment and to their personal health) would be less than that of organic farmers.

Therefore the general research question to be explored in this section is: Are there differences between organic and conventional farmers in how they perceive and evaluate synthetic agrichemicals? (Research Question 9) The specific research questions to be explored in this analysis are:

Research Question 9a. Compared to conventional farmers, organic farmers will hold more negative beliefs about the relative economic advantages of the use of synthetic agrichemicals.

Research Question 9b. Compared to conventional farmers, organic farmers will attribute higher complexity to the use of synthetic agrichemicals in agricultural production.

Research Question 9c. Compared to conventional farmers, organic farmers will attribute greater risk (to the environment and to personal health) to the use of synthetic agrichemicals in agricultural production.

To gain a clearer understanding of the degree to which organic/bio-dynamic and conventional farmers differ in their evaluations of agrichemicals, they were asked to complete "The Use of Agrichemicals in Farming Questionnaire" (16 items on a 7 point Likert-type scale). [See Appendix E for a copy of the questionnaire.] The seven agrichemical scales are as follows:

AC1: Production/Economic Benefits

AC2: Pest/Weed Control

AC3: Effect on the Soil

AC4: Ease of Use (Complexity)

AC5: Effect on Natural Environment

AC6: Safety for Farmer/Farmworker

AC7: Effect on Food Produced (presence of chemical residues)

AC8: Global Assessment of Agrichemicals

Use of Agrichemicals in Farming Questionnaire Results

Table 5-16 contains the means and standard deviations of scale scores for the 120 individuals (106 of whom were farmers) who completed the Use of Agrichemicals in Farming questionnaire. Group comparisons based on ANOVA tests revealed that with the exception of the single item scale of "ease of use", organic and bio-dynamic (and sometimes organic-conventional) farmers had significantly more negative evaluations of agrichemicals than did the other groups. A summary of these ANOVA tests is provided in Table 5-17.

Thus it appears that conventional farmers (and their farm organization staff), organic-conventional farmers and government agricultural extension agents hold more favourable perceptions (than organic and bio-dynamic farmers) regarding: agrichemicals in total ($F_{(5, 112)}$ = 56.6028, $p < .0001$); the economic/production benefits of agrichemicals ($F_{(5,112)}$ = 28.2469, $p < .0001$); the effect of agrichemicals on the environment ($F_{(5,112)}$ = 26.6711, $p < .0001$); and personal safety in their use ($F_{(5,112)}$ = 41.4809, $p < .0001$). Bio-dynamic, organic and organic-conventional farmers were significantly less positive than other groups regarding: pest/weed control benefits of agrichemicals ($F_{(5,112)}$ = 28.9918, $p < .0001$); and agrichemicals' effect on food safety ($F_{(5,112)}$ = 22.0524, $p < .0001$). Bio-dynamic and organic farmers were less positive than conventional farmers, farm organization staff and government representatives regarding the beneficial effects of agrichemicals on the soil ($F_{(5,112)}$ = 24.4716, $p < .0001$). The only agrichemical scale for which there were no significant between groups differences was "ease of use", all were fairly neutral on this item.

To determine whether there were relationships between farmers' age, farming experience, scale and diversity of production, separate correlation analyses were conducted for each production method group. For the organic farmer group, positive relationships were found between age and the effect of agrichemicals on the soil ($r = .3441$, $p < .01$) as well as between years of total farming experience (but not organic farming experience) and the effectiveness of agrichemicals for pest/weed control ($r = .3650$, $p = .01$) and effect on the soil ($r = .4738$, $p < .001$). There were several positive relationships between the number of acres in production and agrichemicals' economic/production benefits ($r = .2602$, $p < .05$), effectiveness for pest/weed control ($r = .5498$, $p < .001$), ease of use ($r = .5271$, $p < .001$), effect on the environment ($r = .3718$, $p < .01$), and on food safety ($r = .2430$, $p < .05$). In total, scale of production was positively correlated with global assessment of the benefits of agrichemicals ($r = .3639$, $p < .01$). The only negative relationship concerned farm diversity (average number of farm product categories) and agrichemicals' effect on the environment ($r = -.3401$, $p < .01$). Thus it would appear that older farmers and those on larger acreages are much more supportive of the benefits of

TABLE 5-16. USE OF AGRICHEMICALS IN FARMING QUESTIONNAIRE: AGRICHEMICAL SCALE MEANS

AGRICHEMICAL SCALE	TOTAL SAMPLE (n=120) Mean (s.d.)	ORGANIC FARMERS (n=53) Mean (s.d.)	CONVENTIONAL FARMERS (n=40) Mean (s.d.)	ORGANIC-CONVENTIONAL FARMERS (n=5) Mean (s.d.)	BIODYNAMIC FARMERS (n=8) Mean (s.d.)	GOVT. REPS (n=10) Mean (s.d.)	OTHER (n=4) Mean (s.d.)
AC1: Production/Economic	3.8792 (1.345)	2.9343 (.961)	5.0083 (.821)	4.1667 (1.514)	2.7917 (.728)	4.5556 (.809)	5.1667 (.839)
AC2: Pests/Weed Control	2.7875 (1.491)	1.6918 (.871)	3.9250 (1.100)	2.8667 (1.198)	1.9792 (1.093)	3.8500 (1.251)	4.7917 (.725)
AC3: Effect on Soil	2.3729 (1.415)	1.4151 (.686)	3.3750 (1.345)	3.1000 (1.194)	1.1563 (.229)	3.5500 (.985)	3.6250 (1.315)
AC4: Ease of Use	4.3193 (1.797)	4.0481 (1.861)	4.7500 (1.687)	4.4000 (1.851)	5.0625 (1.148)	3.5000 (1.886)	4.0000 (2.273)
AC5: Effect on Environment	2.6486 (1.641)	1.5283 (.754)	3.9000 (1.439)	3.2667 (1.417)	1.1667 (.236)	3.8000 (1.710)	4.2917 (.927)
AC6: Safety	3.0698 (1.695)	1.7783 (.708)	4.4000 (1.331)	3.8500 (.945)	1.5469 (.453)	4.6500 (1.261)	5.0000 (1.504)
AC7: Effect on Food	2.8250 (1.756)	1.6981 (.895)	4.0750 (1.647)	2.8000 (1.255)	1.3750 (.443)	4.2000 (1.255)	4.7500 (1.040)
AC8: Global Assessment	3.1255 (1.313)	2.1076 (.607)	4.2758 (.947)	3.6375 (1.154)	1.9102 (.370)	4.0174 (.766)	4.6406 (.496)

Note 1. High score on scale indicates positive evaluation/perception on
7-point Likert-type scale: 1=Strongly Disagree, 2=Disagree, 3=Slightly Disagree, 4=Neutral, 5=Slightly Agree, 6=Agree, 7=Strongly Agree

TABLE 5-17. USE OF AGRICHEMICALS IN FARMING QUESTIONNAIRE: SUMMARY OF ANOVA TESTS FOR BETWEEN GROUPS DIFFERENCES

AGRICHEMICAL SCALE		d.f.	Means Squares	F-ratio	prob.	Significant Group differences (at p<.05 level) (Note 1)
AC1: Production/Economic						
	between groups	5	23.6096	28.2469	.0000	[OTHER, CONV, GOVT, O-C] > [ORG, BD]
	within groups	112	.8358			OTHER > O-C
AC2: Pests/Weed Control						
	between groups	5	29.5995	28.9918	.0000	[OTHER, CONV, GOVT] > [O-C, BD, ORG]
	within groups	112	1.0210			O-C > ORG
AC3: Effect on Soil						
	between groups	5	24.6804	24.4716	.0000	[OTHER, GOVT, CONV] > [ORG, BD]
	within groups	112	1.0085			
AC4: Ease of Use						
	between groups	5	4.5634	1.4402	.2153	
	within groups	112	3.1686			
AC5: Effect on Environment						
	between groups	5	34.5387	26.6711	.0000	[OTHER, CONV, GOVT, O-C] > [ORG, BD]
	within groups	112	1.2950			
AC6: Safety						
	between groups	5	44.1301	41.4809	.0000	[OTHER, GOVT, CONV, O-C] > [ORG, BD]
	within groups	112	1.0639			
AC7: Effect on Food						
	between groups	5	36.0710	22.0524	.0000	[OTHER, GOVT, CONV] > [O-C, ORG, BD]
	within groups	112	1.6357			O-C > BD
AC8: Global Assessment						
	between groups	5	27.2551	46.6028	.0000	[OTHER, CONV, GOVT, O-C] > [ORG, BD]
	within groups	112	.5848			OTHER > O-C

Note 1. Abbreviations for groups: ORG = Organic Farmers; CONV = Conventional Farmers; O-C = Organic-Conventional Farmers; BD = Biodynamics Farmers; GOVT = Government Representatives; OTHER = Conventional Farm Organization Staff Members.

Means of groups within brackets are not significantly different from each other.

agrichemicals than those who have fewer years farming experience and/or are on smaller acreages.

Correlation analyses conducted for the conventional farmer group indicates that age and years of farming experience are most related to one's evaluation of agrichemicals. There were positive relationships between scale scores on the ease of use item with age ($r = .4694$, $p < .001$) and years of farming experience ($r = .4988$, $p < .001$). In contrast, negative relationships were found between perceptions of the impact of agrichemicals on the soil and age ($r = -.4042$, $p < .01$) and years of farming experience ($r = -.3158$, $p < .05$) as well as between agrichemicals' effect on food (i.e., no chemical residues) and age ($r = -.2649$, $p < .05$). In regards to scale of production, no significant relationships were found with agrichemical scale scores. There were a number of positive relationships between diversity of farm operations and evaluations of the economic/production benefits of agrichemicals ($r = .3394$, $p < .05$), effect on the soil ($r = .3013$, $p < .05$), and agrichemicals' effect on the environment ($r = .3077$, $p < .05$). However there was a negative relationship between farm diversity and global evaluation of agrichemicals ($r = -.3519$, $p < .05$).

These findings would indicate that older, more experienced conventional farmers have more positive evaluations of how easy agrichemicals are to use but perhaps as a result of their lengthier experience, are less positive regarding the effect of agrichemicals on the soil and on personal health. While conventional farmers with more diversified operations see greater economic/production, soil and environmental benefits to be derived from the use of agrichemicals (as well as greater safety in their use), the negative relationship with the global assessment of agrichemicals is interesting. Thus it would appear that those with more specialized operations have a more positive general evaluation while farmers with more diversified operations hold stronger beliefs regarding the specific benefits of agrichemicals.

Despite their small numbers (only 5), there were several significant correlations observed for the organic-conventional group of farmers. Negative relationships were observed between an organic-conventional farmer's number of years farming experience and evaluation of agrichemicals' economic/production benefits ($r = -.9131$, $p = .015$), effectiveness in pest/weed control ($r = -.8505$, $p = .034$), food safety ($r = -.8313$, $p = .041$), and global evaluation ($r = -.8484$, $p = .035$). There was a positive relationship between diversity of operations and the environmental benefits of agrichemicals ($r = .8223$, $p = .044$). The direction of these relationships are quite different from that of either organic or conventional farmers in that it is the less experienced organic-conventional farmers who are the most positive about agrichemicals.

Discussion. The results of the analysis of Use of Synthetic Chemicals in Agriculture Questionnaire data indicate that there is strong support for the conclusion that there are significant differences between organic and conventional farmers in how they perceive and evaluate synthetic agrichemicals. Support was also found for Research Question 9a, that is, organic farmers hold more negative beliefs than conventional farmers about the relative economic advantages of the use of synthetic agrichemicals (in particular, overall production benefits, weed and pest control). Research Question 9c is supported in that organic farmers (and especially bio-dynamic farmers) attributed greater risks (to the natural environment, soil, personal safety, food safety) to the use of agrichemicals. Only Research Question 9b could not be supported in that both organic and conventional farmers agreed that there was relatively low complexity (easy to use) to the use of agrichemicals. With the inclusion of the responses of government extension agents in the analysis we also see that there is a close congruence between their perceptions and evaluations of agrichemicals and those of conventional farmers.

The correlation analyses between questionnaire responses and respondents' background characteristics indicate that age, years of farming experience and farm size may have an influence on a farmer's evaluation of agrichemicals. Specifically, for organic farmers it appears that those who are older and have larger sized farms are less negative about the environmental impact of agrichemicals and more positive about agrichemicals' production benefits. While there was no significant relationship between farm size and conventional farmers' assessments of agrichemicals, it is interesting to find that older and more experienced conventional farmers were more critical than their younger, less experienced counterparts about the environmental and personal health effects of agrichemicals. Thus, compared to the organic farmers, age and farming experience appear to have the opposite effect on the evaluations of conventional farmers.

Relationship between Perceptions of Agrichemicals and Perceptions of Organic Farming

What is the nature of the relationship between one's perceptions regarding organic farming and one's perceptions regarding the use of agrichemicals in farming?(Research Question 11a) Can one support both or are they diametrically opposed? Based on earlier findings and discussion, it is predicted that a strong negative relationship would exist. To test out this prediction, correlation analyses between scale scores on the perceptions of organic farming and use of agrichemicals questionnaires were conducted.

For the total group, there would appear to be strong support for the prediction that support for organic farming and agrichemicals is mutually exclusive. Only two scales, the trialability of organic farming and the ease of use of agrichemicals failed to yield statistically significant negative correlations.

Separate correlation analyses were conducted for each production method group to determine the relative strengths of those differences in perceptions. Given the strong convictions of organic and bio-dynamic farmers regarding the benefits or organic farming (and the costs/risks associated with agrichemicals) as related in their definitions of organic farming and motivations to convert, it is interesting that the differences between the two sets of scales were less numerous and of lower statistical significance. The correlations of most interest in Table 5-18 are those which measure similar constructs (and which are underlined in the table). For example, there are negative relationships between agrichemicals' and organic farming's economic benefits ($r = -.3119$, $p < .05$) and between their perceived effectiveness in pest/weed control ($r = -.2466$, $p < .05$).

The agrichemical scale relating to ease of use is comparable to the organic farming scales concerning complexity and trialability. Interestingly, there was a positive relationship between the perceived trialability of organic farming and the perceived ease of use of agrichemicals ($r = .2798$, $p < .05$). In terms of

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TABLE 5-18. PERCEPTIONS OF ORGANIC FARMING AND AGRICHEMICALS: CORRELATIONS OF SUMMARY SCALES

			PERCEPTIONS OF ORGANIC FARMING SCALES					
ALL GROUPS (N=117)								
AGRICHEMICALS SCALES	Means	s.d.	OF1	OF2	OF3	OF4	OF5	OF6
AC1: Production/Economic	3.8782	1.351	-.6860***	-.5941***	-.3456***	-.0100	-.5545***	-.5913***
AC2: Pests/Weed Control	2.7963	1.473	-.6166***	-.5617***	-.2195**	-.0787	-.6391***	-.5691***
AC3: Effect on Soil	2.3697	1.392	-.6173***	-.5206***	-.2776***	-.1826*	-.6556***	-.6039***
AC4: Ease of Use	4.3504	1.785	-.0953	-.1118	-.0927	.1327	-.0012	.0186
AC5: Effect on Environment	2.6396	1.597	-.6259***	-.5454***	-.2749***	-.0980	-.6024***	-.5901***
AC6: Safety	3.0566	1.675	-.6968***	-.5398***	-.3460***	-.1359	-.6705***	-.6732***
AC7: Effect on Food	2.7863	1.730	-.6100***	-.5224***	-.2838***	-.1278	-.6077***	-.5997***
AC8: Global Assessment	3.1309	1.318	-.7285***	-.6147***	-.3523***	-.0981	-.6742***	-.6754***
OF1: Economic Benefits	2.7436	.655						
OF2: Pest/Weed Control	2.7137	.929						
OF3: Complexity	2.9530	.864						
OF4: Trialability	3.8120	1.203						
OF5: Compatibility	2.9573	1.182						
OF6: Global Perception	2.9192	.541						
ORGANIC FARMERS (N=51)								
AC1: Production/Economic	2.9134	.959	-.3119*	-.4067**	-.3825**	.2074	-.1409	-.2215
AC2: Pests/Weed Control	1.7190	.877	-.0826	-.2466*	-.1676	.0130	-.1775	-.0068
AC3: Effect on Soil	1.4314	.695	.0752	-.0593	-.1149	-.0760	-.3416**	.0804
AC4: Ease of Use	4.0490	1.880	-.1178	-.1765	-.1878	.2798*	-.1497	-.0200
AC5: Effect on Environment	1.5490	.762	.1592	-.0479	-.1386	.0881	-.0638	.1110
AC6: Safety	1.7696	.713	-.0651	.0081	-.1913	.0534	-.4264***	-.0798
AC7: Effect on Food	1.6471	.850	.1215	.1349	.0319	.1057	-.1715	.1117
AC8: Global Assessment	2.0999	.611	-.1593	-.2836*	-.3225**	.1468	-.2910*	-.1204
OF1: Economic Benefits	3.1618	.528						
OF2: Pest/Weed Control	3.1176	.892						
OF3: Complexity	3.1275	.953						
OF4: Trialability	2.9804	1.257						
OF5: Compatibility	4.5490	.702						
OF6: Global Perception	3.2264	.447						

* p < .05   ** p < .01   *** p < .001

TABLE 5-18.(continued) PERCEPTIONS OF ORGANIC FARMING AND AGRICHEMICALS: CORRELATIONS OF SUMMARY SCALES

AGRICHEMICALS SCALES	Means	s.d.	OF1	OF2	OF3	OF4	OF5	OF6
			PERCEPTIONS OF ORGANIC FARMING SCALES					
CONVENTIONAL FARMERS (N=40)								
AC1: Production/Economic	5.0083	.821	-.4966***	-.5523***	.0531	.0601	-.2412	-.3422*
AC2: Pests/Weed Control	3.9250	1.100	-.3777**	-.5478***	.0411	-.0202	-.4371**	-.4034**
AC3: Effect on Soil	3.3750	1.345	-.5405***	-.4878***	-.1679	-.2475	-.4241**	-.5929***
AC4: Ease of Use	4.7500	1.687	.0160	.0326	.0359	.0359	.1565	.2165
AC5: Effect on Environment	3.9000	1.439	-.5088***	-.4692***	-.2148	.0092	-.2442	-.4099**
AC6: Safety	4.4000	1.331	-.6231***	-.5640***	-.3090*	-.1470	-.3047*	-.5972***
AC7: Effect on Food	4.0750	1.647	-.5092***	-.6024***	-.3213*	-.1246	-.3176*	-.5082***
AC8: Global Assessment	4.2758	.947	-.6381***	-.6188***	-.2055	-.0832	-.3584*	-.5695***
OF1: Economic Benefits	2.2938	.474						
OF2: Pest/Weed Control	2.2750	.816						
OF3: Complexity	2.7375	.689						
OF4: Trialability	2.7750	1.166						
OF5: Compatibility	2.9250	1.141						
OF6: Global Perception	2.5977	.407						
GOVERNMENT REPRESENTATIVES (N=9)								
AC1: Production/Economic	4.5556	.809	-.5736	-.3755	.5279	.4416	-.2879	-.1913
AC2: Pests/Weed Control	3.6852	1.206	-.6711*	-.7034*	.4549	-.1916	-.3484	-.4885
AC3: Effect on Soil	3.3333	.750	-.7623**	-.6972*	-.0833	-.0572	-.1370	-.3224
AC4: Ease of Use	3.7778	1.770	.2929	.2054	.5533	-.0323	.4800	.3351
AC5: Effect on Environment	3.4444	1.367	-.7627**	-.8927***	-.0610	-.4810	-.4912	-.6561*
AC6: Safety	4.4167	1.084	-.7026*	-.7785**	-.3602	-.4053	-.4738	-.5625
AC7: Effect on Food	3.8889	1.244	-.6049*	-.8804***	-.0335	-.4364	-.3523	-.5216
AC8: Global Assessment	4.0174	.766	-.9030***	-.9072***	.1106	-.1884	-.5246	-.5957*
OF1: Economic Benefits	2.3194	.456						
OF2: Pest/Weed Control	2.3889	.697						
OF3: Complexity	2.3333	.500						
OF4: Trialability	2.7778	.972						
OF5: Compatibility	3.4444	1.014						
OF6: Global Perception	2.5859	.439						

* p < .05 ** p < .01 *** p < .001

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global assessment of agrichemicals and organic farming, there was observed a negative relationship (r = -.1204) which was not statistically significant.

However, it appears to be the conventional farmers who hold the strongest beliefs regarding the relative merits of agrichemicals versus organic farming. Strong negative relationships were observed between perceptions of the economic benefits (r = -.4966, p < .001) and pest/weed control effectiveness (r = -.5478, p < .001) of agrichemicals as opposed to organic farming. There were no significant relationships found for scales related to the trialability and complexity of organic farming and agrichemicals' ease of use. The global assessments of each were negatively related ($r = -.5695$, $p < .001$).

Organic-conventional farmers recorded only significant relationships in regards to ease of use of agrichemicals. Negative relationships between this scale and perceptions of organic farming's complexity ($r = -.8824$, $p = .024$) and trialability ($r = -.9221$, $p = .013$) were observed. Correlation analysis for the bio-dynamic farmer group yielded a positive relationship concerning the effectiveness for pest/weed control ($r = .8469$, $p = .004$) thereby indicating that they felt both methods were effective in this regard.

An analysis of the responses of the government representatives yielded two interesting correlations. Like conventional farmers, government extension agents perceived there to be negative relationships between organic farming's and agrichemicals' effectiveness in pest and weed control ($r = =.7034$, $p < .05$) and overall benefits ($r = - .5957$, $p < .05$).

Discussion. As expected, organic and bio-dynamic farmers hold significantly more negative perceptions regarding the benefits (economic, production, environmental, safety) of agrichemicals than conventional farmers and government representatives. What was not expected is that conventional farmers held the strongest beliefs regarding the relative merits of organic farming versus the use of agrichemicals in agriculture. It would appear that conventional farmers' rejection of the merits of organic farming is stronger than organic or bio-dynamic farmers' rejection of the merits of agrichemicals. Much of this can be traced to the acknowledgement by many organic and bio-dynamic farmers that there are significant economic benefits to be derived from the use of agrichemicals in farming. If that were their primary motivation in choosing their production method (which they charge is the primary concern of conventional farmers), then they would not be farming organically. However, organic and bio-dynamic farmers appear to be relatively more motivated by their environmental concerns rather than economic concerns. To gain further insight into the strength of their environmental concerns as a factor in their decisions to choose alternative production methods, all respondents were asked to complete the

"Environmental Opinion Survey" questionnaire, the results of which are presented next.

PART D. ENVIRONMENTAL VALUES AND BELIEFS

Are there differences between organic and conventional farmers in terms of their values and beliefs regarding the natural environment?(Question 10) While initially it would appear to be self-evident that organic farmers are more firmly committed to environmental values and beliefs, it is contended by those who support conventional agriculture that they are also committed to achieving environmental sustainability (see Council for Agricultural Science and Technology, 1990; Marco et al., 1987; and others). Therefore, the claim to being the more environmentally responsible actor is a contested one within the agricultural sector. Analysis of respondents' answers to the Environmental Opinion Survey offers one way to test whether there are differences and if so, that is that nature of those differences between organic and conventional farmers as well with government extension agents.

The Measurement of Environmental Attitudes

The measurement of environmental attitudes has following the initial work of Dunlap and Van Liere (1978) who developed the "New Environmental Paradigm Scale" (NEP). The set of assumptions underlying the New Environmental Paradigm have been summarized as follows by Catton and Dunlap (1978, p. 45).

> "1. Human beings are but one species among the many that are interdependently involved in the biotic communities that shape our social life.
>
> 2. Intricate linkages of cause and effect and feedback in the web of nature produce many unintended consequences from purposive human action.
>
> 3. The world is finite, so there are potent physical and biological limits constraining economic growth, social progress, and other societal phenomena."

In the subsequent literature on the NEP scale, these assumptions are referred to as "Man over Nature", "Balance of Nature", and "Limits to Growth" (Dunlap & Van Liere, 1978; Van Liere & Dunlap, 1980, 1981; Albrecht, Bultena, Hoiberg & Nowak, 1982; Arcury, Johnson & Scollay, 1986; Kuhn & Jackson, 1989; Shetzer, Stackman & Moore, 1991). Each of these assumptions are based in environmentalist philosophies of deep ecology (Naess, 1988; Devall & Sessions, 1985) and social ecology (Bookchin, 1990). The New Environmental Paradigm is positioned in opposition to what has been characterized as the Dominant Social Paradigm (DSP) which represents "the traditional values, attitudes, and beliefs prevalent in our society...our belief in abundance and progress, our devotion to growth and prosperity, our faith in science and technology, and our commitment to a laissez-faire economy, limited governmental planning and private property rights all contribute to environmental degradation and/or hinder efforts to improve the quality of the environment" (Dunlap & Van Liere, 1978). This has been represented as an anti-ecological worldview which rejects the central assumptions of the New Environmental Paradigm.

The NEP scale has been used to compare the level of environmental concerns of the general public and members of environmental organizations (Dunlap & Van Liere, 1978), and farmers and urbanites (Albrecht et al., 1982; Geller & Lasley, 1985). The NEP scale has been used in conjunction with other measures of environmental attitudes on a sample of the general public in Alberta (Kuhn & Jackson, 1989) and in Kentucky (Arcury et al., 1986) and of U.B.C. business students (Shetzer et al., 1991). In general, it has been found that NEP scale scores are positively related to education level, awareness of environmental problems, urban residence and political liberalism but negatively related to age.

As reported by Buttel, Gillespie, Larson and Harris (1981), several studies have found that compared to urban residents, farmers have lower levels of environmental awareness or concern. In their own study of environmental attitudes of farm operators in Michigan and New York states, Buttel et al. (1981) found negative relationships between environmental concern and scale of operation (farm acreage) and family wealth indicators. They found inconsistent results as far as relationships with age or education levels. Perhaps most interesting was their finding of a strong positive relationship between farmers' environmental concern and noneconomic orientation toward agriculture.

The Environmental Opinion Survey (30 items on a 7 point Likert-type scale) used in this study utilized environmental concern items from the original NEP Scale (Dunlap and Van Liere, 1978) as well as from other sources (Devall, 1988; Kuhn & Jackson, 1989; Shetzer et al., 1991). Environmental concern was measured on the following seven scales:

EOS1: Negative consequences of growth and technology.

EOS2: Relationship between humankind and nature

EOS3: Quality of life

EOS4: Limits to the biosphere

EOS5: Attention to environmental issues

EOS6: Role of government regarding the natural environment

EOS7: Total environment concern

Environmental Opinion Survey Results

A total of 116 individuals (102 farmers, 10 government, 4 farm organization staff) completed the Environmental Opinion Survey (EOS). An examination of the group means in Table 5-19 indicates that organic and bio-dynamic farmers and government representatives appear more pro-environmental than conventional and organic-conventional farmers who were essentially neutral on many of the dimensions of environmental concern. It appears that the organic farmers followed by the bio-dynamic farmers are overall, more pro-environmental than the other groups of respondents ($F_{(5,110)} = 10.4949$, $p < .0001$). However this may be primarily a function of degree given the observation that all group mens were greater than neutral (i.e., 4 on the scale). There were no group means below neutrality (4) which would have indicated support for the Dominant Social Paradigm.

Comparison of the means by analysis of variance tests revealed that organic farmers believed most strongly that there were negative consequences to growth and technology ($F_{(3,110)} = 10.7126$, $p < .0001$). It was interesting that government agricultural extension agents (followed by conventional farmers and farm organization employees) were much more likely to be neutral regarding the consequences of growth and technology. In regards to the NEP value of the relationship between humankind and nature, organic, bio-dynamic and government representatives appear to subscribe more strongly (than conventional or organic-conventional farmers) to the belief that human beings need to live in harmony with nature in order to survive. This also indicates support for the ecological principle of the interdependence and equality of life forms.

High scores on the quality of life scale indicates that one believes that there are limits to economic growth and the ability of science and technology to improve the standard of living. Organic and bio-dynamic farmers were found to subscribe more strongly to this position that conventional, organic-conventional or farm organization employees did ($F_{(5,110)} = 11.4274$, $p < .0001$). The limits to the biosphere scale addresses the belief that the earth is like a spaceship, that natural resources are limited and humans are fast approaching the upper limit of earth's capacity to support the human population. There was general agreement amongst all respondents that this is indeed the situation (i.e., no significant group differences).

The attention to environmental issues scale measured the degree to which one believes that enough attention is paid to environmental issues and whether the news media is accurate regarding the seriousness of such issues. The only difference between groups was that government and farm organization employees had higher scale scores than bio-dynamic farmers did ($F_{(5,110)} = 2.0907$, $p = .0717$).

The role of government in regards to environmental issues addresses the degree to which one believes in the active intervention of government (the Dominant Social Paradigm supports the principle of laissez-faire government). While it appears that organic, bio-dynamic and government representatives favour more interventionist government action, the only significant difference was between organic and organic-conventional farmers ($F_{(5,110)} = 3.4940$, $p = .0057$).

TABLE 5-19. ENVIRONMENTAL OPINION SURVEY: EOS SCALE MEANS

EOS SCALE	TOTAL SAMPLE (n=116) Mean (s.d.)	ORGANIC FARMERS (n=51) Mean (s.d.)	CONVENTIONAL FARMERS (n=38) Mean (s.d.)	ORGANIC-CONVENTIONAL FARMERS (n=5) Mean (s.d.)	BIODYNAMIC FARMERS (n=8) Mean (s.d.)	GOVT. REPS (n=10) Mean (s.d.)	OTHER (n=4) Mean (s.d.)
EOS1: Growth & Technology	5.1988 (1.040)	5.8027 (.719)	4.7023 (1.024)	4.7500 (.893)	5.4844 (1.072)	4.1875 (.811)	4.7344 (.785)
EOS2: Humankind and Nature	5.8251 (.948)	6.3056 (.729)	5.2951 (1.005)	4.9429 (.773)	5.9196 (.739)	5.8714 (.812)	5.5179 (.357)
EOS3: Quality of Life	5.1889 (1.103)	5.8072 (.794)	4.405 (1.053)	4.5667 (.608)	5.6771 (1.053)	5.1500 (.901)	4.6458 (1.010)
EOS4: Limits to Biosphere	5.2991 (1.067)	5.5863 (.949)	4.9256 (1.208)	4.8000 (.762)	5.2250 (.972)	5.4600 (1.024)	5.6500 (.854)
EOS5: Attention to Envir.Issues	4.6780 (.893)	4.5529 (.876)	4.6923 (.878)	5.1000 (.894)	4.1875 (.799)	5.2000 (1.006)	5.3125 (.239)
EOS6: Role of Government	5.2161 (1.173)	5.6442 (1.053)	4.7949 (1.134)	4.3000 (1.565)	5.4063 (.906)	5.1000 (1.350)	4.8125 (.800)
EOS7: Total Envir. Concern	5.3103 (.760)	5.7735 (.539)	4.8342 (.749)	4.7600 (.651)	5.4896 (.707)	5.1133 (.564)	5.0958 (.550)

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note 1. High score indicates higher commitment to the New Environmental Paradigm (Dunlap & Van Liere, 1978).

TABLE 5-20. ENVIRONMENTAL OPINION SURVEY: SUMMARY OF ANOVA TESTS FOR BETWEEN GROUPS DIFFERENCES

ENVIRONMENTAL OPINION SCALE		d.f.	Means Squares	F-ratio	prob.	Sig. Group differences (p<.05 level) (Note 1)
EOS1: Growth & Technology						
	between groups	5	8.1432	10.7126	.0000	ORG > [O-C, OTHER, CONV,GOVT]
	within groups	110	.7602			BD > GOVT
EOS2: Humankind & Nature						
	between groups	5	5.3732	7.7288	.0000	[ORG, BD, GOVT] > O-C
	within groups	110	.6952			ORG > CONV
EOS3: Quality of Life						
	between groups	5	9.5686	11.4274	.0000	[ORG, BD] > [OTHER, O-C, CONV]
	within groups	110	.8373			
EOS4: Limits to Biosphere						
	between groups	5	2.3372	2.1573	.0639	
	within groups	110	1.0835			
EOS5: Attention to Envir.Issues						
	between groups	5	1.5945	2.0907	.0717	[OTHER, GOVT] > BD
	within groups	110	.7626			
EOS6: Role of Government						
	between groups	5	4.3446	3.4940	.0057	ORG > O-C
	within groups	110	1.2434			
EOS7: Total Environmental Concern						
	between groups	5	4.2520	10.4949	.0000	ORG > [GOVT, OTHER, CONV, O-C]
	within groups	110	.4051			BD > O-C

Note 1. Abbreviations for groups: ORG = Organic Farmers; CONV = Conventional Farmers; O-C = Organic-Conventional Farmers; BD = Biodynamics Farmers; GOVT = Government Representatives; OTHER = Conventional Farm Organization Staff Members.
Means of groups within brackets are not significantly different from each other.

Given the observed differences in means between groups, separate analyses were conducted to determine whether age, education level, farming experience, and farm scale and diversity were explanatory variables in scale means. Unlike previous research using the NEP scales, very few significant relationships were found for this group of farmers. In regards to age, there was a negative relationship between the age of organic farmers and their support for government intervention in regards to environmental issues ($r = -.2711$, $p < .05$). Contrary to the findings in other studies, the age of conventional farmers was positively related to the belief that there are limits to the biosphere ($r = .3140$, $p < .05$). In addition, the age of bio-dynamic farmers was positively related to scores on the quality of life scale ($r = .6525$, $p < .05$).

A farmers' education level had no relationship with EOS scale scores after controlling for production method type. There were also no differences based on the type of post-secondary eduction completed by a respondent.

In answer to the question of whether years of farming experience was related to one's level of environmental concern, we find that for organic farmers there were negative relationships between years of total farming experience and the quality of life scale mean ($r = -.4045$, $p < .01$) and between years of organic farming experience and the role of government scale mean ($r = -.2930$, $p < .05$). Organic-conventional farmers also had a strong negative relationship between years of organic farming experience and the role of government in environmental issues score ($r = -.9616$, $p < .01$). The only significant relationship for bio-dynamic farmers was a positive one between years of total farming experience and belief in the negative consequences of growth and technology ($r = .6843$, $p < .05$). No significant relationships between farming experience and scale scores were found for the conventional farmer group.

Two measures of farm operations were considered -- average number of acres in production and average number of farm product categories. Organic farmers with fewer acres in production scored higher on the quality of life factor ($r = -.3636$, $p < .01$). Organic farmers with higher product diversity scored higher on the negative consequence of growth and technology scale ($r = .2846$, $p < .05$) and total EOS scale ($r = .2793$, $p < .05$). Bio-dynamic farmers with greater diversity scored higher on the role of government factor ($r = .6282$, $p < .05$). In contrast, there were negative relationships between diversity of farm products and organic-conventional farmers' scores on three factors -- relationship between humankind and nature ($r = -.9716$, $p < .01$), the limits to the biosphere ($r = -.9416$, $p < .01$), and the total EOS scale ($r = -.8993$, $p < .05$). Positive relationships were found between the number of acres in production and conventional farmers' scores on the relationship between humankind and nature scale ($r = .3177$, $p < .05$) and the role of government ($r = .374$, $p < .05$).

Discussion. Whereas previous research on environmental concern amongst members of the general public indicated that there were strong relationships between environmental concern and demographic variables such as age and education level, there were inconsistent results for these variables for this sample of B.C. farmers. In their study of New York and Michigan farm operators, Buttel et al. (1981) had similar inconsistent findings regarding demographic characteristics. Support for Buttel et al.'s (1981) finding of a negative relationship between scale of production and environmental concern was not found. The only significant relationship in this direction was for one item (quality of life) for the organic farmer group. However for a more comparable sample (i.e., conventional farmers) to that of Buttel et al., the opposite was found. That is, there was a positive relationship between the number of acres in production and environmental concern (and then only on 2 scales).

Given the consistently strong relationships between these types of variables and environmental concern found elsewhere, one wonders why there were so few for this sample of farmers. One reason may be the relatively small sample size in this study compared to that of studies reported in the research literature. Another reason may be the time of the survey, that is, one result of the recent increase in attention to environmental issues in the media and elsewhere has been the raising of environmental concern and knowledge of environmental issues for everyone, irrespective of their age or educational background. There is also the possibility that social desirability (or 'political correctness') was influencing individuals' responses to items in the Ecological Opinion Survey. Although previous research studies on the NEP scale have not explicitly examined the influence of social desirability on item responses, one result of the debate surrounding environmental responsibility may have been the sensitization of the general public in identifying politically correct (and incorrect) statements.

What these findings do reveal is that organic and bio-dynamic farmers are more committed to NEP assumptions than their conventional counterparts are. This is to be expected given their stated motivation to farm organically as a way of enacting their environmental beliefs. On the other hand, while not as strongly committed to ecological principles (as represented by NEP type scales), conventional farmers are not fully supportive of the Dominant Social Paradigm. They are essentially "caught in the middle" between both paradigms. This lends support for the contention of Colby (1990) that there has been an evolution in perceptions of environmental problems which renders inappropriate a bipolar dominant environmental paradigm approach. Instead, Colby identifies five paradigms of environmental management along a continuum anchored by Dominant Social Paradigm assumptions ("Frontier Economics") at one end and Deep Ecology assumptions at the other. In between there are three middle-range paradigms ("Environmental Protection", "Resource Management", "Eco-Development") which share to varying degrees the different assumptions of those paradigms at the ends of the continuum. Using this extended conceptual framework of environmental paradigms, it would appear that the conventional farmers could be categorized as subscribing to Resource Management paradigm assumptions underlying the concept of sustainable development as outlined in the Brundtland Report (World Commission on Environment and Development, 1987a; 1987b).

PART E. RELATIONSHIPS BETWEEN ENVIRONMENTAL VALUES AND PERCEPTIONS OF ORGANIC FARMING AND SYNTHETIC AGRICHEMICALS

In this part of the analysis, the following relationships between values and perceptions will be explored: first, the relationship between environmental values and perceptions of organic farming (Research Question 11b); second, the relationship between environmental values and synthetic agrichemicals (Research Question 11c).

To examine the relationships between one's level of environmental concern and one's perceptions regarding organic farming, correlation analyses of responses to the two scales were conducted. As evident in Table 5-21, there appears to be a relatively high number of positive relationships between the two sets of variables. Two exceptions would be the organic farming scale regarding trialability and the EOS scale for government involvement which showed fewer and weaker relationships. For all other variables and in particular the summary scales, perceptions of organic farming are strongly and positively related to pro-environmental values and beliefs. Subsequent analyses by production method group reduced the number of significant relationships somewhat (for example only 15 for organic farmers, 7 for conventional, 5 for bio-dynamic, 1 for organic-conventional and 1 for government representatives). This may be primarily a function of the reduced sample sizes but all of the correlations remained in the same directions.

Given the environmentalist position that the use of synthetic chemicals is not an environmentally sound practice, could one hold pro-environmental values at the same time as having a positive valuation of these inputs to agricultural production? If the environmentalist position is correct then one would expect strong negative correlations between scale scores on the EOS and the Use of Agrichemicals questionnaires. This prediction is confirmed by the results of the correlation analysis presented in Table 5-22.

TABLE 5-21. PERCEPTIONS OF ORGANIC FARMING AND ENVIRONMENTAL OPINIONS: CORRELATIONS OF SUMMARY SCALES

TOTAL SAMPLE (n=113)

ORGANIC FARMING SCALES	Means	s.d.	ENVIRONMENTAL OPINION SCALES						
			EOS1	EOS2	EOS3	EOS4	EOS5	EOS6	EOS7
OF1: Economic Benefits	2.7201	.633	.4831***	.4759***	.4164***	.2398**	-.2401**	.0787	.4825***
OF2: Pest/Weed Control	2.6726	.896	.4285***	.4310***	.3642***	.2697**	-.1657*	-.0142	.4374***
OF3: Complexity	2.9292	.855	.2617**	.2482**	.1954*	.0523	-.2440**	-.0650	.2116*
OF4: Trialability	2.9478	1.191	.0034	.0505	-.0968	-.1057	-.0439	-.0439	.0059
OF5: Compatibility	3.8142	1.146	.4197***	.2861***	.3051***	.2324**	-.0652	.1710*	.3929***
OF6: Global Perception	2.8938	.512	.5156***	.3410***	.3351***	.2346**	-.1833*	.0625	.4331***
EOS1: Growth & Technology	5.1787	1.046							
EOS2: Humankind and Nature	5.8066	.954							
EOS3: Quality of Life	5.1615	1.097							
EOS4: Limits to Biosphere	5.2973	1.064							
EOS5: Attention to Envir.Issues	4.6814	.890							
EOS6: Role of Government	5.2080	1.179							
EOS7: Total Envir. Concern	5.3103	.760							

* p < .05 ** p < .01 *** p < .001

TABLE 5-21.(Continued) PERCEPTIONS OF ORGANIC FARMING AND ENVIRONMENTAL OPINIONS: CORRELATIONS OF SUMMARY SCALES

	Means	s.d.	ENVIRONMENTAL OPINION SCALES						
			EOS1	EOS2	EOS3	EOS4	EOS5	EOS6	EOS7
ORGANIC FARMERS (n=48)									
OF1: Economic Benefits	3.1224	.511	.0135	.2487*	.0228	.2627*	-.1330	-.3105*	-.1154
OF2: Pest/Weed Control	3.0313	.847	.2263	.3158*	.3361**	.4046**	-.0454	-.3392**	.3548**
OF3: Complexity	3.0729	.951	.2406*	.3726**	.2170	.1953	-.3091*	-.0810	.2874*
OF4: Trialability	2.9792	1.280	-.0075	.0224	-.1647	-.0263	-.0138	-.1738	-.0764
OF5: Compatibility	4.5208	.714	-.0332	.1829	.0083	.2601*	-.0662	.0582	.1287
OF6: Global Perception	3.1818	.421	.0963	.1361	-.0811	.2610*	-.1922	-.2985*	.0736
EOS1: Growth & Technology	5.7930	.739							
EOS2: Humankind and Nature	6.2932	.749							
EOS3: Quality of Life	5.7813	.788							
EOS4: Limits to Biosphere	5.5604	.972							
EOS5: Attention to Envir.Issues	4.5365	.860							
EOS6: Role of Government	5.6250	1.088							
EOS7: Total Envir. Concern	5.7736	.539							
CONVENTIONAL FARMERS (n=38)									
OF1: Economic Benefits	2.3224	.436	.3969**	.3985**	.1620	.2258	-.1506	.1564	.3789*
OF2: Pest/Weed Control	2.3158	.809	.3502*	.3333*	.0558	.1412	-.1240	.1496	.2907*
OF3: Complexity	2.8026	.632	.2071	.0911	.1220	-.0092	.0644	-.0581	.1351
OF4: Trialability	2.8421	1.151	.1210	-.1121	-.2356	-.1726	.2597	-.1773	-.1007
OF5: Compatibility	3.0263	1.078	.2171	-.2087	-.2201	.0719	.1929	-.1406	-.0279
OF6: Global Perception	2.5813	.368	.4201**	.1030	-.0476	.1396	.0594	.0004	.2139
EOS1: Growth & Technology	4.7023	1.024							
EOS2: Humankind and Nature	5.2951	1.005							
EOS3: Quality of Life	4.4057	1.053							
EOS4: Limits to Biosphere	4.9658	1.197							
EOS5: Attention to Envir.Issues	4.7105	.883							
EOS6: Role of Government	4.8289	1.129							
EOS7: Total Envir. Concern	4.8342	.749							

* p < .05   ** p < .01   *** p < .001

Only the EOS scale regarding attention to environmental issues failed to conform to expectations (it showed significant positive relationships with the benefits of agrichemicals). Even with reduced sample sizes, the majority of correlations remained in the same direction as well as of the same magnitudes. The only exception concerned conventional farmers for whom many of the correlations between the EOS scale regarding attention to environmental issues and organic farming and agrichemical scales were negative rather than positive (but not statistically significant).

From the environmentalist perspective these findings are counterintuitive. While organic, bio-dynamic and organic-conventional farmers conform to expectations, apparently conventional farmers do not see the same inconsistency between their use of agrichemicals and pro-environmental values and beliefs. Rather than foregoing synthetic chemicals as the other groups have done, some conventional farmers are reducing their use of pesticides through IPM programmes and biological pest controls. They are also reducing their use of chemical fertilizers by trying crop rotations, green and animal manures. To minimize soil erosion, several conventional farmers are involved in soil conservation initiatives (which may or may not involve a reduction in the use of agrichemicals). It is in these less ideologically radical but pragmatic ways that conventional farmers are enacting their environmental values.

TABLE 5-22. USE OF AGRICHEMICALS AND ENVIRONMENTAL OPINIONS: CORRELATIONS OF SUMMARY SCALES

TOTAL SAMPLE (n=111)

AGRICHEMICAL SCALES	Means	s.d.	EOS1	EOS2	EOS3	EOS4	EOS5	EOS6	EOS7
			ENVIRONMENTAL OPINION SCALES						
AC1: Production/Economic	3.8829	1.313	-.5480***	-.4585***	-.5361***	-.3045***	.2471**	-.1646	-.5570***
AC2: Pests/Weed Control	2.7673	1.424	-.5477***	-.4750***	-.5278***	-.2110*	.1771*	-.2255**	-.5493***
AC3: Effect on Soil	2.3266	1.323	-.6499***	-.4840***	-.5222***	-.3562***	.1291	-.3283***	-.6359***
AC4: Ease of Use	4.4054	1.774	-.0370	-.1741*	-.1035	-.1484	-.0676	.0775	-.1258
AC5: Effect on Environment	2.6261	1.554	-.7070***	-.5591***	-.5718***	-.4185***	.2091*	-.3741***	-.7059***
AC6: Safety	3.0462	1.637	-.6938***	-.4350***	-.5251***	-.3782***	.2848***	-.3377***	-.6325***
AC7: Effect on Food	2.7477	1.665	-.6355***	-.3785***	-.4839***	-.3223***	.2253**	-.2720**	-.5677***
AC8: Global Assessment	3.1191	1.270	-.6994***	-.5268***	-.5919***	-.3914***	.2533**	-.3030***	-.6824***
EOS1: Growth & Technology	5.1920	1.050							
EOS2: Humankind and Nature	5.8132	.951							
EOS3: Quality of Life	5.1734	1.100							
EOS4: Limits to Biosphere	5.2811	1.067							
EOS5: Attention to Envir.Issues	4.6847	.895							
EOS6: Role of Government	5.2162	1.183							
EOS7: Total Envir. Concern	5.3159	.764							

* p < .05   ** p < .01   *** p < .001

TABLE 5-22.(continued) USE OF AGRICHEMICALS AND ENVIRONMENTAL OPINIONS: CORRELATIONS OF SUMMARY SCALES

ENVIRONMENTAL OPINION SCALES

ORGANIC FARMERS (n=48)

AGRICHEMICAL SCALES	Means	s.d.	EOS1	EOS2	EOS3	EOS4	EOS5	EOS6	EOS7
AC1: Production/Economic	2.9722	.936	-.4040**	-.2273	-.4081**	-.3823**	.2414*	.2046	-.4027**
AC2: Pests/Weed Control	1.7465	.896	-.3883**	-.3873**	-.5727***	-.2707*	.0399	-.0377	-.5176***
AC3: Effect on Soil	1.4479	.711	-.3299*	-.3061*	-.4166**	-.2170	.0621	.1169	-.4295***
AC4: Ease of Use	4.1667	1.846	-.0980	-.1031	-.0707	-.1658	.0430	.1232	-.1187
AC5: Effect on Environment	1.5729	.777	-.5124***	-.3581**	-.2659*	-.2631*	.1512	-.3319*	-.4892***
AC6: Safety	1.7917	.715	-.4303***	-.3539**	-.1992	-.3091*	-.3134*	-.3874*	-.4423***
AC7: Effect on Food	1.6563	.858	-.3770**	-.3010*	-.2055	-.1748	-.1760	-.5116***	-.3984**
AC8: Global Assessment	2.1354	.606	-.5582***	-.4299***	-.4652***	-.4461***	.2594*	-.0902	-.5985***
EOS1: Growth & Technology	5.7930	.739							
EOS2: Humankind and Nature	6.2932	.749							
EOS3: Quality of Life	5.7813	.788							
EOS4: Limits to Biosphere	5.5604	.972							
EOS5: Attention to Envir.Issues	4.5365	.860							
EOS6: Role of Government	5.6250	1.088							
EOS7: Total Envir. Concern	5.7736	.539							

* $p < .05$ ** $p < .01$ *** $p < .001$

TABLE 5-22.(continued) USE OF AGRICHEMICALS AND ENVIRONMENTAL OPINIONS: CORRELATIONS OF SUMMARY SCALES

CONVENTIONAL FARMERS (n=38)

			ENVIRONMENTAL OPINION SCALES						
AGRICHEMICAL SCALES	Means	s.d.	EOS1	EOS2	EOS3	EOS4	EOS5	EOS6	EOS7
AC1: Production/Economic	4.9781	.831	-.3137*	-.2788*	-.1269	-.2151	.0541	-.1122	-.3017*
AC2: Pests/Weed Control	3.8246	1.033	-.1984	-.3173*	-.0951	.0613	-.1042	-.1791	-.2083
AC3: Effect on Soil	3.2368	1.230	-.5402***	-.3250*	-.1736	-.3696*	-.1623	-.2742*	-.4863***
AC4: Ease of Use	4.7895	1.707	.0376	-.0950	.0100	-.1160	-.1896	.1982	-.0377
AC5: Effect on Environment	3.7895	1.387	-.6334***	-.4989***	-.4455**	-.5322***	-.0162	-.3746**	-.6932***
AC6: Safety	4.3026	1.282	-.6556***	-.2026	-.2858*	-.4910***	.0064	-.2002	-.5332***
AC7: Effect on Food	3.9211	1.540	-.5329***	-.1734	-.2214	-.3371*	-.0918	-.0624	-.4141**
AC8: Global Assessment	4.1900	.889	-.6291***	-.3828**	-.3149*	-.4702***	-.0341	-.2681	-.5927***
EOS1: Growth & Technology	4.7023	1.024							
EOS2: Humankind and Nature	5.2951	1.005							
EOS3: Quality of Life	4.4057	1.053							
EOS4: Limits to Biosphere	4.9658	1.197							
EOS5: Attention to Envir.Issues	4.7105	.883							
EOS6: Role of Government	4.8289	1.129							
EOS7: Total Envir. Concern	4.8342	.749							

* $p < .05$ ** $p < .01$ *** $p < .001$

SECTION IV. FARM ORGANIZATIONS AND THEIR POWER AND POLITICS

"Now I love to till and work, the ever precious land,
but the banks are getting tougher -- Payment on demand!

Farming used to be, just a way of life.
Now it's all business, with hardship and strife.

Time to put the crop in, I need a dozen "grand"!
"Take more," they said, "we'll secure it with the land."

That was very fine, when time was well and plenty,
but now they have no heart, since we've lost our equity.

Into my farm, every penny I sank.
It may be over soon -- taken by the bank."

-- Allen Watson (Dawson Creek farmer)

In the rest of his poem, Allen Watson goes on to describe the case of a long time Dawson Creek farm family who almost lost their farm in foreclosure proceedings instituted by their bank. They might not be farming today if not for the intervention of other farmers who rallied to their support. Organizing to protect and promote the interests of farmers has a long tradition in Canadian agriculture (Pugh, 1987; Wood, 1975). The economic crisis in agriculture which started in the early 1980s has continued to grow cumulating with the organizing of farm protest rallies involving thousands of farmers in the 1990s.

One motivation for organizing in agriculture is to gain a strong collective voice to advocate government policies and programmes (economic, social, environmental) which will ensure the continuation of the agricultural sector. As detailed in Table IV-1, the farmers interviewed in this research study had no problems identifying a wide variety of problems in modern agriculture. The most pressing financial problems identified by farmers (especially conventional farmers) involve remaining financially viable in the face of free trade with the U.S., low market prices, imports from Third World countries, and international farmer subsidies. Many are struggling to continue to make a living in their chosen profession.

TABLE IV-1. PROBLEMS IN MODERN AGRICULTURE

	TOTAL SAMPLE (n=117) No. (%)	ORGANIC FARMERS (n=54) No. (%)	CONVENTIONAL FARMERS (n=44) No. (%)	ORGANIC-CONVENTIONAL FARMERS (n=6) No. (%)	BIODYNAMIC FARMERS (n=9) No. (%)	OTHER (n=4) No. (%)
Financial Problems						
1. Free trade (U.S. imports)	32 (27.4%)	9 (16.7%)	18 (40.9%)	2 (33.3%)	2 (22.2%)	1 (25.0%)
2. Low market prices	29 (24.8%)	12 (22.2%)	12 (27.3%)	--	4 (44.4%)	1 (25.0%)
3. To make a living farming	21 (17.9%)	7 (13.0%)	10 (22.7%)	2 (33.3%)	--	2 (50.0%)
4. Imports from the Third World	17 (14.5%)	10 (18.5%)	3 (6.8%)	1 (16.7%)	1 (11.1%)	2 (50.0%)
5. International subsidies	16 (13.7%)	6 (11.1%)	7 (15.9%)	--	1 (11.1%)	2 (50.0%)
6. Withdrawal of government subsidies	6 (5.1%)	--	4 (9.1%)	--	1 (11.1%)	1 (25.0%)
6. High interest rates	6 (5.1%)	1 (1.9%)	5 (11.4%)	--	--	--
6. Marketing, distribution	6 (5.1%)	4 (7.4%)	2 (4.6%)	--	--	--
9. Taxes (e.g., GST)	4 (3.4%)	1 (1.9%)	2 (4.6%)	1 (16.7%)	--	--
9. Lack of pesticides	4 (3.4%)	--	4 (9.1%)	--	--	--
11. Need for off-farm employment	3 (2.6%)	2 (3.7%)	1 (2.3%)	--	--	--
11. High proportion of farm debt	3 (2.6%)	1 (1.9%)	2 (4.6%)	--	--	--
11. High price of land	3 (2.6%)	2 (3.7%)	1 (2.3%)	--	--	--
14. Poor farm business management	2 (1.7%)	1 (1.9%)	1 (2.3%)	--	--	--
Environmental Problems						
1. Urban encroachment of farmland	15 (12.8%)	7 (13.0%)	7 (15.9%)	--	--	1 (25.0%)
2. Soil and water pollution	14 (12.0%)	12 (22.2%)	--	--	2 (22.2%)	--
3. Weather	8 (6.8%)	2 (3.7%)	5 (11.4%)	--	1 (11.1%)	--
4. Desertification of land	5 (4.3%)	4 (7.4%)	--	1 (16.7%)	--	--
4. Depletion of nonrenewable resources	5 (4.3%)	2 (3.7%)	3 (6.8%)	--	--	--
6. Lack of bioregional sustainability	3 (2.6%)	3 (5.6%)	--	--	--	--
6. Pest resistance	3 (2.6%)	2 (3.7%)	1 (2.3%)	--	--	--
8. World overpopulation	1 (0.9%)	--	--	1 (16.7%)	--	--
8. Climate change (e.g., ozone layer)	1 (0.9%)	1 (1.9%)	--	--	--	--
Personal/Other Problems						
1. Lack of respect for farming in modern society	24 (20.5%)	12 (22.2%)	11 (25.0%)	1 (16.7%)	--	--
2. Young people leaving rural life	11 (10.3%)	6 (11.1%)	5 (11.4%)			
3. Outmigration from rural areas	10 (8.5%)	6 (11.1%)	3 (6.8%)	--	1 (11.1%)	--
4. Loss of family farms	9 (7.7%)	4 (7.4%)	4 (9.1%)	1 (16.7%)	--	--
5. Agricultural Land Reserve	7 (6.0%)	--	6 (13.6%)	--	--	1 (25.0%)
6. Interference of environmental rights activists	5 (4.3%)	1 (1.9%)	3 (6.7%)	1 (16.7%)	--	--
6. Stress/Overwork	5 (4.3%)	2 (3.7%)	3 (6.7%)	--	--	--
8. Realizing spiritual fulfilment	3 (2.6%)	3 (5.6%)	--	--	--	--
8. Agriculture's lack of political clout	3 (2.6%)	2 (3.7%)	--	1 (16.7%)	--	--
10. Need for stronger farm organizations	2 (1.7%)	1 (1.9%)	1 (2.3%)	--	--	--

For organic farmers especially, there is often additional concern with the environmental problems in agriculture (eg., soil and water pollution, desertification of the land) and in general (eg., depletion of nonrenewable resources). Both organic and conventional farmers share a concern over the loss of farmland due to urban encroachment and the problems created by a close proximity to urban dwellings. And finally, there is a common concern that modern society takes agriculture for granted and does not respect the role that agriculture plays in providing the public with a high standard of living. They identify the loss of the family farm and the out-migration of existing and future generations of farmers from rural areas as threatening the long term viability of agriculture in Canada.

It is against this background that this section focuses on how farmers are organizing to help address these problems in modern agriculture. Chapter 8 on farm organizations in B.C. agriculture has three parts. Part A details the types and number of organizational memberships held by the B.C. farmers interviewed. Also identified are the reasons why they belong to these primarily volunteer organizations. The research questions of interest in understanding the strength and nature of farmers' linkages with farm organizations are:

> Are organic and conventional farmers different in terms of the number and types of farm organizations they belong to? (Research Question 19)
>
> Are organic and conventional farmers different in terms of their motivations for belonging to farm organizations? (Research Question 20)
>
> Are organic and conventional farmers different in terms of their memberships in organizations outside of agriculture? (Research Question 21)

Part B presents a more detailed picture of farm organizations through case study analyses of a total of 33 organizations involved in both conventional agriculture (farm interest groups, marketing associations/co-operatives, product commodity associations and one farmer education association) and organic agriculture (organic certifying associations). The descriptive research questions of interest in Part B are:

> What are the history, mission and objectives, activities, organizational structure and processes of different types of farm organizations? (Research Question 22)

> What roles do different types of farm organizations serve for their members? (Research Question 23)

In addition to providing a summary of the history, structure and processes of each organization, incidents involving organizational politics will also be discussed. This chapter concludes with Part C which focuses on leaders and leadership of B.C. farm organizations.

> What roles do leaders play in different types of farm organizations? (Research Question 24)

The analysis of leadership roles assumed by the farm organization leaders in the study includes an investigation of: Which leadership roles are most required in predominantly voluntary organizations? Are there differences in leadership role due to the size and age of an organization? Do leaders play different roles in organic farm associations as compared to farm organizations in mainstream agriculture?

Another focus of analysis is the identification of social innovations in organizing and/or promoting organizational interests in B.C. farm organizations.

> What is the incidence and nature of social innovations within different types of farm organizations? (Research Question 25)

Similarly, there is a research interest in determining the operation of any interorganizational linkages amongst and between farm organizations within B.C. agriculture.

> What has been the incidence, purpose and nature of interorganizational networks in conventional and organic agriculture? (Research Question 26)

This in turn serves as an entrée into Chapter 9 which focuses more specifically on the interorganizational politics surrounding the introduction of the B.C. government's organic certification programme. This account details how the government's initiative to develop an innovative regulatory system challenged the fledgling organic certifying associations' ability to remain a cohesive community. A detailed analysis of the organizational politics which occurred during the development of this social innovation in government is also conducted to answer the following research questions.

> What has been the incidence and nature of organizational politics operating within interorganizational networks in conventional and organic agriculture? (Research Question 27)

> What is the incidence and nature of social innovation championship and nonchampionship in interorganizational networks? (Research Question 28)

And finally, Section IV concludes with Chapter 10 which provides a summary discussion of the B.C. farm organizations reviewed in this study, perceptions of government's role in agriculture and future challenges for B.C. farm organizations.

TABLE IV-2. ANALYSIS OF THE ORGANIZATIONAL FIELD IN AGRICULTURE

INDIVIDUAL LEVEL (CHAPTER 6)

- Number and type of organizational memberships
  * farm organizations (RQ# 19)
  * nonagricultural organizations (RQ# 21)

- Motivations for belonging to farm organizations (RQ# 20)

- Innovation championship
  * type of championship role (RQ# 16)
  * political nature of championship (RQ# 17)

ORGANIZATIONAL LEVEL (CHAPTER 6)

- Organizations in mainstream and organic agriculture
  * organizational goals and structure (RQ# 22a)
  * critical issues and decision making processes (RQ# 22b)
  * incidence of intra- and inter-organizational politics (RQ# 22c)
  * nature of intra- and inter-organizational politics (RQ# 22c)

- Farm organizations' services for membership (RQ# 23)

- Leaders and leadership roles in farm organizations (RQ# 24)

- Innovation championship
  * type of championship role (RQ# 16)
  * political nature of championship (RQ# 17)
  * incidence and nature of social innovations (RQ# 18, 25)

INTERORGANIZATIONAL LEVEL (CHAPTERS 6, 7)

- Incidence, purpose and nature of interorganizational networks in conventional and organic agriculture (RQ# 26)

- Interorganizational politics in mainstream and organic agriculture
  * pattern of incidence of politics (RQ# 27a)
  * events/actions triggering political activity (RQ# 27b)
  * results of political activity (RQ# 27c)

- Innovation championship
  * type of championship role (RQ# 16)
  * political nature of championship (RQ# 17)
  * incidence and nature of social innovations (RQ# 18, 25)

- The politics of social innovation championship in organic agriculture
  * number of political tactics (RQ# 28a)
  * types of political tactics (RQ# 28b)
  * pattern of political tactics: number (RQ# 28c); type (RQ# 28d)

SOCIETAL LEVEL (CHAPTER 8)

- Government's role in agriculture (RQ# 20, 22, 23, 25, 26)

- Innovation championship
  * type of championship role (RQ# 16)
  * political nature of championship (RQ# 17)
  * incidence and nature of social innovations (RQ# 18, 25)

CHAPTER 6. FARM ORGANIZATIONS IN B.C. AGRICULTURE

As earlier set out in the introduction to Section IV, Chapter 6 is organized into three Parts. Part A presents a general analysis of the number of and motivations for membership in B.C. farm organizations. This is followed by Part B which provides a more in-depth understanding of the operation and functioning of individual B.C. farm organizations. And finally, Chapter 6 concludes with an analysis of the leaders and leadership roles in these primarily voluntary organizations.

PART A. ORGANIZATION MEMBERSHIP OF B.C. FARMERS

To determine the level and scope of farmers' involvement in farm organizations, respondents were asked to identify those organizations in which they held memberships, currently and in the past. They were also asked why they belonged to these farm organizations and in the case of those with past memberships, why they had left.

Farm Organization Membership

Only eight farmers interviewed were not currently members of a farm organization. The majority (65) held either one or two memberships while 17 were members of three farm organizations, 10 with four memberships and 15 were members of five or more such organizations. On average, this sample of farmers belonged to 2.42 (s.d. = 1.76) farm organizations with conventional farmers holding the greatest number of farm organization memberships (mean = 3.04, s.d. = 2.00) followed by organic farmers (mean = 2.14, s.d. = 1.49), bio-dynamic farmers (mean = 1.78, s.d. = 1.56) and organic-conventional farmers (mean = 1.33, s.d. = 1.03). Overall, conventional farmers held significantly more farm organization memberships than did organic farmers.[$F_{(3,112)} = 3.7655$, $p = .0128$, group difference significant at $p = .01$ level]. Given the relatively small number of bio-dynamic and organic-conventional farmers in the sample, their responses in regards to farm organization membership were combined with those of organic farmers and will be referred to henceforth as "organic".

TABLE 6-1. ORGANIZATIONAL MEMBERSHIPS: NUMBER OF FARM ORGANIZATIONS

No. of Farm Organizations	TOTAL FARMERS (n=114)	ORGANIC FARMERS (n=54)	CONVENTIONAL FARMERS (n=45)	ORGANIC-CONVENTIONAL FARMERS (n=6)	BIODYNAMIC FARMERS (n=9)
0	8	3	3	1	1
1	35	18	9	3	5
2	30	21	8	1	0
3	15	4	8	1	2
4	12	6	6	0	0
5+	16	4	11	0	1
Means	2.4224	2.1429	3.0444	1.3333	1.7778
Std.dev.	1.7602	1.4946	1.9995	1.0328	1.5635

In total 274 farm memberships were identified by respondents with the 69 organic farmers reporting 140 farm organization memberships and the 45 conventional farmers reporting 137 memberships. As revealed in Table 6-2, the types of farm organizations which respondents belong to differs substantially depending on their method of production. [Note that only four farm organization members were coded for each respondent thereby reducing the number reported on to 250 memberships.]

As expected, organic farmers are primarily members of farm organizations involved in organic and sustainable agriculture (99 memberships, 74 of which were in their local organic certifying associations) with only 17 memberships reported in conventional agriculture commodity organizations. In contrast, conventional farmers were most likely to identify memberships in conventional agriculture commodity groups (49), farmers' marketing co-operatives (21) while only two reported memberships in organic or sustainable agriculture organizations (although 3 did belong to Soil Conservation Societies). Thus it would appear that in terms of farm organization memberships, organic and conventional farmers tend to belong to different types of organizations thus limiting the degree of interpersonal contact in organizational activities.

TABLE 6-2. ORGANIZATIONAL MEMBERSHIPS: TYPES OF FARM ORGANIZATION MEMBERSHIPS

Type of Farm Organization (Note 1)	TOTAL FARMERS (n=114) No. (%)	ORGANIC/ BD/O-C FARMERS (n=69) No. (%)	CONVENTIONAL FARMERS (n=45) No. (%)
Organic/Sustainable Agriculture	101 (40.4%)	99 (73.3%)	2 (1.7%)
B.C. Regional Certifying Assn.	74	72	2
B.C. -- Other	12	12	0
National -- Outside B.C.	13	13	0
International	2	2	0
Conventional Agriculture General	6 (2.4%)	1 (0.7%)	5 (4.3%)
Conventional Agric. Commodity	66 (26.4%)	17 (12.6%)	49 (42.6%)
Livestock/Dairy	22	7	15
Poultry	2	0	2
Grains	9	4	5
Tree Fruits	24	3	21
Berries	4	0	4
Vegetables/Field Crops	2	0	2
Specialty	3	3	0
Farmer Marketing Co-operatives	23 (9.2%)	2 (1.5%)	21 (18.3%)
Direct Marketing/Farmers' Markets	12 (4.8%)	4 (3.0%)	8 (7.0%)
Farmers' Institutes	8 (3.2%)	1 (0.7%)	7 (6.1%)
Farmers Union	6 (2.4%)	3 (2.2%)	3 (2.6%)
Government Agricultural Committee	2 (0.1%)	0	2 (1.7%)
Other	26 (10.4%)	8 (5.9%)	18 (15.7%)
TOTAL MEMBERSHIPS	250 (100%)	135 (100%)	115 (100%)

Note: Only 4 organizations per respondent coded.

In terms of the geographic scope of the farm organizations to which they belonged, organic farmers were most likely to be members of local/regional organizations (52.6% of organizational memberships) with 32.6% of memberships in provincial organizations and only 6.7% in national and 8.1% in international farm organizations. Conventional farmers show a similar distribution in the geographic scope of their farm organization memberships with 49.6% of memberships in local/regional organizations, 42.6% in provincial organizations, 6.1% in

TABLE 6-3. ORGANIZATIONAL MEMBERSHIPS: GEOGRAPHIC SCOPE OF FARM ORGANIZATION MEMBERSHIPS

Geographic Scope of Organization (Note 1)	TOTAL FARMERS (n=114) No. (%)	ORGANIC/ BD/O-C FARMERS (n=69) No. (%)	CONVENTIONAL FARMERS (n=45) No. (%)
Local/Regional	128 (51.2%)	71 (52.6%)	56 (49.6%)
Provincial	93 (37.2%)	44 (32.6%)	49 (42.6%)
National	16 (6.4%)	9 (6.7%)	7 (6.1%)
International	13 (5.2%)	11 (8.1%)	2 (1.7%)
TOTAL	250 (100%)	135 (100%)	115 (100%)

Note: Only 4 organizations per respondent coded.

national organizations, and only 1.7% in international organizations. It should be noted that these results pertain only to the geographic scope of those organizations which farmers identified that they were involved with and does not reflect the subsidiary membership arrangements between local/regional farm organizations and their provincial or national counterparts or umbrella associations (the most notable being, within conventional agriculture, the membership of almost all product commodity associations in the B.C. Federation of Agriculture and through that, the Canadian Federation of Agriculture).

Reasons for Belonging to Farm Organizations

What then are the farmers' reasons for belonging to these organizations? There were nine categories of reasons for membership: (1) information/ educational; (2) lobbying government policy makers; (3) services to members; (4) marketing farm products; (5) purchase of farm supplies; (6) certification of organic products; (7) social life; (8) expected to join by others; (9) provide advice to government agencies/researchers. Up to three reasons for membership were coded for each organizational membership.

TABLE 6-4. ORGANIZATIONAL MEMBERSHIPS: REASONS FOR BELONGING TO FARM ORGANIZATIONS

Reasons for Belonging (Note 1)	TOTAL FARMERS (n=114) No. (%)	ORGANIC/ BD/O-C FARMERS (n=69) No. (%)	CONVENTIONAL FARMERS (n=45) No. (%)
Organic/Sustainable Agriculture			
(No. of Organizational Memberships)	(74)	(72)	(2)
Information/Education	56 (76.7%)	54 (75.0%)	2 (100%)
Organic Certification	53 (71.6%)	53 (73.6%)	0
Marketing Farm Products	8 (10.8%)	8 (11.1%)	0
Purchase of Farm Supplies	4 (5.4%)	4 (5.6%)	0
Services to Members	1 (1.4%)	1 (1.4%)	0
Lobbying Government	1 (1.4%)	1 (1.4%)	0
General and Commodity Groups			
(No. of Organizational Memberships)	(72)	(18)	(54)
Information/Education	45 (62.5%)	16 (88.9%)	29 (53.7%)
Marketing Farm Products	32 (44.4%)	9 (50.0%)	23 (42.6%)
Services to Members	17 (23.6%)	4 (22.2%)	13 (24.1%)
Lobbying Government	15 (20.8%)	3 (16.7%)	12 (22.2%)
Purchase of Farm Supplies	3 (4.2%)	0	3 (5.6%)
Farmer Marketing Co-operatives			
(No. of Organizational Memberships)	(23)	(2)	(21)
Marketing Farm Products	17 (73.9%)	2 (100%)	15 (71.4%)
Services to Members	5 (21.7%)	0	5 (23.8%)
Purchase of Farm Supplies	2 (8.6%)	0	2 (9.5%)
Lobbying Government	1 (4.3%)	0	1 (4.8%)
Direct Marketing/Farmers Markets			
(No. of Organizational Memberships)	(12)	(4)	(8)
Marketing Farm Products	11 (91.6%)	4 (100%)	7 (87.5%)
Lobbying Government	1 (8.3%)	0	1 (12.5%)
Farmers' Institutes			
(No. of Organizational Memberships)	(8)	(1)	(7)
Information/Education	6 (75.0%)	1 (100%)	5 (71.4%)
Lobbying Government	6 (75.0%)	1 (100%)	5 (71.4%)
Farmers Union			
(No. of Organizational Memberships)	(4)	(2)	(2)
Lobbying Government	4 (100%)	2 (100%)	2 (100%)
Information/Education	2 (50.0%)	2 (100%)	0
Expected to Join by Others	1 (25.0%)	0	1 (50.0%)

Note 1. Maximum 3 reasons per organization. Only 4 organizations per respondent coded.

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The two primary reasons for membership in organic/sustainable agriculture organizations (74 memberships) are: information/education (75% of organic farmer members); and certification of organic products (73.6% of organic farmer members). Marketing (11.1%) and purchase of farm supplies (5.6%) were much less often cited reasons for belonging to these types of organizations.

Membership in conventional general and commodity group farm organizations (72 memberships) were primarily for information/education purposes (62.5% of total sample members) and marketing (44.4%); and secondarily for the services offered to members (23.6%) and lobbying government policy makers (20.8%). A comparison of reasons provided by organic and conventional farmers show that the information/education purpose was somewhat stronger for organic farmers (88.9%) than for conventional farmers (53.7%). Otherwise both types of farmers cited similar reasons for belonging to these organizations.

Membership in marketing co-operatives (conventional agriculture) was, not surprisingly, primarily for the purpose of marketing one's farm products (73.9% of total sample members); and secondarily, for the services they provide to members (23.8% of conventional farmer members). Similarly, the sole purpose for the majority of those belonging to direct marketing associations and farmers markets was to market their products (91.6% of members).

For the eight farmers who belong to farmers' institutes, their motivations were evenly split between information/education (75% of members) and lobbying government policy makers (75%). Membership in a farmer union was primarily for government lobbying purposes (100%) and secondarily for information purposes (50%).

In summary, organic farming organizations serve two primary functions for their members -- information/ education and the provision of a certification process (which can then be utilized in marketing their products). General and commodity group organizations in conventional agriculture are seen to play a wider variety of roles for their members including lobbying government policy makers to provide benefits for their members. Lobbying government plays a relatively more important role for local farmers institutes.

Reasons for Leaving Farm Organizations

There were a number of farmers (30 organic and 12 conventional) who reported that they had ceased membership in farm organizations. Table 6-5 presents a comparison of the reasons why these farmers had belonged and had left organic farming, conventional agriculture, farmer marketing co-operatives, and farmers unions.

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TABLE 6-5. PAST ORGANIZATIONAL MEMBERSHIPS: REASONS FOR BELONGING AND LEAVING FARM ORGANIZATIONS

	TOTAL FARMERS (n=114) No. (%)	ORGANIC/ BD/O-C FARMERS (n=69) No. (%)	CONVENTIONAL FARMERS (n=45) No. (%)
Organic/Sustainable Agriculture (No.)	(24)	(23)	(1)
Reasons for Belonging			
1. Organic Certification	18 (75.0%)	17 (73.9%)	1 (100%)
2. Information/Education	12 (50.05)	11 (47.8%)	1 (100%)
3. Marketing Farm Products	1 (4.2%)	1 (4.3%)	0
4. Purchase of Farm Supplies	1 (4.2%)	1 (4.3%)	0
5. Lobbying Government	1 (4.2%)	1 (4.3%)	0
Reasons for Leaving			
1. Disagreed with Orgn. Goals	9 (37.5%)	9 (39.1%)	0
2. Dissatisfied with Orgn. Leadership	7 (29.2%)	7 (30.4%)	0
3. Disagreed with Orgn. Strategies	6 (25.0%)	6 (26.1%)	0
4. No Benefits to Belonging	5 (20.8%)	4 (17.4%)	1 (100%)
5. Moved Away	4 (16.7%)	4 (17.4%)	0
6. Took too much Time	2 (8.3%)	2 (8.6%)	0
7. Orgn. Discontinued	2 (8.3%)	2 (8.6%)	0
8. Change in Needs	2 (8.3%)	2 (8.6%)	0
General and Commodity Groups (No.)	(27)	(16)	(11)
Reasons for Belonging			
1. Information/Education	11 (40.7%)	8 (50.0%)	3 (27.3%)
2. Marketing Farm Products	10 (37.0%)	5 (31.3%)	5 (45.5%)
3. Services to Members	5 (18.5%)	4 (25.0%)	1 (9.1%)
4. Lobbying Government	4 (14.8%)	3 (18.8%)	1 (9.1%)
5. Purchase of Farm Supplies	2 (7.4%)	1 (6.3%)	1 (9.1%)
6. Social Life	1 (3.7%)	0	1 (9.1%)
Reasons for Leaving			
1. No Benefits to Belonging	7 (25.9%)	4 (25.0%)	3 (27.3%)
2. Orgn. Discontinued	6 (22.2%)	2 (12.5%)	4 (36.4%)
3. Change in Needs	5 (18.5%)	4 (25.0%)	1 (9.1%)
4. Disagreed with Orgn. Strategies	4 (14.8%)	0	3 (27.3%)
5. Disagreed with Orgn. Goals	3 (11.1%)	2 (12.5%)	1 (9.1%)
6. Moved Away	3 (11.1%)	3 (18.8%)	0
7. Dissatisfied with Orgn. Leadership	2 (7.4%)	2 (12.5%)	0
8. Took too much Time	1 (3.7%)	0	1 (9.1%)
9. Dissatisfied with Orgn. Membership	1 (3.7%)	1 (6.3%)	0

TABLE 6-5.(Cont.) PAST ORGANIZATIONAL MEMBERSHIPS: REASONS FOR BELONGING AND LEAVING FARM ORGANIZATIONS

	TOTAL FARMERS (n=114) No. (%)	ORGANIC/ BD/O-C FARMERS (n=69) No. (%)	CONVENTIONAL FARMERS (n=45) No. (%)
Farmers Union (No.)	(4)	(4)	(0)
Reasons for Belonging			
1. Lobbying Government	4 (100%)	4 (100%)	0
2. Information/Education	1 (25.0%)	1 (25.0%)	0
Reasons for Leaving			
1. Moved Away	3 (75.0%)	3 (75.0%)	0
2. Disagreed with Orgn. Goals	1 (25.0%)	1 (25.0%)	0
3. Disagreed with Orgn. Strategies	1 (25.0%)	1 (25.0%)	0
4. Orgn. Discontinued	1 (25.0%)	1 (25.0%)	0
Farmers' Marketing Co-operative (No.)	(3)	(3)	(0)
Reasons for Belonging			
1. Marketing Farm Products	3 (100%)	3 (100%)	0
2. Information/Education	2 (66.7%)	2 (66.7%)	0
Reasons for Leaving			
1. Moved Away	2 (66.7%)	2 (66.7%)	0
2. Took too much Time	1 (33.3%)	1 (33.3%)	0
3. Orgn. Discontinued	1 (33.3%)	1 (33.3%)	0

In respect to organic farming associations, 23 organic farmers and one conventional farmer stated that they had joined such an organization to gain information and to certify organic farm products. The reasons why they left these organizations varied considerably. Foremost was a disagreement with organizational goals (9 responses), leadership (7 responses), and strategies (6 responses). Many of these responses were related to eight organic farmers' disagreements with the Alliance of B.C. Organic Producers Association which will be discussed in further detail later in Chapter 7.

Those who have left conventional agriculture organizations (general and commodity group) related that they had joined primarily to obtain information/education and to help with marketing their farm products. Conventional farmers (11) who had left these organizations most often stated that they were dissatisfied with the organization's membership (4 responses), disagreed with organizational strategies (3) or saw no benefits to continuing their membership (3). Organic farmers who had past membership in these organizations more often stated that they had had a change in their needs (4) and no longer saw any benefits to belonging (4) -- both reasons often related to their decision to convert to organic farming production methods.

Only three organic farmers reported past memberships in farmer marketing co-operatives. Their reasons for discontinuing membership were that they had moved away (2), the co-operative had discontinued (1) or it took too much time to remain involved (1). The primary reason why the four organic farmers had left a farmers union (which they had joined for the organization's lobbying role) was that they had moved to a B.C. location where the farmers union did not operate (3).

In total, considering the large number of organization memberships (274) currently held by the farmers interviewed, there were relatively few who had ceased memberships. The conventional farmers appear to have had the most stable farm organization membership. Considering the relatively short time which many of the organic farming associations have been in existence (all but one were less than 8 years old), it is interesting that there is a proportionately greater degree of turnover in their membership.

Membership in Nonagricultural Organizations

To conclude this part on organizational membership, to what degree were the farmers interviewed involved in nonagricultural organizations? 58% of organic and 49% of conventional farmers belonged to organizations outside agriculture. In general, organic farmers hold relatively more such memberships (mean = 1.51, s.d. = 1.91) than do conventional farmers (mean = .76, s.d. = .91). [$t = 2.46$, $df = 114$, $p = .015$]

Several organic farmers (16) were members of environmental interest groups (compared to none of the conventional farmers surveyed). They were also more likely to be in special interest organizations (12 organic compared to 5 conventional farmers) such as Arts Councils, crafts groups, etc. Both groups

TABLE 6-6. ORGANIZATIONAL MEMBERSHIPS: NONAGRICULTURAL ORGANIZATIONS

Types of Organizations	TOTAL FARMERS (n=63) No. (%)	ORGANIC/ BD/O-C FARMERS (n=41) No. (%)	CONVENTIONAL FARMERS (n=22) No. (%)
Special Interest/Hobby	20 (17.9%)	15 (19.2%)	5 (14.7%)
Environmental Interest Group	16 (14.3%)	16 (20.5%)	0
Religious/Spiritual	16 (14.3%)	10 (12.8%)	6 (17.6%)
Municipal Government	16 (14.3%)	9 (11.5%)	7 (20.6%)
Professional Assn./Trade Union	10 (8.9%)	7 (9.0%)	3 (8.8%)
Political Party	7 (6.3%)	6 (7.7%)	1 (2.9%)
Youth Orgn. (Sports, Scouts)	7 (6.3%)	3 (3.8%)	4 (11.8%)
Service Club	6 (5.4%)	3 (3.8%)	3 (8.8%)
Nongovt. Interest Group	5 (4.5%)	4 (5.1%)	1 (2.9%)
School/Education	3 (2.7%)	3 (3.8%)	0
Chamber of Commerce	3 (2.7%)	0	3 (8.8%)
Food Co-operative	2 (1.8%)	2 (2.6%)	0
Federal Govt. Agency	1 (0.1%)	0	1 (2.9%)
Total No. Memberships	112 (100%)	78 (100%)	34 (100%)
Number of Nonagricultural Organizational Memberships			
0	53 (45.7%)	30 (42.3%)	23 (51.1%)
1	28 (24.1%)	16 (22.5%)	12 (26.7%)
2	17 (14.7%)	9 (12.7%)	8 (17.8%)
3	7 (6.0%)	5 (7.0%)	2 (4.4%)
4	3 (2.6%)	3 (4.2%)	0
5	4 (3.4%)	4 (5.6%)	0
6+	4 (3.4%)	4 (5.6%)	0
No. Farmers	116 (100%)	71 (100%)	45 (100%)
Means	1.2155	1.5070	.7556
Std.Dev.	1.6355	1.9110	.9084

were almost equally likely to be involved in their municipal governments either as elected officials or on committees (9 organic, 7 conventional) and in religious/spiritual organizations (10 organic, 6 conventional). There were three conventional farmers who belonged to their local Chamber of Commerce. Five of the organic farmers stated they held membership in a political party (primarily the NDP). It would appear then that many of the farmers interviewed are actively involved in their communities in areas outside of agriculture.

Summary Discussion

These findings indicate that there are differences between organic and conventional farmers in terms of the level and nature of their organizational memberships. First of all, conventional farmers report a greater number of memberships in farm organizations whilst organic farmers report a greater number of memberships in nonagricultural organizations. The types of memberships held by each group indicates that there are very few individuals who memberships in both organic and conventional farm organizations. This is to be expected in that the primary reason for belonging to a farm organization was stated to be obtaining information and education about agriculture. One side effect of this evident separatism in membership is that there is little contact between organic and conventional farmers in organizational settings thus limiting the diffusion of ideas and developments (either organic or conventional) from one area to the other.

PART B. CASE STUDIES OF B.C. FARM ORGANIZATIONS

The reporting of summary data regarding farm organization membership and motivations to belong (or leave) these organizations offers only a general picture of their roles and operation. In this section, a more complete detailed picture of farm organizations in B.C. will be provided. During their interviews, farmers and farm organization staff were asked to focus on one organization which they were the most involved in. Information was also gathered from an organization's literature and secondary data sources (newspapers, reports, publications, etc.). Efforts were made to interview both members and the leaders of farm organizations (a total of 30 organization leaders were interviewed -- 16 organic/bio-dynamic and 14 conventional) in order that both top-down and bottom-up perspectives on organizational processes and functioning were obtained. Through this process, detailed data on over 34 conventional and 13 organic farm organizations were obtained.

Sufficient information was gathered on 20 conventional and all 13 organic farm organizations to develop individual case study reports. One requirement for selection in this section was that two or more individuals had discussed the organization in their interviews. In regards to farm organizations in mainstream agriculture, a compete survey of the over 100 B.C. farm organizations was not possible given the parameters of this study. However a cross section of large and small organizations involved in the following categories was possible: (1) general farm interest groups; (2) specialized farm product commodity groups; (3) farm product marketing; (4) farmer education; (5) organic farming associations. In respect to the organic farming associations, a more complete survey was possible with all (but for the exception of one formed in late 1992) being included in this analysis.

In the following case studies, one focus is on the history, mission and objectives, organizational structure and membership, activities and leadership of each organization. Another focus is on the issues which are perceived to be critical by an organization's membership. Accounts of the operation of organizational politics (internal and/or external) are also discussed.

In addition to providing a descriptive analysis of these farm organizations, comparisons are made between organizations involved in mainstream conventional as opposed to organic agriculture. To what degree are they similar or different in terms of: their organizational goals and processes? the ways in which critical issues are addressed and decisions made? To what extent have organizational politics operated within their organization and in relation to other organizations? [Political strategies and tactics are highlighted in the text in bold type]

General Farm Interest Groups

Representing farmers' interests to governments and the general public is the primary purpose of these organizations. Their political advocacy role is given weight by the size of their memberships as well as their breadth of representation of various farm product commodity groups. As the umbrella provincial farm interest group, the B.C. Federation of Agriculture is the largest and most diversified. The other three organizations included in this section are representative of smaller farm interest groups operating at local levels to promote agriculture in their communities. The Delta Farmers Institute and the Surrey Farmers Institute are part of the Canadian farm institute movement which traces its origin to the early 1900s. While not named as such, in many respects the Creston Agricultural Society shares the same goals and operates much like a farmers institute. In addition to offering a contrast in size and geographic scope, these four farm interest groups offer a contrast in organizational age. While the B.C. Federation of Agriculture and Delta Farmers Institute have had a long and continuous presence, the Surrey Farmers Institute and the Creston Agriculture Society only recently formed in response to perceived threats to agriculture in their communities.

(1) B.C. Federation of Agriculture

The B.C. Federation of Agriculture (BCFA) is the primary and largest umbrella organization in the province. Founded in 1935, it is estimated that through its 59 commodity association members and seven regional farmers institutes, the BCFA represents 8000 of B.C.'s 8500 commercial farmers. Organizational policy is set by the seven executive directors (including 1 president and 2 vice-presidents) and 21 directors who are elected by the BCFA's annual general meeting. The executive committee meets once a month while the board of directors meet three times a year. Directors are paid on a per diem basis, and the president and vice-presidents receive additional honorariums.

The BCFA has 18 committees to deal with key issues facing farmers in B.C., eg., animal care, crop protection, education, finance, labour and safety, taxation, trade and tariff, etc. In addition, the BCFA has two subsidiary companies, ARDCORP (B.C. Agricultural Research and Development Corporation) which reviews and administers research and development projects; and BCFA Publications which publishes the B.C. Agriculture monthly magazine. The BCFA also has three subsidiary organizations: B.C. Agricultural Environmental Protection Council; B.C. Food Marketing Council; and Farm and Ranch Safety Agency. The administration and programme work of the BCFA and its subsidiary organizations and companies is carried out by 10 full-time employees (led by a general manager) and various contract employees who work out of an office located a few blocks away from the BCMAFF offices in Victoria.

To finance the operation of the BCFA, member organizations pay membership fees based on a per capita basis; funds are obtained from commodity programme checkoffs (such as Farm Income Insurance); and funds are transferred from a recently instituted Levy Council which collects a levy on products sold to marketing agencies, wholesalers and processors.

As stated in their publication, the mission of the BCFA is as follows:

> "The B.C. Federation of Agriculture's mission is to provide a forum for farmers and ranchers to work together to develop agricultural policies and then to advocate those policies for the benefit of the industry." (B.C. Federation of Agriculture, 1991)

Thus the BCFA's primary activity is lobbying government policy makers (directly at the provincial level and through its membership in the Canadian Federation of Agriculture at the federal level) to implement policies which are beneficial to farmers in the province. Their advocacy role involves frequent informal contact between the BCFA's executive directors and general manager with BCMAFF officials and bureaucrats (primarily at the Assistant Deputy Minister level but occasionally at the Minister level). They are also in contact with Opposition agriculture critics in the legislature.[networking] As remarked by one BCFA director, the general manager is "on a first name basis with everybody in the Ministry". The close relationship between the BCFA executive and government is illustrated by the observation of one interviewee that officers of the BCFA (especially presidents) often go on to be government appointees to government boards and agencies. The BCFA also formally presents briefs to the BCMAFF on proposed and existing legislation with the intention of influencing government policy makers to be more supportive of the interests of their membership. [rational persuasion] This formal and informal lobbying of government by BCFA executives and management is augmented by their innovative Connections Program in which a producer is linked up with every MLA in the province. This political influence strategy of networking operates as follows:

> "These volunteers communicate regularly with the MLA they are assigned to with a view to educating them. They impress upon them the importance of the agri-food industry to the economy of the province. They also use the meeting as a forum to lobby for one or two specific changes or initiatives the industry is wanting." (B.C. Federation of Agriculture, 1991, p. 6)

In general, the primary intent of the BCFA's lobbying efforts has been to minimize "government interference" in agriculture through what they view as unnecessary or restrictive regulations. For example, the BCFA successfully lobbied for exemptions from certain provisions in the B.C. Waste Management Act. Faced with the threat of government regulation, the BCFA responded by establishing the B.C. Agricultural Environmental Protection Council which sets standards and monitors member compliance to its environmental code of practice. In regards to the recently instituted government farm safety program, the BCFA's lobby for a voluntary as opposed to a compulsory programme proved to be unsuccessful (The Western Producer, 1992, June 11).

Other ways in which the BCFA is able to utilize collaborative tactics to their advantage is through involvement on various government and nongovernment committees. The political tactic of interlocking directorships is evident in the presence of BCFA representatives on the B.C. Round Table on the Environment and the Economy (2 representatives); the B.C. Agricultural Employment Management Committee which deals with farm labour and education; and their representative on the Third Party Advisory Committee on Native Land Claims. Through membership on these committees, the BCFA has taken a proactive approach to control decision premises and agendas on issues viewed as critical to their members.

Foremost on the agenda for many farmers in the province is the impact of free trade on the B.C. agriculture economy. However, as an umbrella organization representing a wide diversity of commodity groups (some of which would benefit while others would suffer under free international trade), the GATT, Canada-U.S. Free Trade Agreement and NAFTA raise an interesting challenge to the organization's leadership. To date, their response has been as follows:

> "It's a difficult issue for this federation, the whole free trade issue. Often consensus doesn't exist and we simply say that consensus doesn't exist. It helps some commodities and hinders others and we therefore didn't take a position for or against. What we tried to do is make sure that the rules were somewhat fair. So our position on Mexico is somewhat the same. It makes some people mad at us that we don't take those kinds

> of positions. But in my mind, as an organization, you can't. I think it's more honest to say we can't take a position on that and let the individual groups who see benefits fight for it, and let those who see problems fight against it."

Thus on one of the biggest and most controversial issues in Canadian agriculture today, the BCFA's strategy apparently has been to relinquish their traditional advocacy role as the unified voice of B.C. agriculture. For the organization it is a classic example of a "no win" situation in that if they take a stand on the free trade issue (either way), they risk alienating a significant proportion of their membership and possible loss of members. On the other hand, by recognizing the conflicts of interest within their membership and not publicly taking a stand, they are criticized by member organizations as not performing their political advocacy role.

Whereas the BCFA is generally against government regulation, they are in favour of government funding of research and development in the agri-food industry. The role of the BCFA's subsidiary company, ARDCORP has been to review and administer research and development projects which (to varying degrees) have been government funded. In B.C. between 1985 and 1990, through the ARDSA programme (Agri-Food Development Subsidiary Agreement) the federal and provincial governments each spent $20 million on over 400 applied research projects (B.C. Ministry of Agriculture & Fisheries, and Agriculture Canada, 1991). These projects focused on productivity enhancement, resource development and commodity development. With the conclusion of the ARDSA programme in 1990 and continued federal government cutbacks on agricultural research funds, the BCFA has been actively lobbying the BCMAFF for a new provincial research and development funding programme.

As this brief review of the BCFA reveals, the lobbying efforts of this large umbrella organization have benefitted from their extensive use of a variety of collaborative influence strategies. With a large membership, established organization structure and financial resources (although regarded as not adequate), the BCFA has the capability to maintain an extensive network of contacts with government and industry decision makers. Evidence of building coalitions of support through frequent informal contact and formal membership on committees are also possible for a large established organization with substantial professional administrative support. Their position as the "voice of B.C. agriculture" is enhanced by the fact that their member organizations include all the major agricultural commodity groups in the province thereby negating the charge that they only represent a special interest group within the industry. As observed by Stanbury (1993), strength in absolute numbers and diversity in membership are both very positive features in lobbying government.

However, this is not to say that the BCFA is not without internal conflict. One of the largest and most powerful member organizations, the B.C. Cattlemen's Association has had an ongoing public debate as to whether they should continue to belong to the BCFA. At the last three annual general meetings of the B.C. Cattlemen's, resolutions have been tabled to withdraw from the BCFA. The argument has been that their $40 per member contribution to the BCFA could be better spent and that the Cattlemen's were powerful enough to lobby government on their own. Each year a decision has been deferred however it remains a contentious issue. If the B.C. Cattlemen's were to leave the BCFA, it would mean that the BCFA would lose approximately 25% of their current membership thus dealing a serious blow to the BCFA's finances and lobbying power in the province.

The BCFA's role and operation has changed over the years and promises to change even more in the future. The BCFA has grown from a small informal organization with very limited resources in the 1960s and 1970s to a large professional organization with three subsidiary organizations, two subsidiary companies and 18 committees in the 1990s. In the face of government fiscal restraint, the BCFA has expanded their lobbying role to include providing services to members through educational, information, research and development programmes. One other threat that is being faced by the BCFA is the loss in revenues and lobbying power that are the outcomes of the declining size of the commercial farmer population.

(2) Delta Farmers Institute

The Delta Farmers Institute traces its origin back to 1911 when it was "formed to provide a voice for farmers concerned about farming and farm related issues in Delta" (B.C. Federation of Agriculture, 1991, p. 20). At one time Delta was a predominantly farming community but the area has undergone a significant transformation in terms of land use. Many of the current issues which the Delta Farmers Institute are concerned with involve the rapid urban development in the area and the sometimes conflicting needs of urban and rural residents.

The 45 members of the Delta Farmers Institute meet regularly to discuss and formulate recommendations to municipal and provincial governments on: drainage problems created by suburban developments; traffic through farmlands; wildlife concerns,; and golf course developments.[reasoning and rational persuasion] Municipal restrictions on aerial spraying in areas adjacent to suburban housing is also an issue. The key challenge for the Delta Farmers Institute is to maintain a strong farm industry and community in Delta in the face of rapid urban development and declining membership.

(3) Surrey Farmers Institute

The need for a "united voice" is also the motivation for the re-formation of the Surrey Farmers Institute in 1991. The original Surrey Farmers Institute was formed to buy in-store chemicals, fertilizers and dynamite (for land clearing) and went defunct in the 1950s. The directors of the Surrey Farmers Institute were interviewed only two months after they had registered as a society and had 10 members. It was a group of young vegetable growers (most are less than 35 years of age) who started the Farmers Institute again because they felt that the concerns of agriculture in the area were not being adequately considered in an area undergoing rapid urban development. Their intent is to have members representing all commodity product groups in the area to widen the scope of the their representation.

Their initial purpose has been to lobby government (municipal and provincial) to change policies viewed as detrimental to the farming community's interests. For example, they met with Surrey Municipal Council in March 1992 about the need for regional drainage improvements and ditch maintenance to prevent lowland flooding (a problem exacerbated by urban developments on hillsides above farmland).[rational persuasion] With other grower groups they met with the Minister of Agriculture at the LMHIA Growers Short Course to press for a "Buy B.C." programme to promote B.C. product sales in the face of lower priced imports from the United States (charges were that U.S. growers were "dumping" their produce in B.C.). They were also part of a contingent of grower groups who met with the B.C. Leader of the Opposition the same week regarding problems in B.C. agriculture.

The leader of the Surrey Farmers Institute was a prominent organizer and participant at the June 24, 1992 farmer demonstration on the provincial legislature steps.[assertiveness] At the demonstration 150 vegetable growers from the Lower Mainland/Fraser Valley and Vancouver Island gave away thousands of heads of lettuce and cabbages, and hundreds of pounds of potatoes to Victoria residents (Brennan, 1992). Other farm organizations represented at the protest were the Cloverdale Vegetable Co-operative (of which the directors of the Surrey Farmers Institute are also directors), Island Vegetable Co-operative, Law Pacific Vegetable Growers, and the B.C. Federation of Agriculture. In his address to the protestors, the president of the Surrey Farmers Institute was quoted as saying,

> "Twenty years ago we entered into a relationship with NDP Premier Dave Barrett whereby our land was put into the Agricultural Land Reserve with the understanding that it would be preserved and protected. We accepted the economic expropriation of our land on the understanding that the NDP would ensure that our family farmers would receive government's help to make family farming viable." (Brennan, 1992, pp. 1, 19).

The position of the Farmers Institute was that the government either provide financial support (i.e., countervailing tariffs on cheaper U.S. imports, promotion programmes) or free farmers from the restrictions of the ALR.[reasoning] At the demonstration, a delegation met with the Premier and the Minister of Agriculture. Media coverage of the event was widespread in the newspapers, television and radio and apparently, the high pressure tactic worked. Shortly after the demonstration, the provincial government imposed temporary countervail duties on U.S. lettuce. A repeat performance is not expected in 1993 as the economic condition of the fresh vegetable industry in B.C. is much improved (Schmidt, 1993).

In addition to their lobbying on behalf of local area growers, the Institute membership fee of $100 also pays for a bilingual newsletter (English/Chinese) and the establishment of an agricultural advisory committee (not yet implemented in 1993).

The high visibility of the Surrey Farmers Institute so early in its life has been largely due to their articulate and hardworking young president. As a third generation farmer operating one of the largest vegetable farms in the Cloverdale area, he recognized as a leader (at only 29 years of age) in the Cloverdale farming community. As identified by one of the directors of the Farmers Institute, his primary motivation is that: "He doesn't want to see the family farm go. He wants agriculture to survive."

In an industry with an aging farm population, it is noteworthy that there is a small contingent of highly motivated young farmers who have emerged as leaders in the Fraser Valley. Their political influence strategy to date has been to lobby government directly and to effectively utilize the mass media to communicate their concerns to the public by creating dramatic protest demonstrations. Rather than solely working behind the scenes to influence government policy makers, the Surrey Farmers Institute has adopted a proactive public strategy to voice their concerns. It is a competitive political activist approach consistent with that of the farmer protest rallies that have been organized in the Prairie provinces, Ontario and Ottawa since the summer of 1991 and which to date have involved several thousand farmers.

(4) Creston Agricultural Society

Another type of local agricultural advocacy organization is exemplified by the Creston Agricultural Society. In this case, the formation of the Agricultural Society in 1989 was motivated primarily by attacks by the local environmentalist group rather than financial distress. The Creston Valley

Agricultural Society represents the fruit, dairy, grain and beef producers in the valley (2 directors per commodity group). Their purpose is "to promote agriculture in the community" and "to represent agriculture as a unit because each of them in the valley is fairly small. Banding together they have some strength and some resources to do things." The administrative work of the Agricultural Society is done by a part-time manager who works two to three days per week.

Conventional agriculture has often been the target of the East Kootenay Environmental Society's campaign for environmental protection. The perception that the Environmental Society is comprised of hard-core radical environmentalists is also shared by a number of the persons who are involved in organic farming in the area. After a series of attacks in the local newspapers and the Environmental Society's newsletter on conventional agricultural practices in the valley (eg., pesticide spraying, burning alfalfa hay stubble) [assertiveness], the commodity groups banded together to correct the impression that farmers were not acting in environmentally responsible ways. To counteract the Environmental Society's information campaign, the Agricultural Society's approach has been to communicate their point of view to the public in several ways. They have a weekly editorial column ("Farm Facts") in the local newspaper; give presentations in the schools; organize farm tours for school children; participate in forum debates in the schools (one being on the topic of "No Beef" with the East Kootenay Environmental Society). Thus the Agricultural Society's response to the Environmental Society's aggressive offense has been first to build a coalition of support amongst the local commodity groups, then through reasoning and rational persuasion present their position on the various issues in public forums and in the media. Through their educational initiatives involving school children, they are also looking to the future in framing the perspectives of both the children and their parents in ways which are supportive of conventional agriculture.

In addition to public education and information, another role of the Creston Agricultural Society is to represent agricultural interests to government policy makers. To this end they meet with BCMAFF representatives, and in regards to wildlife problems (deer and elk damage to crops), meet with Fisheries and Wildlife officials.[rational persuasion] Again, their position is enhanced by the diversity of their membership and the number of farmers they represent in the area.

Marketing Farm Organizations

These six farm organizations whose primary purpose is the marketing of farm products offer a cross-section of the different avenues taken by farmers to sell their products. The first three marketing organizations are involved with the sale of regulated vegetables under the Natural Products Marketing (B.C.) Act, B.C. Vegetable Scheme (B.C. reg. 96/80). They include an umbrella organization, the B.C. Vegetable Marketing Commission, plus two fresh market vegetable grower co-operatives (Cloverdale Lettuce and Vegetable Co-operative, Island Vegetable Co-operative).

Direct sales to consumers at the farm gate and at farmers markets are two avenues chosen by many B.C. farmers with smaller operations. Accounts of the Quesnel Direct Marketing Association, the Vancouver Island Direct Marketing Association, and the Kamloops Farmers Market show how farmers are organizing to sell independent of marketing board controls.

(1) B.C. Vegetable Marketing Commission

The B.C. Vegetable Marketing Commission was formed July 1, 1980 through an order-in-council which amalgamated the Interior Vegetable Marketing Board and the Coast Vegetable Marketing Board (established in 1935). Part of the impetus for the merger was to reduce the competition between the two boards and

> "It was hoped a single agency would help to maximize producer returns, encourage vegetable production in naturally advantageous areas, and increase the availability of province wide marketing information." (B.C. Vegetable Marketing Commission literature)

With the organizational motto of "Growers working for growers", the B.C. Vegetable Marketing Commission has three primary objectives. The first objective is to establish and monitor production quotas for the sale of regulated vegetables in the province. The Marketing Commission is empowered to regulate (through a producer quota system based on a five year rolling average) the production of 16 vegetables sold on the fresh market, and 11 vegetables and strawberries sold for processing. A vegetable becomes regulated if 60% to 70% of its producers vote to be under market control. The Commission has the power to fine growers who sell regulated product outside the marketing agencies (maximum $500) other than at roadside stands and municipal markets. In 1991, there were approximately 460 growers involved in regulated vegetable markets. Minimum market prices are set weekly in cooperation with the seven participating sales agencies for fresh vegetables and the five crop grower groups for processed vegetables and strawberries. Seven directors are elected on the basis of regional representation. The daily administration of the B.C. Vegetable Marketing Commission is conducted by four full-time staff (1 General Manager, 1 secretary/computer operator, 1 inspector, and 1 produce manager). The Commission is totally funded by its members through an annual license fee paid by producers.

The second service of the Commission is to provide data and information to growers/marketing agencies, wholesalers, retailers, consumers and government. They publish a monthly newsletter "The B.C. Veggie Times" and promote B.C. vegetables through the production of promotional material (pamphlets, posters). The Commission also administers government funds for industry development and improvement.

A third service is to represent growers' interests to government policy makers (federal, provincial and municipal levels) and to the public. Lobbying involves both frequent informal contact (meetings and telephone calls) with Ministry officials as well as the presentation of briefs and reports.[networking, rational persuasion] The prospect of tariff reductions on vegetables under the Canada-U.S. Free Trade Agreement is a major concern to members of the Marketing Commission. As outlined in the B.C. Vegetable Marketing Commission study entitled "Strategic cost analysis of selected British Columbia horticultural products" (prepared by Crane Management Consultants), a comparison of production and operating costs between B.C. and the U.S. showed that B.C. vegetable producers face a competitive disadvantage relative to U.S. producers. The position of the Commission on the Free Trade Agreement is that the U.S. farm system contains many "hidden subsidies" in the form of agricultural support programmes which are not available to Canadian growers.

In their brief to the Canadian International Trade Tribunal Hearing into the competitiveness of Canadian Fresh and Processed Fruits and Vegetables, the Vegetable Marketing Commission also recommended that Canadian growers' competitive disadvantage be reduced through the international harmonization of pesticide and agricultural chemicals, the availability of loans to commercial farmers at rates competitive to the U.S., and the reduction of taxes on agricultural land. They further advocated an increase in applied research and development in the agricultural sector. The political advocacy role of the B.C. Vegetable Marketing Commission is furthered by their connections with other marketing boards in Canada. In 1991, a Director of the Commission was also President of the Canadian Horticultural Council.[interlocking directorships] All are evidence of significant networking and coalition building within the agricultural regulated marketing sector.

(2) Cloverdale Lettuce and Vegetable Co-operative

Established in 1969, the Cloverdale Lettuce and Vegetable Co-operative had 35 members selling regulated vegetables in the Lower Mainland/Fraser Valley area. Seven directors meet one to two times per month while the general membership meets two to four times a year. The Cloverdale Co-op employs five in office administration and sales (1 manager) and 40-60 seasonal employees in its central warehouse. The Co-op is funded through a checkoff system on produce (primarily lettuce, celery, cauliflower) handled and sold through their facility.

In the past five years, the leadership of the Co-op has undergone a transition in that younger growers (in their 30s and late 20s) have taken on executive positions. This group of younger farmers (several of whom have assumed ownership of their parents' farms) in the Cloverdale area are also Directors of the Cloverdale Soil Conservation Group and founding members of the Surrey Farmers

Institute.[interlocking directorships]

The most critical issue currently facing the Cloverdale Co-op growers is the threat of cheap imports from the United States. In the summer of 1992, the threat of cheap U.S. fresh vegetables prompted members of the Cloverdale Co-op to stage public ploughdowns of vegetables and to organize and participate in the farmer demonstration on the steps of the B.C. legislature (Schmidt, 1992d; Brennan, 1992).[assertiveness] The manager of the Cloverdale Co-op was quoted extensively in newspaper reports of these demonstrations. As earlier detailed in the discussion regarding the Surrey Farmers Institute, they were successful in their efforts to have tariffs reinstated against U.S. imports.

Within the Co-op itself, low market prices coupled with the high cost of packaging and product handling have contributed to an ongoing concern regarding the financial stability of the Co-op. As part of their modernization programme they have recently implemented a new computer system to increase administrative efficiency and in 1993 invested in a $100,000 machine to cello wrap head lettuce in the field.

One incident which the Co-op directors had to deal with in a political manner concerned the addition of cauliflower as a regulated vegetable in the area. Prior to that time, the Co-op had traditionally handled only lettuce and celery produced by the larger established growers in the area. The addition of cauliflower as a regulated vegetable resulted in the application of a large number of smaller growers who wanted to be voting Co-op members. One possible outcome of this influx of new members would be that they would have been able to out-vote the more established members. The response of the directors was to change the by-laws of the co-operative to require that a voting member needed to have a minimum shipping of 3000 cases of regulated product per year for two to three years. The intent was: "This is one way of separating the growers from the hobby farmers" (Co-op director). So instead of gaining 30 new voting members, only six were qualified to vote. Thus through the political tactic of selective use of objective criteria (i.e., the redefinition of what a voting member would be), the Co-op's Board was able to retain control of the organization in the hands of the larger growers.

(3) Island Vegetable Co-operative

Known until 1991 as the Peninsula Growers Association, the Island Vegetable Co-operative has been in operation since 1952. There are currently 26 Co-op members located in the southern part of Vancouver Island. The four to six directors meet every four to six weeks with one annual general meeting for the membership. The Island Co-op employs one full-time manager and 10-20 employees in season. The Island Co-op is funded through a checkoff system on produce which is handled through the warehouse and packing facility located in Saanichton.

There have been two key events in the history of the Island Vegetable Co-operative. In 1981, the federal government quarantined a large area of the Saanich Peninsula due to a potato nematode infestation. As a result, potato production (which had been a major crop) was cut in half and several members were lost. The remaining potato growers in the quarantined area were forced to diversify into other vegetables such as carrots, cabbages, cauliflower, corn, etc. The effect on the Island Co-op was that the rapid switchover resulted in an overproduction of these new vegetables in existing markets and a reduction in farmers' and Co-op revenues.

In 1985, another blow was dealt to the Island Co-op when 22 growers in the northern part of Vancouver Island (43% of their growers at the time) left the Co-op. These growers opted out of the Island Co-op and established a sales desk operation. They felt that grower overhead costs would be reduced if growers delivered directly to retailers and wholesalers.

The cumulative effect of the loss of growers due to the potato nematode quarantine, the loss of the north Vancouver island growers, continuing loss of farmland to urban development, and competition from cheap imports has dramatically decreased the volume of produce going through the Island Co-op. Compared to 15 years ago, produce volume is down 65%. Whereas 20 years ago it is estimated that 20 growers produced 80% of the regulated vegetable crops in the area, now only six growers produce 80% of the crops. The resulting increases in per unit overhead costs has some directors considering the option of also going to an order desk system. In the meantime, the Island Co-op is taking more of a sales and marketing role and working on a campaign to promote local sales in Victoria area supermarkets and other retail outlets. They are working on a publicity campaign to build support in the wider community to preserve the farmland in the Saanich peninsula. In concert with other vegetable grower co-operatives, the Island Co-op participated in the 1992 vegetable grower demonstration on the legislature steps to draw government and public attention to the economic problems of the B.C. vegetable industry.[assertiveness]

(4) Quesnel Direct Marketing Association

In operation since 1988, the Quesnel Direct Marketing Association had 12 farm members in 1991. In a region dominated by large cattle ranches, the Quesnel Direct Marketing Association assists the viability of small market garden operations in the area through the promotion of direct marketing. The primary activities of the Association are: (1) the production of a promotional flyer to identify producers selling at the farm gate; and (2) the organization of farmers markets in Quesnel. To generate more public interest, the Direct Marketing Association also has a booth at the local trade fair at which they have free draws for prizes.

The Quesnel Direct Marketing Association is operated on a cost recovery basis with the ads (costing $40 each in 1991) in the flyer covering printing costs. Booth rentals at the farmers markets cover promotional and set up costs.

The organization has benefitted from the active support of BCMAFF staff in the Quesnel office. Government extension agents were instrumental in obtaining initial seed money and advice through the North Cariboo Business Development Centre "Community Futures" programme. BCMAFF employees were actively involved in the initial organizing and administration by coordinating the production and printing of the promotional flyers containing farm ads and a map indicating farm locations. In 1991, plans were to "wean" the Quesnel Direct Marketing

Association from their government helpers in order to become a fully independent operation.

(5) Vancouver Island Direct Marketing Association

The Vancouver Island Direct Marketing Association has also benefitted from the active assistance of their local BCMAFF extension agent. Prior to its formation in 1987, the local BCMAFF office would gather information on local small fruit growers in the Greater Victoria area who were selling at the farm gate. They used to hand out photocopied lists (up to 2000 a year) to the public. However under government fiscal restraints, the summer student budget was cut off and the local office could no longer afford to provide this public service.

The horticultural specialist in the BCMAFF Saanich office is a strong advocate for direct farm marketing (he is now the first Canadian Director of the National Farm Marketing Association based in the U.S.) and he arranged an information/organizing meeting which featured a speaker from an Oregon direct marketing association. At the meeting, sufficient interest was expressed to form their own local association and with a $1500 government grant, work started on producing their first promotional flyer.

In the first year, 25 farms were listed in the flyer (it costs $125 for a 2" X 4" ad). The first 20,000 copies were distributed at the farms and at garden centres, and by putting them on windshields in shopping centre parking lots (a task not remembered fondly by those who did it). Promotion of farm gate sales has proven to be very successful in the Greater Victoria area. In 1992, there were 40 ads placed and 150,000 copies of the flyers distributed. Distribution of the flyers is less labour intensive now since they have arranged for 100,000 copies to be included as an insert in local newspapers. Plans are to add a special section for retail garden trades and nurseries (at higher ad rates) which will expand the scope of the flyer.

With a budget of $15,000-$16,000 in 1992, the Direct Marketing Association is almost at a breakeven financial position through the sale of ads and one time $25 membership fees. They continue their promotional efforts by having a stand at the Victoria Labour Day weekend fair.

As with most voluntary organizations, it has been primarily the same three people doing all the work in the association. While admittedly tired, they are proud of their organization's success in filling a small marketing niche. They have also benefitted from the presence of a committed champion of direct marketing in the local BCMAFF office. In the face of urban encroachment on area farmlands, this group of large and small market garden producers have proven that close proximity to a large growing urban centre can be beneficial.

(6) Kamloops Farmers Market Society

The Kamloops Farmers Market Society is also another success story in direct marketing. When it first opened in 1979, there were only 10 vendors participating. By 1985, they had reached their physical limit within their area in downtown Kamloops and are now stable at 67 vendors (half small and half large farm producers). It is estimated that 4000 to 5000 customers come to these weekend farmers markets which start in late April and continue weekly until the end of October. The Kamloops Farmers Market Society has nine directors plus one employee (paid only $1300 in 1991) to handle administration and advertising. Their directors' meetings are chaired by a non-member to ensure impartiality.

One of the key issues in the Society concerns the definition of a farmer for membership. The Society has a 75% rule that vendors must sell 75% of what they grow but it remains unresolved whether this means 75% of the ground growing area or 75% of product volume. Another issue concerns the importing of sale product from outside the Kamloops area (defined as a 75 mile radius around the city). In the past, some vendors have brought in produce from the South Okanagan to sell at what is supposed to be a local market. In both cases, the enforcement of these rules is difficult (and not done) in a voluntary organization operating in a relatively small community with close personal and social ties.

Farm Product Commodity Groups

Farm product commodity groups constitute the greatest number (over 60) of farm organizations in B.C. The organizations detailed in this section represent two of the largest agricultural product sectors in the province -- the beef industry (B.C. Cattlemen's Association) and the tree fruit industry (B.C. Fruit Growers Association). Both associations have a long tradition in B.C. agriculture and are recognized as two of the most powerful (in terms of numbers and political influence) in the province. Reflective of the product diversity of B.C. agriculture, included in this analysis are smaller more specialized commodity organizations. Many of these organizations were only formed within the last 10 years thus providing a contrast to the more established commodity organizations. Some of the associations are involved with commodities which are staples in Canadian's diets while others are involved with new specialized food products. For livestock production, case analyses are provided of the B.C. Association of Cattle Feeders, the B.C. Sheep Federation and the Peace River Bison Association. For commodity organizations involved with grain and field crops, accounts of the B.C. Grain Producers Association and the B.C. Certified Seed Potato Growers Association are provided. Offering a contrast to the operation of the B.C. Fruit Growers Association which has dominated the tree fruits industry in the province, analyses are provided of the new Kiwi Fruit Growers Association in B.C. and (as part of the case study of the BCFGA) the establishment of the Okanagan Valley Tree Fruit Authority as the provincial crown corporation for the industry.

(1) B.C. Cattlemen's Association

One of the oldest product commodity groups in the province, the B.C. Cattlemen's Association started in the 1920s. By 1991, the B.C. Cattlemen's Association had 1962 members -- approximately 82% of the commercial cattle operators in B.C. Perhaps the largest single product commodity group in the province, the B.C. Cattlemen's operates on three geographic levels: (1) provincial; (2) regional associations; and (3) local area associations. At each level there are executive directors who meet two to four times a year and elect a delegate to the next higher level in the organization. At the provincial level there are six executive committee members plus a paid staff operating out of a Kamloops office. At each level there are several committees organized to address various issues of concern to the beef industry, eg., environmental and animal care committees.

The organization's stated objectives are:

> "To promote, encourage, develop and protect the cattle industry in B.C.; to represent cattle producers in the province in all matters in which they are interested; to co-operate with associations, societies and organizations having objectives in whole or in part similar to those of the Association's to co-operate with federal and provincial governments to secure the enactment of necessary legislation and its enforcement; and to improve transportation and market conditions in the industry." (B.C. Federation of Agriculture, 1991, p. 10)

The activities of the B.C. Cattlemen's are financed though a $55 membership fee (of which approximately $40 is forwarded through to the B.C. Federation of Agriculture). The Cattlemen's Association also has a checkoff system (in the past, $2 per head of beef sold in the province) which is refundable on application. At their May 1993 convention, the B.C. Cattlemen's voted to raise the checkoff to $2.50 per head and to continue to lobby government that it be made mandatory and nonrefundable (Duckworth, 1993c). The checkoffs are collected by the Cattle Industry Development Board (administered by the B.C. Cattlemen's) to be applied to cattle industry development and promotion initiatives. The B.C. Cattlemen's also administers the government tripartite income insurance programmes and receives government grants to conduct research and development projects in the beef industry.

One major role of the B.C. Cattlemen's at the provincial, regional and local levels is lobbying government to promote the interests of the beef industry. At regional and local levels this means ongoing networking with the BCMAFF and politicians. For example, in the Cariboo region, the regional Cattlemen's president sits on the Cariboo Local Advisory Council for economic development. In general, the B.C. Cattlemen's is regarded as being very effective in their political lobbying efforts--this was remarked on by both Cattlemen's members and several farmers in other commodity associations who see the B.C. Cattlemen's as a model to emulate. Amongst the foremost concerns of cattle ranchers in the province are: (1) government range problems (land use, forestry timber management, cattle rustling, government regulations; grazing and water license fees); (2) native land claims; (3) environmental and waste management; (4) animal rights activities; and (5) weed control by the government Highways department. The lobbying efforts of the B.C. Cattlemen's often goes outside private consultation with government into the public media. When the B.C. government announced a $1 million increase in range grazing and water license fees in December 1992, B.C. Cattlemen's spokesperson went to the press protesting the rate increase.[assertiveness] One example offered was that for a rancher with 400 cows water license fees on range land would increase from $207 in 1991 to $443 in 1993. Grazing fees would increase from $1.58 per month per head in 1993 to $1.78 a month. The president of the B.C. Cattlemen's Association stated that: "The Minister's logic in explaining that the increase is to encourage efficient and sustainable use of water is an insult to every beef cattle producer in the province." (Country Life in B.C., 1993, Feb.(a), p. 1)[reasoning]

In May 1993, the B.C. Cattlemen's increased pressure on the provincial government by designating May 17 as lobby day for the Harcourt government (The Western Producer, 1993, May 20). They called for the province's 2000 ranchers to contact the Premier or an NDP MLA to protest the increased cost of doing business in the cattle industry.[assertiveness] Amongst the various government programmes targeted were: grazing permits; water licenses; crown range administration and brand inspections; new burning regulations; code of water management; protected area strategy; new watershed management guidelines; wildlife management areas; new workers' compensation board regulations; native land claims. This multi-pronged attack on government regulatory programmes appears to have been successful in that at the B.C. Cattlemen's annual general meeting later that month, the B.C. Minister of Agriculture announced his intention to freeze range grazing fees and to send the proposed burning regulations back to an intergovernmental committee for revision (with public meetings on the issue to be held in July 1993).

Another issue on which the B.C. Cattlemen's has gone on the attack concerns what are seen to be "radical environmental and animal rights extremists". In a speech to the B.C. Institute of Agrologists, the chair of the B.C. Cattlemen's Association's Environmental and Animal Care Committee was quoted as saying,

> "Frankly, those of us who depend on using the abundant natural resources of the province as a means of helping to make a living are getting fed up with the antics of radical environmental groups whose main reason for existence, besides making big bucks from a gullible public, is to shut down all natural resource-based industries in the province." (Country Life in B.C., 1992, April, p. 1)

The position of the B.C. Cattlemen's is that through their Environmental and Animal Care Committees and compliance to an environmental code of practice, the cattle industry is acting in environmentally sustainable ways.

To counteract a decline in beef consumption (attributed by several cattle producers to erroneous information provided by environmentalist opponents of the cattle industry), the B.C. Cattlemen's has the "Beef in B.C." promotional and marketing programme (actually part of a federal initiative of the Canadian Cattlemen's Association). Thus to counteract the threat to their markets, it appears that the B.C. Cattlemen's has chosen to influence consumer opinion and behaviour by a media campaign highlighting: the positive attributes of their product and practices [rational persuasion]; demonstrating their environmental concern through the establishment of industry committees; and labelling their critics as being self-interested and dangerous to the economic well-being of the public.

In addition to government lobbying, the B.C. Cattlemen's also serves an education and information role for their members. They publish a magazine (The B.C. Cattleman) and invite speakers to local and regional meetings and their annual conventions.

As a large lobby group, the B.C. Cattlemen's have proven to be especially skilful. This has led to the feeling amongst some members that they no longer need the B.C. Federation of Agriculture to represent their interests. The argument is that the $40 per member now being sent to the BCFA could be better spent by the B.C. Cattlemen's Association for their direct benefit. Another impetus for this change is the large financial losses suffered by the B.C. Cattlemen's in recent years. At their 1993 annual general meeting, the motion to withdraw membership from the BCFA was again deferred for another year. But as the history of the B.C Association of Cattle Feeders shows, the B.C. Cattlemen's has had its own experience with break away groups.

(2) B.C. Cattle Feeders Association

With its 60 members, the B.C. Cattle Feeders Association represents 90% of B.C.'s cattle feeding, finishing and packing operations. Its executive director (hired to operate the organization) and five directors formally meet three to four times a year and hold telephone conferences in-between. Prior to forming in 1988, the cattle feedlot operators and packers were members of the B.C. Cattlemen's Association. However, they viewed the B.C. Cattlemen's as a conservative traditional organization which was not addressing cattle feeder problems or expanding new feeder finance programmes. The cattle feeders and packers felt that with 60 members they had the "critical mass" to establish a direct relationship with the provincial government on what they see as the unique issues involved in the finishing of cattle. For this reason, they are also not members of the B.C. Federation of Agriculture although they retain contact on environmental issues with both the B.C. Cattlemen's Association and the BCFA.

In establishing the organization, a key issue was securing money for organizational administration, research and promotion through the Cattle Industry Development Fund. As earlier discussed in the B.C. Cattlemen's case, the $2 per head levy (now $2.50) is collected by the B.C. Cattlemen's for the purposes of industry development and market promotion. As related by the founding and current President of the B.C. Cattle Feeders, securing their members' contributions was not a straightforward task.

> "That was an area that our association said we wish the money that was going to B.C. Cattlemen's, part of that to go to the Cattle Feeders to finance their activities and the Cattlemen said get lost. So basically we said to a couple of big packers, don't send the money to the B.C. Cattlemen's, send it to this lawyer to set up a trust fund and suddenly the Cattlemen's office wasn't getting any money. It took about four to six months but the money was sitting in an account collecting interest and we said, okay, if you guys recognize that there's a change here in the

> money, then we'll come forward. And so now what happens is once a year the individuals, under the Act voluntarily you can ask for yours back, so what we did is we sent them a letter asking for it back and to be sent to the B.C. Cattle Feeders Association. So we got around that. There's no reason why the Minister didn't update the programme in terms of having the research function on which it needs to be done. Because it's just promotion. Making sure that we have good communication between producers, making sure that we have an effective organization, and good communication about what it's being used for. So those people that maybe had a propensity to want the money back would feel that they would want to be a part of it. So you're collecting also all the money that can be collected and it's getting used most efficiently. So we've made a recommendation to the Minister and he's dealing with that."

This account of how the Cattle Feeders obtained the necessary funds for their operations details how after they had been initially denied access to money which they felt was theirs, they were able to skilfully use the rules of the Cattle Industry Development Fund to their advantage (rule citing) and circumvent the B.C. Cattlemen's Association's gatekeeping.

One of the major competitors to the B.C. cattle feeder industry is the Alberta feeder industry which has historically benefitted from, among other things, more generous fuel and grain freight rebate programmes. Since their inception, the B.C. Cattle Feeders has lobbied the provincial government for similar subsidy programmes in order to achieve parity with their Alberta competitors. In February 1993, they were successful in gaining increases in a Feed Freight Assistance Program which subsidizes the freight costs of grain shipped to feed deficient areas (a 40 cent increase to $5 per metric tonne of grain). (Country Life in B.C., 1993, Feb.(b)) In this way, grain costs throughout the province are more consistent. Their lobbying efforts to gain additional financial support from the provincial government also appears to have borne fruit when in May 1993, the B.C. Minister of Agriculture announced that the B.C. Cattle Feeders' loan guarantee budget would increase from $15 million to $17 million (Duckworth, 1993b).

(3) B.C. Sheep Federation

Since 1976, the B.C. Sheep and Wool Commission existed to regulate the sale of sheep meat and wool in B.C. but was limited to a marketing role. The B.C. Sheep Federation was formed in 1990 to meet the educational, informational and lobbying needs of the 500 sheep farmers in B.C.'s seven regional sheep organizations. There are three executive and 12 directors in the B.C. Sheep Federation which also has three committees on grazing, research, and marketing.

The economic issues facing the sheep producers in the province include competition from Australia and New Zealand lamb and low wool prices on the world market. Health issues are a concern for sheep in silviculture (eg., wildlife-domestic disease transmission on rangelands). One of their latest initiatives has been supporting the use of sheep in clearcut forest blocks to replace herbicide spraying to control for weed trees.

An ARDSA grant was obtained by the Sheep Federation to conduct research on the B.C. Sheep and Wool Industry strategy. This research provided much needed information on: the economics of sheep production; marketing and distribution; regional differences; and the need for BCMAFF specialist extension services. Another identified need was for trained shepherds which is being addressed by Federation sponsored shepherd training courses (the first one was held in February 1992).

(4) Peace Country Bison Association

The Peace Country Bison Association formed in 1984 when five bison producers met informally. Now 50 members strong, they meet three times a year for meetings which feature an educational programme. The Bison Association is funded by $100 membership fees as well as government grants to partially fund meetings and seminars.

In addition to its educational function, members lobby B.C. and Alberta politicians for policy changes (eg., quality standards). As part of their research and information role, the Bison Association received an ARDSA grant to commission a market research project. In a related vein, a group of 12 to 15 producers set up a separate marketing corporation (sales desk operation) to sell bison meat.

(5) B.C. Grain Producers Association

The B.C. Grain Producers Association formed in 1986 to "improve the economics of field crop production in the B.C. Peace River area". Unlike in the Prairie provinces where grain growers are a major force in the agricultural sector, the B.C. grain producers felt that relatively little attention was given to their concerns by the B.C. government. The B.C. Grain Producers Association is based primarily in the Peace River region which accounts for 90% of the grass seed, 85% of wheat, 95% of barley and 60-75% of oat production in the province. Of the estimated 650 grain growers in the Peace River region, the B.C. Grain Producers Association counts 150 as members.

The B.C. Grain Producers have four executive directors and eight directors on the board plus eight committees working on production, marketing, research and development, finances, etc. A part-time manager/secretary handles the administration of the organization. Directors meet once a month while the general membership meet once a year. The membership is also kept informed about the Association's activities through a newsletter. The B.C. Grain Producers Association is funded by membership fees ($100) and an industry checkoff system (1/3 of 1% of all grain sold in the area) which goes to the Grain Development Council (approximately $100,000 per year). As with other checkoff systems, the levy is refundable. Still, when instituted, the checkoff system was strongly opposed by members of the National Farmers Union, many of whom have subsequently left the Grain Producers Association.[sanctioning]

Lobbying government for economic support programmes and research projects has taken most of the energy of the Association's executive. To date they have successfully lobbied for (among other things): guaranteed farm operating loans (interest free for one year); a B.C. Feed Grain Market Development Program; and the removal of a farm chemical tax. In February-March 1991, the Grain Producers Association lobbied for inclusion on GRIP and NISA income insurance programmes for their members. It proved to be a contentious issue with growers in the South Peace wanting it while those in the North Peace were against it. Irrespective, a delegation of grain producers (5 from the Peace River region, 4 from other areas) met with the BCMAFF to lobby (successfully) for the programmes. Judging from their record to date, their lobbying efforts appear to have been quite successful. In addition, the association president who is a director of the B.C. Federation of Agriculture, states that he is in weekly contact with the Victoria office of the BCMAFF.[networking]

Another area in which the Grain Producers Association are active in lobbying government is for government funded research projects. The list of research and marketing projects conducted up to 1991 includes: research on early maturing hard spring wheat ($100,000 from the Western Grains Research Foundation); wheat, barley, oats, rye, peas, canola and forage variety trials ($452,000 from ARDSA); promotion of Creeping Red Fescue in the U.S. ($25,000 from the federal Export Marketing Development Agency); and market potential for grasses ($40,000 from ARDSA).(B.C. Federation of Agriculture, 1991)

(6) <u>B.C. Certified Seed Potato Growers Association</u>

Formed in 1923, the B.C. Certified Seed Potato Growers Association has 50 members. The Seed Potato Growers Association's primary functions are the education of growers and the promotion of certified potato seed sales at trade shows and through arranging farm tours for buyers. They also set a recommended price list. Given that Agriculture Canada certifies seed potatoes, close contact is maintained with federal inspectors and researchers. Concerns about organization renewal were allayed when a number of younger farmers (in their late 20s) took on executive positions in the association.

In 1988-91 period, the Seed Potato Growers Association negotiated for and coordinated two major ARDSA projects. The first was a project to build three greenhouses and train members to do seed potato tissue cultures (ARDSA funded $171,662 of the total budget of $217,477). A major seed potato storage facility upgrade programme was also assisted by ARDSA grant money ($142,827 out of a total of $455,800).

In 1990, a front page newspaper article on an organic potato farmer in the Pemberton Valley had appeared (Forgacs, 1990). At the time, the organic farmer had been told by the BCMAFF and the Pemberton Valley group of the Certified Seed Potato Growers Association that the farm would be sprayed with pesticides if diseases or insects were found.[rule citing] The Pemberton Valley is the site of the majority of the seed potato growers in the province ($1.5 million in sales a year). The government was empowered by the Seed Potato Control Act to take such action. But as stated in the newspaper account, the organic farmer was adamant that he would not use chemical pesticides on his crops.[assertiveness]

In February 1992, I met with two executive members of the Seed Potato Growers Association and asked them their perspectives on the incident. The following account from the interview transcript reveals much about the quandary which the perceived threat of the organic farmers placed both the certified seed potato growers and the government in.

(#124) "Basically he went in and planted and wasn't doing any spraying or control of anything and if the buildup had been allowed to go on, then there was a chance of spreading the disease into the other seed growers."

(#123) "He was very selfish because he wants to grow all these vegetables organically to sell them to the people in Whistler. And that was fine except he also said, 'I've got to grow some spuds'. So the growers said, 'Why don't you go around the corner and down towards Mount Currie and grow the spuds down there?' Which he could have easily done. It was out of the control area and the wind would have blown the aphids, the bugs, in a different direction. He said, 'No, I'm going to grow them right here.' So there was a couple of million dollars worth of seed potatoes that come out of Pemberton every year, or $1.5 million. And the whole thing was in jeopardy because he was going to have an infested field and all the bugs were going to fly up the valley and it was a very selfish thing."

(#124) "He went broke, thank God. The bank seized everything illegally and then they had to give it back to him and then go through court to seize it properly."

(#123) "It's sort of a sad story but in my opinion, he didn't go broke for any other reason but the fact that he was a poor business manager. It had nothing to do with the fact that the government told him he had to spray. Because the government was trying to protect one of main incomes for the valley which is seed potatoes. So it was in the interests of the community to stop him growing spuds."

(#124) "I think the government would have lost the case. They said it would be a can of worms to try for it so we dropped that. Some of the guys didn't spray as it was so how could they make somebody else spray? No, but then monitor the stuff. They still didn't find anything on his place that required him to spray. They found some aphids but they found aphids on other farms up there too. They were thankful that the banker closed him down. I wouldn't have wanted to go to court to argue the case with the government. I could have argued his case a lot easier."

(#123) "And then you probably have quite an anti-spraying yuppie type crowd at Whistler, for want of a better word. They buy these properties and they all drive their BMWs and Mercedes and they're in other businesses."

"We were trying to get a covenant on the properties up there that stated that this property was in Pemberton and it was on the deeds of the property that it was a seed potato control area and therefore the people must realize that there are regulations governing the growing of potatoes. But I think we should continue to try and do that."

Fortunately for the certified seed potato growers and the government, they were able to avoid invoking their legitimate power to enforce the compliance of the organic grower.[rule citing] However even with legislated authority, they felt that public opinion would have been against them and were uneasy about making this a test case in the courts. This incident illustrates the practical limits to legislated authority to protect this farmer group's interests once media attention has been focused on an issue.

(7) B.C. Fruit Growers Association

The tree fruit industry has traditionally been one of the largest sectors of B.C. agriculture. And within the B.C. tree fruit industry, the B.C. Fruit Growers Association (BCFGA) has been the most prominent. Established in 1889, the BCFGA now represents 1500 of the 2000 tree fruit growers located in the Okanagan Valley and Kootenays. There are 11 executive directors in the BCFGA (president, vice-president, three directors from the Northern District Council, three directors from the Southern District Council, three from the Kootenay District Council) and 49 delegates from 14 area local associations (approximately 1 delegate per 500 acres of orchard).

The history of the BCFGA as documented by Dendy and Kyle (1990) has been one of both successes and failures in advancing and protecting the economic interests of orchardists. While the primary role of the BCFGA is to be the "political voice of orchardists", the BCFGA subsidiary companies -- B.C. Tree Fruits Ltd. (and its 6 regional packinghouse grower co-operatives) and Sun-Rype Products Ltd. (established in 1946 for processing fruits) -- play a major role in tree fruit sales and marketing. Between 1939 and 1973, B.C. Tree Fruits had a monopoly on sales of tree fruits in the industry. Since then, B.C. Tree Fruits has had competition from the Okanagan Fruit Producers and Shippers Association (90 members) and several smaller independent packinghouses.

During the last 10 years, developments have served to separate the BCFGA from its traditional roles in the sale, marketing and processing of tree fruits. In 1979, the B.C. Tree Fruit Marketing Board (established in 1934 by the Natural Products Marketing Act) was made separate from the BCFGA. In 1985, it was decided that B.C. Tree Fruits' board of directors would be comprised of representatives from the grower co-operative packinghouses rather than elected at the annual BCFGA convention. The various packinghouses were also given more independence in regards to operating and marketing. Returns to member growers are now calculated on the basis of house pooling rather than industry pooling thus making each packinghouse more accountable to its members. In 1993, Sun-Type Products (which employs 240) is proceeding with plans to become fully independent as a publicly owned company.

In the 1990s, the BCFGA is now focused primarily on three functions: (1) political advocacy to government for policies and programmes which serve the tree fruit industry's interests; (2) education and information to growers through annual Horticulture Forums (attended by 300-400 growers each year) and the publication of "British Columbia Grower", etc.; (3) research into new varieties through their budwood orchard and test orchard facilities.

The BCFGA's lobbying efforts have been most closely tied to the economic problems facing the apple industry in the province. As identified in his presentation to the Canadian International Trade Tribunal during a hearing on industry competitiveness, the then president of the BCFGA identified the following critical issues in the apple industry: an aging farm population; high debt load; land use conflicts; low returns on fruit; the Agricultural Land Reserve; and competition from imports. BCFGA executives have continuously lobbied for income insurance programmes for orchardists. For example, with the conclusion of the National Tripartite Stabilization Plan for Apples in July 1990, they lobbied for provincial farm income insurance programmes. In addition, the

BCFGA has often lobbied for government grants for the tree fruit industry. Recent successes have been the $50 million aid package announced by the NDP government in November 1991 ($24 million to the tree fruit industry; $23 million to reduce packinghouse debt; and $3 million to advertise B.C. agricultural commodities) (The Western Producer, 1991, Nov. 7); and $4 million for the orchard replanting programme in January 1992 (The Vancouver Sun, 1992, Jan. 23).

However the BCFGA was significantly less successful in lobbying the provincial government to reject the report of the B.C. Tree Fruit Industry Commission (or the Lusztig Report) issued May 31, 1990. (Lusztig, 1990) In his report, Dr. Peter Lusztig (then U.B.C. Dean of Commerce and Business Administration) noted that many of the current issues and problems facing the tree fruit industry were the same as those identified in the 1957 report of the MacPhee Royal Commission on the B.C. Tree Fruit Industry (Dr. MacPhee also being a U.B.C. Dean of Commerce at the time). The Lusztig commission held eight pubic hearings from January to April 1990 and received over 160 written submissions. Lusztig's intent was to provide recommendations to increase the efficiency and economic viability of the B.C. tree fruit industry. In general, he recommended reductions in government subsidies and the promotion of industry renewal through diversification into fruit tree replant programmes for new varieties planted at higher densities. Amongst the more controversial recommendations contained in the Commission report were: (1) the reduction of general government financial support programmes and their replacement with temporary support "only to the more limited number of committed growers who are willing and able to adopt new technologies to improve their efficiency and product, and willing to meet the demands of the marketplace" (Lusztig, 1990, p. 147); (2) the phasing out of farm income insurance by 1992 with the provision of emergency interim assistance to growers (including independents); (3) removal of the government crop insurance programme; (4) not to support an apple supply management programme; (5) the decentralization of marketing through the encouragement of independent packinghouses; (6) privatization of Sun-Rype Products Ltd.; (7) lifting of restrictions on B.C. Tree Fruits and affiliated packinghouse sales.

The response of the BCFGA executive and membership to the Lusztig Report was, to put it mildly, one of angry rejection. At public meetings held in six major centres in the Okanagan and Kootenays in June 1990, the Commissioner and local MLAs were subjected to verbal abuse from orchardists. The BCFGA condemned the report and voted unanimously for Agriculture Minister John Savage's resignation. At Commission hearings growers chanted "10 cents a pound or on the ground", a familiar slogan from the 1933 growers' strike when the slogan was "A cent a pound or on the ground". In one instance, 150 angry tree fruit growers threw apples at Premier VanderZalm's car to protest the Lusztig Report. In a symbolic gesture, one retired orchardist threw himself down in front of VanderZalm's car. (The Vancouver Sun, 1990, June 19, June 25)[assertiveness, labelling, sanctioning]

While effective in gaining media attention to their position on the Lusztig Report, these scenes of angry confrontation resulted in several unintended consequences. As recounted by one BCMAFF extension agent who had attended one of the public meetings,

> "The fruit growers tore the place to pieces. So for some of us government people sitting in the back row being very quiet, for us it cast a whole new face on the industry and one that we really didn't look on very favourably. Because in the past, the growers have not gone to that extreme."

Other BCMAFF employees felt that many of the Report's recommendations were valid but that growers had not read the report in its entirety and were only reacting to the biased information provided by their BCFGA leaders.

Another outcome of the farmers' protests (identified by several farmers and BCMAFF representatives) was the establishment of the Okanagan Valley Tree Fruit Authority (OVTFA) on July 25, 1990.[strategic candidate] Rather than deal with an antagonistic fruit grower association, the government established a new crown corporation whose mandate is to "ensure an efficient and coordinated approach to the revitalization and transformation of the Interior tree fruit industry to ensure a strong, dynamic, and competitive tree fruit industry" (OVTFA, 1990, p. 14). While the OVTFA is only a temporary organization (there are sunset clauses for its review in December 1995 and the Act is to be repealed December 31, 2000), its activities have been to: administer the orchard renovation and replanting program; develop and institute a retraining and relocation programme for grower; to conduct research into production and marketing; provide advice and assistance to growers, processors and marketing enterprises; and purchase, sell or lease orchard lands.

Given that several of the OVTFA's responsibilities duplicated those that have traditionally been assumed by the BCFGA and its subsidiary companies, it is especially noteworthy that only the Chairman and one director on the first OVTFA board of directors were members of the BCFGA. Effectively, the BCFGA had been shut out of the new crown corporation. Rather than accept this new entrant in the tree fruit industry, at the BCFGA's 1992 general meeting a motion of non-confidence in the OVTFA was put forward. A resolution was also tabled to dissolve the OVTFA and transfer its resources and responsibilities to government and growers associations. After one hour of discussion, both motions were deferred until the following year (The Western Producer, 1992, Feb. 6).

The OVTFA has since gone through two changes in its board of directors. In March 1992, the B.C. Agriculture Minister retained the Chairman but replaced all directors and increased the board size to 13 members. Amongst the new directors were six who were also members of the BCFGA. In April 1993, citing government fiscal guidelines and a shift from planning to an operational focus, the Agriculture Minister reduced the size of the board to eight regional members.

In summary, the BCFGA's response to the Lusztig Report and the provincial government's subsequent establishment of the OVTFA illustrate the risks of employing aggressive confrontational influence tactics to resist change. Rather than force compliance, the public demonstrations and protests served to alienate those in government and resulted in a further erosion of the BCFGA's power base as the voice of the tree fruit industry. Several orchardists interviewed attributed much of the response of the BCFGA to the then president who, although recognized as a "capable", "forceful" and "aggressive" advocate for tree fruit growers, as characterized by one grower, he's "a terrier type of leader and he just doesn't know when to stop barking". The perceived tendency of this leader and the BCFGA executive has been to constantly be reacting to crises and "putting out brushfires" rather than taking a proactive creative approach. As a result,

> "Within the industry they've sort of abdicated or lost their control, their power. I think it has been an organization that has tried to service everybody and as a result, is servicing nobody. They have no sense of who they are or their own identity. We seem to have an opinion on everything and quite often, they're not relevant to the industry. And yet, the important issues, we're always so busy that the important issues never get dealt with. So there's no long term planning, no effective policy in action." (orchardist and former BCFGA director)

A shift in focus may be occurring though in the BCFGA. In January 1992, the president announced his resignation after seven years stating that: "In a political job, some change is needed every once in a while. There is a need to bring in a fresh perspective."(The Western Producer, 1992, Jan. 9) In the past year, accounts of BCFGA activities have featured a new environmental information programme for the general public (The Western Producer, 1992, Aug. 20); and the establishment of the B.C. Plant Improvement Agency to license new varieties and sell them under the Plant Breeders Rights Act (Country Life in B.C., 1992, Oct.).

The BCFGA has continued its advocacy role in pressing for the continuance of farm income insurance programmes and changes to other government policies such as the Agricultural Land Reserve. They worked with other organizations for a National Apple Marketing Agency which was defeated in a national vote by growers in February 1993 (Duckworth, 1993a). With the continuing threat of world tree free competition, a shrinking and aging population of orchardists, high production costs and low market prices, the need for the BCFGA as one (although not the only one) voice for B.C. orchardists remains secure. With the reduction of government extension services and research, the educational and research roles of the BCFGA would also appear to be increasing.

(8) Kiwi Fruit Growers Association of B.C.

The fledging Kiwi Growers Association of B.C. illustrates a commodity group in its start up phase. Founded in 1985, the Kiwi Fruit Growers had 20 members in 1992 and see that number growing due to the high interest of growers in the area. For example when the BCMAFF and Kiwi Growers Association held an information meeting on growing kiwi fruit in 1988, 240 people showed up for the session. With the first trees in B.C. being planted in 1985, by 1991 there were 25 acres producing 750,000 tons of kiwi fruit on the Saanich peninsula and in the Fraser Valley. The Kiwi Fruit Growers' five year plan is to have 75 acres in production. The operations of the Association are funded through membership fees, an advertising fee (collected though the Saanichton packing facility), and a trade fee (matched by the Western Development Fund).

The main competitors for kiwi fruit are imports from New Zealand and California. The main goal of the Kiwi Fruit Growers is to promote market identification of B.C. kiwi fruit through in-store, pamphlets in stores, and school visits by "Captain Kiwi" (actually Expo Ernie in a different outfit). To assist in their marketing efforts, they have signed an agreement with the Wester Diversification Fund for a marketing development strategy programme.

<u>Farmer Education</u>

(1) <u>The Lower Mainland Horticultural Improvement Association</u>

The Lower Mainland Horticultural Improvement Association (LMHIA) was established in 1958 as an educational organization "to promote the dissemination of information to growers and grower groups in B.C." The main event for the organization is the LMHIA's Growers Short Course held for three days at the Abbotsford Ag Rec Building. The programme features speakers (local, national, international) on horticulture concerned with small fruits and vegetable production. Other topics include environmental issues, business administration and marketing. In 1992, the B.C. Minister of Agriculture was the keynote speaker while in 1993, the B.C. Minister of Labour was the keynote speaker. An industry trade show is also an important part of the Short Course. The LMHIA prints a proceedings which is distributed to all those who attend.

While ostensibly a farm organization, the LMHIA illustrates the instrumental role which government can play in support of such organizations. The organizational structure is comprised of 15 grower directors and five committees (strawberry, raspberry, blueberry, vegetable, agribusiness). The secretary and the treasurer of the LMHIA are both BCMAFF extension agents who conduct the daily administration of the LMHIA as part of their duties in the Abbotsford BCMAFF office. There are also a number of ex-officio members who are Agriculture Canada research scientists who give advice on topics and speakers to be included in the course programme.

Since 1990, the LMHIA has been self-supporting (before that the BCMAFF paid for meeting room costs). Attendance fees have been kept at a minimum ($15 in advance or $25 at the door) in order to encourage grower participation. Numerous door prizes (in 1991, one prize was a trip to Hawaii) are also offered as an attraction. The trade show is an instrumental part of the Short Course in that it offers growers a convenient way to see that latest equipment and services available as well as subsidizing the event.

Profits from the Short Course are used to give research grants to Agriculture Canada scientists to conduct applied research in horticulture. With federal government cutbacks on hiring summer students for research projects, this is seen as a particularly important service to growers.

The popularity of the LMHIA Growers Short Course is demonstrated by the growth in attendance. In 1970, only 100 farmers attended. By 1992, attendance was between 300 to 400 per day. While the LMHIA directors would like to expand the conference, they are at full capacity in the current facility and alternative sites are unsuitable. If possible, they would also like to expand the programme to include more commodity groups such as tree fruits and filberts.

Farm Organizations in Mainstream Agriculture

Before going on to discuss the organic farming associations in this study, what observations can be made about the objectives and operation of farm organizations in mainstream agriculture? One feature in many of these farm organizations is their focus on lobbying governments on a wide variety of issues, eg., financial assistance, exemption from regulations. As related by one organizational member who participated in lobbying government to provide for an income assurance programme for grain farmers, the real negotiations between industry and government occur often after the formal meetings end.

> "When we were down in Vancouver for the GRIP meetings, more was accomplished in the lounge after the meetings than during the meetings during the day. You are sitting down, everybody relaxes more and tells a joke or something."

For the more established larger organizations, there is close collaboration with government policy and decision makers to promote the interests of their organizational memberships.[networking] In large established organizations such as the B.C. Federation of Agriculture, the B.C. Cattlemen's Association, the B.C. Fruit Growers Association and the B.C. Vegetable Marketing Commission there is ongoing informal contact with politicians and government officials at very senior levels. Communication through more formal channels such as the presentation of briefs [reasoning, rational persuasion] and participation on government-industry committees [controlling decision premises and agendas] also complement their lobbying efforts. Amongst the smaller more specialized commodity groups, the B.C. Cattle Feeders Association and the B.C. Grain Producers Association also appear to have gained substantial access to senior government policy makers to obtain benefits for their members.

Individual BCMAFF extension officers proved to be integral to the formation of a number of the smaller organizations surveyed in this study. For example, BCMAFF employees were actively involved in organizing and obtaining seed money for both the Quesnel and Vancouver Island direct marketing associations. The B.C. Certified Seed Potato Growers Association works closely with the Agriculture Canada researchers and extension agents on variety improvement research.

With a few exceptions, these farm organizations have benefitted substantially from the provision of federal and provincial funds to conduct industry research and development projects. As stated by a number of BCMAFF extension agents, the current strategy of both the federal and provincial governments is to reduce their direct involvement in applied agricultural research by contracting it out to farm organizations. In some cases, this has meant that a farm organization simply sponsors research which is then conducted by contracted researchers supervised by BCMAFF personnel in the regional offices. With government fiscal restraints, more applied research is also being conducted on a cost shared basis with industry.

The case of the LMHIA is an interesting one in terms of the degree of government assistance provided in the operation of the organization. The LMHIA provides one of the few large scale educational events for the horticulture industry and helps the BCMAFF fulfil its mandate of providing farmer education and industry development at a relatively low cost. As such, the assignment of two BCMAFF extension agents to conduct the administrative work of the organization appears to be a bargain. For the Agriculture Canada researchers who serve in an ex-officio capacity to develop the Short Course programme, the incentive for a successful event is clear--the profits of the LMHIA go on to fund their own research projects. The BCMAFF benefits when research results improve farmers' horticultural practices and profitability.

In contrast to the friendly collaboration surrounding government-industry research initiatives, lobbying for direct economic benefits sometimes involves the use of adversarial tactics.[assertiveness, sanctioning] When the economic stakes are high as with the threat of the loss of subsidies and tariff protection under GATT and Free Trade Agreements, farm organizations have proven to be less adverse to staging public demonstrations to influence governments to protect Canadian farmers' economic interests. Farm organizations in B.C. and elsewhere have shown an increased sophistication in the use of the mass media as a potent communication channel to politicians. For some B.C. farm organizations such as the B.C. Cattlemen's Association and the regulated vegetable marketing co-operatives, the use of high pressure tactics appears to have been successful, at least in the short term. However, as shown by the experience of the B.C. Fruit Growers Association and their response to the Lusztig Report, such tactics can also backfire and actually reduce an organization's power and influence with government.

Organic Farming Organizations

While the first organic farming organization was formed in 1974 (Bio-dynamic Agriculture Society of B.C.), the rest have emerged since 1986. The organic farming community in B.C. is relatively unique compared to those in other provinces in Canada in that with one exception, all were founded on a geographically defined basis. In contrast, organic farming organizations in other provinces have provincial scope or cross bioregional territories. The motivation for bioregionally based organizations are two-fold. First, in congruence with ecological principles of bioregional sustainability, organizing on this basis provides a greater commonality amongst member growers in terms of growing conditions (climate, land) and type of product. This specialization of product commodities by location is also more pronounced than in most other provinces given the nature of British Columbia's physical geography. Secondly, the smaller geographic area encompassed by an organization facilitates personal contact amongst members and knowledge of individual farm practices.

There are essentially two parts to this analysis of organic farming organizations in B.C. Parts B and C of Chapter 6 provide a description of the mission, structure, operation, leadership, key activities and issues which have been addressed within each organic farming organization.[See Table 6-7 for a summary of organizational structure, membership and certification programme] Chapter 7 concerns the organizational politics of interorganizational activities of the organic farming associations. Specifically, the history of first, the Alliance of B.C. Organic Producers Association and secondly, the B.C. Certified Organic Farmers/Certified Organic Associations of B.C. umbrella organizations are presented in the context of the process by which provincial certification standards have been developed and implemented. This issue has dominated the agenda of the B.C. organic farming community since 1989 and provides a rich illustration of political strategies and tactics within and amongst organizations engaged in alternative agriculture.

TABLE 6-7. ORGANIC FARMING ASSOCIATIONS: ORGANIZATIONAL STRUCTURE AND MEMBERSHIP

	BIO-DYNAMIC AGRICULTURE SOCIETY OF B.C.	BOUNDARY ORGANIC PRODUCERS ASSN.	B.C. ASSOCIATION FOR REGENERATIVE AGRICULTURE
YEAR FOUNDED	1974	1990	1986
GEOGRAPHIC SCOPE	Provincial	Grand Forks	Lower Mainland/Fraser Valley
MEMBERSHIP (1993)	82 members	24 members	67 members
EXECUTIVE	7 directors	4 directors	6 directors + 1 ex-officio director
COMMITTEES	Certification Ctee.	Certification Ctee.	Certification Ctee. Marketing Ctee. Education Ctee.
STAFF EMPLOYED	0	1 Verification Officer (part-time)	1 Verification Officer (part-time) 1 Administrator (part-time) 2 Contract employees (secretary;admin)
DECISION MAKING PROCESS	Republican system/ Consensus	Consensus	General Membership -- Voting Directors -- Consensus
SOURCE OF FUNDS	Membership fees: $25 Newsletter: $10	Membership fees: $75 grower $15 associate	Membership fees: $50 Newsletter: $15 Fundraisers (Dinner/Auction)
NO. OF FARMS ON PROGRAMME	7 farms	4 farms	36 farms
NO. OF YEARS BEFORE CERTIFIED ORGANIC STATUS	Demeter: 7 years Biodyn: 5 years	3 years	3 years
CERTIFICATION FEES	$150 + Travel expenses of 2 certification ctee. members	$20 Application fee $25 Inspector fee + $15/hr. + mileage fee (if > 10 mi.)	$250 Certification application deposit $150 Renewal certification $ 15 Certification standard manual
NO. VERIFICATION OFFICERS	Not applicable	1 part-time	1 part-time

TABLE 6-7.(cont.) ORGANIC FARMING ASSOCIATIONS: ORGANIZATIONAL STRUCTURE AND MEMBERSHIP

	CARIBOO ORGANIC PRODUCERS ASSN.	COMOX REGIONAL ORGANIC PRODUCERS ASSN.	CRESTON VALLEY ORGANIC ORGANIC PRODUCERS ASSN.
YEAR FOUNDED	1987	1992	1987
GEOGRAPHIC SCOPE	Cariboo-Chilcotin	Comox-Courtenay	Creston Valley
MEMBERSHIP (1993)	20 members (1992)	13 members	10 members (1991)
EXECUTIVE	5 directors	5 directors	1 director
COMMITTEES	Certification Ctee.	Certification Ctee.	
STAFF EMPLOYED	1 Verification officer (part-time)	1 Verification Officer (part-time)	
DECISION MAKING PROCESS	Majority vote	Majority vote	Majority vote
SOURCE OF FUNDS	Membership fees: $20	Membership fees: N/A	Membership fees: $35
NO. OF FARMS ON PROGRAMME	12 farms	6 farms	4 farms
NO. OF YEARS BEFORE CERTIFIED ORGANIC STATUS	3 years	3 years	3 years
CERTIFICATION FEES	$90	Not Available	$20
NO. VERIFICATION OFFICERS	1 part-time	1 part-time	1 part-time (CVOPA president)

TABLE 6-7.(cont.) ORGANIC FARMING ASSOCIATIONS: ORGANIZATIONAL STRUCTURE AND MEMBERSHIP

	ISLANDS ORGANIC PRODUCERS ASSN.	KOOTENAY ORGANIC PRODUCERS ASSN.	NORTH OKANAGAN ORGANIC PRODUCERS ASSN.
YEAR FOUNDED	1989	1990	1989
GEOGRAPHIC SCOPE	South Vancouver Island	Nelson	North Okanagan
MEMBERSHIP (1993)	23 members		58 members (1992)
EXECUTIVE	5 directors	3 directors	5 directors
COMMITTEES	Certification Ctee.		Certification Ctee. By-Laws Ctee. Marketing Ctee.
STAFF EMPLOYED	1 Verification officer (part-time)		1 Verification Officer (part-time)
DECISION MAKING PROCESS	Consensus	Consensus	Majority vote
SOURCE OF FUNDS	Membership fees: $55	Membership fees: $0.00	Membership fees: N/A
NO. OF FARMS ON PROGRAMME	18 farms	3 farms	32 farms
NO. OF YEARS BEFORE CERTIFIED ORGANIC STATUS	3 years	3 years	3 years
CERTIFICATION FEES	$150	$0.00	Not Available
NO. VERIFICATION OFFICERS	1 part-time		1 part-time

TABLE 6-7.(cont.) ORGANIC FARMING ASSOCIATIONS: ORGANIZATIONAL STRUCTURE AND MEMBERSHIP

	PEACE RIVER ORGANIC PRODUCERS ASSN.	SIMILKAMEEN-OKANAGAN ORGANIC PRODUCERS ASSN.	SHUSWAP-THOMPSON ORGANIC PRODUCERS ASSN.
YEAR FOUNDED	1989	1986	1987
GEOGRAPHIC SCOPE	Peace River	Similkameen-South Okanagan	Shuswap-Thompson
MEMBERSHIP (1993)	80 members	68 members (1992)	25 members (1992)
EXECUTIVE	9 directors	8 Directors	
COMMITTEES	Certification Ctee. Communications Ctee.	Certification Ctee. Standards Ctee. Crop Management Ctee. Marketing Ctee.	Certification Ctee.
STAFF EMPLOYED	2 Verification officers (full-time) 1 Administrative Asst. (full-time)	1 Verification officer (part-time)	1 Verification officer (part-time)
DECISION MAKING PROCESS	Majority vote	Consensus	Consensus
SOURCE OF FUNDS	Membership fees: $50	Membership fees: $150 (grower) $ 15 (associate)	Membership fees: $20
NO. OF FARMS ON PROGRAMME	80 farms	56 farms	22 farms
NO. OF YEARS BEFORE CERTIFIED ORGANIC STATUS	3 years	5 years	5 years
CERTIFICATION FEES	$30 Application fee + Percentage of gross income (less non-commodity income)	$25 Application fee $150 Inspection fee + Membership	$20 Application fee $50 Inspection fee
NO. VERIFICATION OFFICERS	2 full-time	1 part-time	1 part-time

(1) Bio-dynamic Agriculture Society of B.C.

Founded in 1974, the Bio-dynamic Agriculture Society of B.C. (BD Society) is the oldest sustainable agriculture organization in the province. In its early years, the BD Society was comprised of 50-60 persons who were primarily gardeners practising or interested in applying Rudolph Steiner's 1924 "Agriculture course" which is based on the anthroposophic philosophy (Steiner, 1974). While still retaining its wider membership (82 members in 1992), the activities of the BD Society are now more focused on meeting the needs of its more active farmer members who are on the farm certification programme (7 farms were on the certification programme in 1992).

The following quotes from two members of the BD Society illustrate their views of what the mission and goals of their organization are.

> "To give ideas, to help people to find solutions for their work problems."
>
> "To make the general public aware of alternative methods of agriculture and gardening. And also of the spiritual aspect that is involved that really combines what we call the cosmic influences with the down to earth physical local aspect. And it has nothing to do with any denomination or religious concept but there are philosophical concepts behind it, definitely yes. That, for instance, include cosmic influences in daily work. So to make people aware of that and to heal the soil before the Earth is destroyed."

Thus membership in the BD Society has a strong philosophical component in addition to the practical member education and farm certification.

In addition to an Annual General Meeting for all members, the seven Directors of the BD Society meet four times a year (once per season) at different locations throughout the province. The purpose of these changes in location is twofold in that Directors are able to tour the farms of their colleagues and the public (generally anthroposophic members) in various regions are invited to participate in farm tours. The BD Society operates on a republican system of decision making in which the Directors make most of the decisions. They try to achieve consensus in order to avoid a voting procedure (which happens "almost never"). There have been only three Presidents in the BD Society over the past 19 years. The first was president for five years, the second for seven years and the current President since 1989.

Membership in the BD Society costs $25 and for an additional $10 one receives a subscription to the Society newsletter, "The Stirring Stick", and an American bio-dynamic quarterly magazine. The BD Society also sells a wide variety of bio-dynamic and anthroposophic books and literature to its members and others.

The most active committee in the BD Society is the Certification Committee. Unlike other organic farming associations, the certification standards utilized by the BD Society are those provided by the International Bio-dynamic Society. In 1990, the new "International Guidelines for Certification of Products from Bio-Dynamic Agriculture" were issued. There are two levels of BD certification, the first is Biodyn which is achieved after five years of bio-dynamic practice, the second is Demeter after seven years. The Demeter and Biodyn trademarks are registered (the B.C. BD Society held the original rights to the trademark) and farmers sign a licensing agreement with their certifying association for their use. In 1992, there were five Demeter and two Biodyn farms certified in B.C. for a total of 1632 acres in the certification programme (note however that one farm in the Peace River region accounted for 1200 of those acres).

The certification procedure involves a visit by two members of the certification committee (both bio-dynamic farmers) who inspect the farm and review the farmer's completed questionnaire. Emphasis is placed on the farm being a diversified self-contained system with purchased off-farm inputs being kept to a minimum. The requirement for a mixed farm operation is such that a farm cannot achieve Demeter status if there are no livestock present. Farm certification costs include a $150 fee plus travel expenses for the two certification committee members. Given the wide dispersion of the bio-dynamic farmers throughout the province (from the Peace River region to Vancouver Island), this represents a substantial expense for the individual farmer.

Amongst the issues which the BD Society has had to deal with in recent years has been the loss of their external consultant to provide technical advice. Efforts are being made to identify someone from outside the province who could provide such independent counsel. Another issue has been the decision of Canada Customs to stop the importing of bio-dynamic preparations -- the reason given by

Customs was that the preparations contained unknown substances. The use of bio-dynamic preparations in fertilization and promoting plant health is an essential part of the bio-dynamic system of agriculture. There are very strict instructions as to their production which require specialized skills and ingredients. Thus since 1991, certain members of the BD Society have produced and distributed the bio-dynamic preparations (29 sets were sold in 1991).

(2) Boundary Organic Producers Association

The Boundary Organic Producers Association (BOPA) formed in 1990 when three organic farmers met about their common need to market their organically grow produce outside their area (Grand Forks) and the need to prevent fraudulent claims regarding organic food. Those three persons plus another became the Directors of the organization who worked to develop the association's constitution and organic certification standards (it took about 25 meetings to do so). BOPA has remained a small organization with four certified organic grower members (all directors) and 20 associate members in 1992. All of the certified growers are located in Grand Forks and grow primarily garlic with a couple also growing market vegetables.

The organization is funded solely through membership fees which (in 1991) for associate members is $15 and for certified members is approximately $120 ($75 membership fee + $20 application fee plus an inspector fee of $25 + $15 per hour + mileage if the farm is greater than 10 miles from Grand Forks). The certification period is three years and the part-time verification officer makes two visits per year (1 unannounced) to certified growers and three visits per year (1 unannounced) to transitional growers. In addition, there is a provision that a laboratory analysis of soil and water samples be required for farm certification (to be paid for by the producer).

As stated in their guidelines for organic food production, BOPA's goals indicate a strong environment ethic.

> "Our goals include defining what organic growing means, establishing a means of certifying produce, and making a commitment to sustainable agriculture concepts.

> Concepts such as placing the long term goals over the short term. We live in a world of inter-connectedness which we influence by our own actions. Choices of what we put in our mouth and what we put in the soil are not as far apart as what was once believed.
>
> To focus just on producing residue free food, while a noble goal, is not the single vision that B.O.P.A. stands for. Producing healthy soil, creating a healthier lifestyle, and the production of quality food through low impact means all encompasses our general philosophy."

Thus far there have been few changes within the BOPA organization. The leadership of the organization has remained stable with the founding president and directors remaining in those roles for the past three years. The BOPA president maintains contact with other organic associations and has been the liaison person to the Alliance of B.C. Organic Producers Associations (ABCOPA). In 1992, he also became the Chair of ABCOPA.

Within BOPA the only major issues have concerned the certification of new members. Some early applicants wanted to gain immediate certification without going through a transitional period. Another had applied to certify only one segment of his land, leaving the remainder under conventional agriculture practices. All were denied certification.

(3) B.C. Association for Regenerative Agriculture

The B.C. Association for Regenerative Agriculture (BCARA) started out as informal get-togethers for 10 new farmers as the following two quotes attest to:

> "It started out as a bit of a garden club. We had guest speakers and what not and had a tea and cakes type of thing. And it was real homey."
>
> "The birth of the organization was magnificent. We spent quite a long time and probably 18 months meeting with a small group of people who became friends and we would have very long meetings and very social with a lot of laughing. We would do uproarious things like write constitutions! It's real fun stuff! So we hammered out, clause by clause, how we wanted the organization to be and it really worked well and we really enjoyed it."

After meeting as a small group of Lower Mainland and Fraser Valley farmers, they registered as a society in 1986. At their first formal meeting a representative from Oregon Tilth (that state's organic certifying association) spoke and warned them that "they would get burnt out". Irrespective, they proceeded with the purpose being to have a "credible and recognized organic programme so that consumers would be really aware of the quality of product that was certified BCARA". Other goals are to educate the public on the need for organic agriculture (and regenerative agriculture which is low input sustainable agriculture), and to provide information to and be a support group for organic farmers.

There are six directors plus one ex-officio director (a BCMAFF employee) in BCARA. From 1988 to 1990, 90% of the activity was on developing certification standards. The certification committee is large with 15 members, although it is acknowledged that six members did most of the work. There is a marketing committee of three members plus two ex-officio members (BCMAFF employees) plus an education committee. There is one part-time secretary-administrator who prepares and prints the newsletter, keeps the financial records and does general administration work. In 1992, two persons were hired on a contract basis -- one to take the minutes at the general and board meetings, and another to handle certification administration and the grower data base. In 1991, BCARA obtained a separate telephone listing for telephone installed in the Pro-Organics (an organic food wholesaler) office at no charge (the president of Pro-Organics is also a BCARA director). There is one part-time verification officer in BCARA. General membership meetings are held once a month at the Cloverdale BCMAFF office. In addition to regular association business, the meetings feature either a guest speaker or a "Growers Corner" for education and information to members. In addition there are monthly directors' meetings. In the four summer months, the general meetings are held at different members' farms and include farm tours, a growers corner and a potluck supper.

From the initial 10 members in 1986, BCARA grew to 12 certified growers (160 acres on the certification programme) in 1990. By 1991, there were 24 farms (335 acres) plus 26 supporting members and in 1993, there were 36 farms on the programme (67 members). Membership fees are $50, the production standards manual costs $15. Applicant growers pay a $250 certification application deposit with the final amount to be paid depending on the size, complexity and location of the operation (a surcharge is applied for travel outside the Lower Mainland region).

Renewal certification costs $150. It is a three year certification programme with two inspections per year (1 scheduled and 1 unscheduled). Nonmembers who wish to subscribe to the quarterly BCARA newsletter, "BCARA Renews", pay $15.

The decision making process at BCARA is a combination of both consensus and majority vote.

> "There is a fair bit of decision making in BCARA that is done by consensus but a lot of it, when it comes down to the real issues that there is a lot of feeling expressed in pros and cons, that will go down to a vote. It's quite clear cut. A lot of the membership decisions are done by vote but the executive of BCARA does all of their decisions by consensus. And if it takes discussing something for two hours, then it's discussed, everybody has to agree."

Comments about what it is like to be a member of BCARA provide a picture of a group of individuals who are highly motivated and energetic. Most of the founding members had come to the organization with extensive education (post-graduate university degrees) and experience in other professions. This appears to have resulted in an early attention to the process of organizing rather than only focusing on the technical aspect of a certifying association.

While the role of the president of BCARA appears to have been defined as that of process leader, others have emerged as leaders in their own right. Two persons in particular were seen as being instrumental in leading the certification committee. Another person was identified as providing useful technical and organizational knowledge based on his previous experience with organic farming associations in the United States.

However one person was often commended for his technical leadership and energy in the organization.

> "Totally invaluable. _____ keeps us on what we are trying to do. Good, excellent resource person."

> "Holding it together by services he provides to the group. I think he's invaluable."

The contribution of this member (who is a BCMAFF extension employee therefore is an ex-officio director) has been to provide information and education to growers at meetings during "Growers' Corner" presentations. In his horticulture extension role, he has been often mentioned by BCARA members, organic farmers in other regions as well as BCMAFF extension employees as a useful source of information regarding organic methods of production. He has proposed and is conducting research projects which involve BCARA growers (for example in 1993, thermal weed control). Also recognized, and appreciated, by BCARA members is his knowledge of government programmes and processes which have been instrumental in BCARA's dealings with the BCMAFF during the process of developing the provincial certification regulatory system. This level of involvement by a government employee in the operation of an organic association is unique to BCARA. However, as will be discussed in Chapter 7 on the development of the provincial government organic certification regulatory system, his role in BCARA has been seen a controversial one by some of the other organic associations.

As part of their public education goal, BCARA and/or its individual members have been featured prominently in several newspaper articles (for example, in The Vancouver Sun, Country Life in B.C., The Western Producer). Since 1991, they have had a booth at the PNE where they hand out informational literature on BCARA and sustainable agriculture. In 1993 they will be able to add a slide show featuring BCARA farms to the exhibit. The BCARA newsletter is distributed to their 67 members and an additional 115 nonmembers (retailers, wholesalers and other interested persons). While they were unable to get space at the LMHIA Growers' Short Course in 1989, they were successful in getting space the following year. For their own members, one person on the education committee (an entomologist) has developed a computer catalogue of resource material on organic agriculture.

Since 1991, BCARA has conducted annual BCARA certification workshops for new growers and those interested in organic certification. The workshops are held in the Cloverdale BCMAFF offices and cost $25 plus $15 for the certification packet. Interest in the workshop (which is advertised in the newspaper and notices are handed out in the BCMAFF office) appears to be declining with 32 attending in 1991, 35 in 1992, and only 10 in 1993. The workshop was developed as part of a Marketing Initiatives Grant under Bill 85, the B.C. Food Choice and Disclosure Act (FC&DA). Other activities under this BCMAFF grant (which totalled $11,250) were: developing and staging a wholesale-retail marketing workshop on handling and marketing products certified under the FC&DA; developing and printing a marketing directory listing member farms and certification status under the FC&DA; and artwork, layout and typesetting of a consumer brochure on organic products under the FC&DA. An earlier grant in 1990-91 for $14,615.98 was received as ARDSA grant to develop production standards and a final report for the proposed provincial organic certification system under the FC&DA.

In Spring 1992, a group of BCARA members formed an independent marketing organization called "Valley Organic Farmers". Operating on a co-operative basis, two tables at Granville Island Market were rented and a person hired to staff the booth for the summer period. In addition to contributing to start-up costs, participating growers are also committed to working six days a year at the table which operates three days per week (Friday, Saturday, Sunday). Produce is sold on a consignment basis and while BCARA members are given first preference, other organic growers (local and then outside the region) can participate. BCARA literature is also available at the tables.

In 1992, BCARA started additional fund raising activities. In September 1992, an all organic dinner and auction was held at Isadora's Restaurant on Granville Island in Vancouver. A total of $1650 was raised and this will become an annual event. In the summer of 1993, a family festival is planned at a member's farm in Abbotsford. It will feature live music, food and games and there will be places for tenting and parking RVs.

As in other organic certifying associations, there have been internal conflicts regarding the certification process. One issue involved the confidentiality of farm inspection reports. In BCARA, these reports are only viewed by members of the certification committee who then make recommendations to the directors (who have signing authority) as to the certification status of a grower. One director felt that he would be legally liable if he signed off on a grower's certification without first reviewing the original certification documents. He also stated his belief that farm records should be open to every member. There was strong opposition from others who believed in the need for confidential records (one reason being the protection of information regarding their specialized markets). The issue was resolved when they sought out an independent legal opinion and found that the directors would not be personally liable if there were inaccuracies in the certification documents. Still, this prompted a number of motions at the general meeting as to what was to be confidential and what was not. The director who had raised the issue also did not stand for re-election to the board.

In developing their relationship with other bioregional organic associations in the province, the BCARA name itself has been an issue. As related by one BCARA director,

> "One of the biggest problems in getting our concept across. We made the mistake at the very beginning calling ourselves the B.C. association. We just didn't think about it. We kind of thought in loose general terms and based things on OFPANA and I guess we forgot that the majority of us are just based in the Fraser Valley. It became very apparent when we started getting some work done that there was a certain amount of animosity, it appeared that we were trying to grab the whole thing. That's an erroneous perspective. We kind of flopped around with it and we're just going ahead and have accepted that we made a mistake by calling ourselves the B.C. Association of Regenerative Agriculture. But we built in stops and measures that we're not grabbing the brass ring. It really is for everyone in B.C. and we very gladly give the work that we've done to others. That's probably amounted to thousands of hours of work. Very gladly pass that information onto other organizations."

Even though they state otherwise, accusations by other organic associations that BCARA is trying to become the dominant provincial certifying body are given credence by their willingness to certify growers outside the Lower Mainland/Fraser Valley region. In Vancouver Island region, two growers who could not get certified organic status from IOPA (Islands Organic Producers Association) have been certified by BCARA. There was no contact made by BCARA to IOPA about their actions. A similar incident of certifying a grower rejected by his local certifying association also occurred in the Shuswap-Thompson region. In their defense, BCARA members' rationale for their actions follows the logic (as stated by two BCARA members) that,

> "BCARA doesn't want to go out of the [Fraser] Valley. But because of our initial input, we will certify anyone who wants to be certified which is happening because some people aren't getting the kind of satisfaction they need from their local bioregional certification. They're asking us to do it."

> "BCARA membership has always had the attitude, yes, we'll focus on this bioregion but it's open to members province-wide. And it focuses on regenerative agriculture. The majority of the membership is interested in

> organics and that's where a lot of the energy has been put. But it's open to anybody to join it so it isn't exclusively an organic producers association."

As will be seen in the discussion in Chapter 7, these incidents contributed to the conflict between BCARA and other organic certifying associations during the development of a provincial certification system under Bill 85.

(4) Cariboo Organic Producers Association

Covering the Cariboo-Chilcotin region of the province, the first meeting of five farmers which led to the establishment of the Cariboo Organic Producers Association (COPA) was held in Quesnel. After registering as a society in 1987, they placed newspaper ads announcing meetings in Quesnel, Williams Lake and 100 Mile House. This resulted in an increase to 13 members by 1990. Following a 1991 membership drive, COPA had grown to 20 members with 17 farms on their certification programme (7 certified and 10 transitional). In 1993 there was 12 farms growing certified organic products. As stated in their constitution, the goals of COPA are:

> "To certify organically grown produce. To promote ecologically sound sustainable agricultural systems. To clarify and aggressively promote a common image of organic products in the market place. To foster the sharing of information and other resources amongst the members of the society."

There is only one class of membership in COPA (no associate or ex-officio members) and 1991 membership fees cost $20. In 1991, the type of farm members was evenly split between those with very small farms and those with large operations who export to the United States. There are six to seven Directors on COPA's board plus a certification committee (all of whom were board members). Board meetings are held once a month in the winter and are open to all members. While their constitution is not on a consensus decision making model, COPA directors try to work on a consensus basis.

Initially COPA adopted the standards used by STOPA (which in turn were based on SOOPA standards). Since then some adjustments have been made to the standards such as the reduction from a five year to a three year transitional period (2 years on virgin land) and changes to the livestock standards. In 1991, it cost $90 for two inspections per year by a part-time verification officer. Most of the members of COPA were previously organic, there has been little contact with conventional ranchers.

The leadership role in COPA appears to have been a shared one. The first president saw his role as that of a facilitator. Other persons have also emerged as leaders in the organization -- two were identified as mediators and another two were identified as providing technical leadership by example.

The first two years of the organization were dominated by the tasks of establishing certification standards and certifying members. Lately, attention has been directed towards more grower and public education as well as marketing.

Inside the organization, one of the greatest challenges has been dealing with the philosophical differences between the majority of members and those belonging to a local communal society named C.E.E.D.S. (Cariboo Community Enhancement and Economic Development Society). As described by one COPA member,

> "Their (C.E.E.D.S.) perspective differs in that they would rather, I think, see this be a much more political or for a lack of a better word, philosophical or spiritual kind of community. A spiritual, philosophical or political type of organization rather than a certification organization. And that creates the difficulties."

C.E.E.D.S. operates five organic farms in the region (they only rent because of a philosophical opposition to private land ownership) and held four memberships in COPA. Philosophically, C.E.E.D.S. is opposed to any government involvement in agriculture or elsewhere for as stated by the C.E.E.D.S. member interviewed,

> "Government wants control over everything. There's a lot of politics in food. Food is everything."

Given that other members in COPA have been actively involved early in the process of developing provincial certification standards in cooperation with the government, this has fuelled significant conflict within the organization. Whereas C.E.E.D.S. members were a strong contingent within COPA during its formative years, they have since left the organization.

(5) Creston Valley Organic Producers Association

When members of the Creston Valley Organic Producers Association (CROPA) were interviewed in 1991, it appeared to be an organization about to dissolve.

When it was established in 1986, there were 12 members with only two not being backyard gardeners. In 1991, there were 10 members with four farm producers. The first 18 months were spent developing the certification standards. While decision making is by majority vote, as one member remarked, there are not many decisions to be made in CVOPA.

Basically, the state of CVOPA in 1991 was that the organization was a "one man show" operated by its president. As stated by one member: "He's the glue that's holding it together." In interviews with members (current and past) of CVOPA, the president emerged as the only active person in the organization. He is the certification officer because "he is the only one willing to do inspections". There is no certification committee. Words used by others to describe the CVOPA president's style were "directive", "domineering", "high control" and "a purist". His philosophy of farming was described as follows,

> "He's very idealistic. His idea of organic farming is hunter-gatherer. You don't plant crops, you go out into the bush and you find your berries -- that's ideal organics."

His strong environmentalist ethic also extends to a personal life style which was described as that of a back-to-the-lander (eg., no electricity, solar house heating, transportation by horse and buggy and bicycle, home schooling for children).

The CVOPA president has proven to be instrumental in the significant shift of the organization towards a radical environmentalist philosophy.[1] As a result, several of the early founding members have left the organization. Key to this change has been the decision by CVOPA's president to have the CVOPA join the East Kootenay Environmental Society as a committee in 1989. The rationale at the time was that the CVOPA could not financially afford to be a separate registered society and there was no one willing to do the organization's administrative work. The benefits of belonging to the Environmental Society were that: there would be a sharing of administrative costs; the CVOPA would be

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[1] The CVOPA president was the only organic association leader who refused to be interviewed for this study. When contacted by telephone, he stated that he would not participate because he believed that all such research was a "waste of money and should not happen".

included in the Environmental Society's newsletter; and the Environmental Society would help with CVOPA activities.

As earlier presented in the case analysis of the Creston Agricultural Society, the East Kootenay Environmental Society has continually attacked conventional farming practices in the area. One of the outcomes of this conflict has been that farmers who are interested in belonging to an organic certifying association and conventional farmers who are interested in converting to organic agriculture will not consider associating with the CVOPA (this was mentioned by three interviewees).

The confrontational style of both the president and several remaining CVOPA members has also extended to dealings with the local BCMAFF extension agent who has worked with individual organic farmers in the area on specific production problems (and which was appreciated by those same growers who were interviewed). He has made a special effort to gather information for the benefit of the organic farmers as well. However, his efforts to develop a relationship with the CVOPA have been met with significant hostility as the following account illustrates. [This account was confirmed by two other organic growers interviewed.] In September 1989, the BCMAFF extension agent had attended a BCMAFF sponsored organic marketing seminar in Vancouver.

> "I went and took a lot of notes and a lot of information, came back and invited the whole organic group into the office here. Held a meeting, fed them coffee, presented all this information and more or less got told this is nice but we don't need you. I went out of my way to try to work with them and it was only about a month after that that [CVOPA president] wrote that letter through the Environmental Society accusing me of all kinds of things that aren't true. About trying to destroy the organic group cause at that time, they were moving. He wanted to move the organic group into the Environmental Society, to become a committee of the Environmental Society which it now is. A number of the organic growers were unhappy with that and I felt that that was bad primarily because I feel that the organic group was different than the environmental group. That it had to have some autonomy so that they could take care of their own affairs.
>
> It was January 1990 that it actually went in. I get attacked with that letter accusing me of telling growers that the Environmental Society was the worst thing they could possibly do, that it would kill the organic association, a whole pile of things that I hadn't said. And I wrote a letter back to the president of the Environmental Society who signed the letter, although she told me [CVOPA president] wrote it. And I wrote her back a flaming letter telling her that this was almost libelous. And within 24 hours, I had a letter hand delivered to the office, a full apology. I wrote a second letter to them questioning their ethics and their presence as a force in the community, that the Environmental Society

> was putting forward points of view with no ethics. They didn't answer that one. I distributed that. I photocopied both letters, all three letters, handed them out to any organic grower I knew so that they would know what the hell had happened."

This incident contains elements of several political games. First there was the CVOPA President's use of labelling and assertiveness to protect against what he viewed as the BCMAFF agent's attempt to influence members on the issue of membership in the East Kootenay Environmental Society [gatekeeping to guard against the perceived encroachment of his territory]. In his own defence, the BCMAFF agent states that he had no such ulterior motive but was only trying to help but when confronted with these charges, he practised assertiveness to ensure that his version of the event was heard. Despite this interchange, the BCMAFF agent is still willing to continue his interest in organic farming but only by assisting individual farmers.

At this point in time, whether the CVOPA remains in existence is questionable. While once a strong member of the ABCOPA, they have not sent a representative in over three years. There has been no contact between the CVOPA and other organic associations in the interim.

It is interesting that while the argument for joining the Environmental Society was that it would help the financial survival of the CVOPA, instead it has served to accelerate the decline of the organization in numbers and influence. Paradoxically, at the same time, the Environmental Society's attacks on conventional agriculture have served to antagonize conventional farmers to organize a counterattack thereby widening the gap between the area's organic and conventional farmers.

(6) Islands Organic Producers Association

The Islands Organic Producers Association (IOPA) traces its start to the Metchosin Organic Producers Association (MOPA) which has been described as a "local farmers' support group". Basically, MOPA served to help farmers exchange information during their monthly meetings in a member's house as well as to do group buying of farm inputs and supplies. They also produced an advertising leaflet listing member farms and locations for farm gate sales. This was distributed at farmers markets and food stores in the Greater Victoria area. While having the word "organic" in its name, MOPA did not certify organic farmers nor were all its members using organic methods of production. A small group of organic farmers in MOPA decided that there was a need to have a separate organization to develop certification standards and with the introduction of Bill 85, to represent the organic farmers on Vancouver Island and the Gulf Islands in dealings with the provincial government. Prior to IOPA forming, organic farmers had been certified by notarized grower affidavits with the Wild West Organic wholesaler but as one such grower recounted, there were no guidelines or on-farm inspections conducted.

Once the decision to organize IOPA was made, one person (who subsequently became the founding president) wrote letters to 15 other organic farmers in the region about organizing. She also telephoned others about the initiative. In the fall of 1989, 20 people met at an organic farmer's house in Ladysmith to form the association. They placed a newspaper ad to announce their second meeting which resulted in more members. In 1989, there were 17 members in IOPA and by 1991, there were 38 members (22 farms on the certification programme and 16 associate members). Membership fees in 1992 were $55 with certification costing $150.

The first year was spent organizing the association while in the second year, the development of organic certification standards consumed all of the members' time. The six members of the certification committee met every two weeks for 10 months. The process of drafting standards was very demanding as related by the following certification committee member.

> "We started out by writing off to wherever we could get copies of standards from other places. We got every copy of standards that we could find that already existed. Then you go through it and discern what's good and what's not about it and then work from there. So when we'd starting meeting, every section, it's divided up into inputs and methods and all this stuff, and we'd do a section and discuss, well, why is this here? What does it mean? We discovered there were things out there that none of us had ever heard of, we didn't even know what they were. So that sent us to the library and to phone calls to the university and to chemists to find out what is this? So it was long and hard, a long laborious process. And it's an ongoing process, it has to be a living document because things continue to happen."

The most difficult issue that the certification committee and IOPA has had to deal with has been the status of composted septage as a production input. This dominated the agenda of the organization for over a year and effectively split the IOPA membership between those who believed that composted septage should be a prohibited production input and those who believed it should be allowed but regulated. In the first year of operation, IOPA had allowed composted septage as a regulated product, however there was a moratorium placed on its use while the issue was being debated. Those who opposed the use of composted septage (the source of the sewage sludge is the contents of household septic tanks) were concerned about the heavy metals content of the product as well as the lack of control or certainty as to what substances were actually contained in the sludge itself. Their research had revealed that sewage sludge was prohibited in the majority of organic associations' production guidelines including those of OFPANA and the proposed national standards being developed by the Canadian Organic Unity Project.

It was a group of farmers located primarily in the Comox-Courtenay area who advocated the use of composted septage as a fertilizer in organic production. They were led by an individual in Courtenay who managed a sewage sludge composting facility. He had previously been certified organic by Wild West but on joining IOPA had to be placed on transitional status because he had only been on that particular land for two years and also had land under conventional production. To gather evidence regarding the use of composted septage, he conducted a research project with the aid of ARDSA grant money ($9783 provided out of $14,674 for the total project budget).[rational persuasion] The research involved the heavy application of composted septage on several types of products to give an indication of "worst case scenarios". Laboratory analyses of the food products were conducted in Hamilton, Ontario. The results in the 80 page report indicated that there were higher levels of cadmium, lead and mercury (the main ones) as well as other heavy metals in the leafy vegetables (eg., lettuce, spinach) and no uptake in tree fruits such as apples. However, all levels were below acceptable government levels. These results are consistent with other research studies about the use of sewage sludge or composted septage in agriculture. Generally, it has been found that it is a high nitrogen fertilizer and soil conditioner but may contain heavy metals which accumulate in the soil and plants (see Clapp, Stark, Clay & Larson, 1986; Parr, Epstein & Willson, 1978; Williams, Guidi & L'Hermite, 1984).

The certification committee was split on the use of composted septage -- three had used the product and felt it should be permitted as a regulated input, three opposed it in any form. Unable to come to consensus, they then took the issue to the membership. To gain further information, IOPA invited a speaker from the Citizens Association for Safe Environment in Saanich to report on research on the topic. But still the two opposing factions remained in a stalemate. As outlined by a member of the association,

> "And [farmer advocating use of composted septage] felt that the levels were below, they were certainly below any recommended levels that had been set out by any government. He felt that it was within reason, that it was safe and that if you took certain precautions, you could reduce those levels quite substantially. And there are some people in IOPA who believe that any contaminant, no matter what it is, is too much. And then there's another faction that says that you have to be economically viable and so you have to allow some impurities. After all, the planet is polluted and we can only do the best that we can do. Sort of the twain shall never meet."

IOPA meetings were consumed by angry arguments over composted septage. A membership vote could not be taken because IOPA operates on a full consensus decision making model. In retrospective, members have said that they should have hired a trained independent facilitator to manage the process. [They started doing so in 1992 and found that it helped significantly in making the consensus process work.].

To resolve the stalemate, the final meeting on the issue was conducted in late 1991 and the outcome was that sewage sludge would be prohibited under IOPA guidelines. The toll of the debate on the organization was significant.

> "Basically, it broke up the organization. Emotionally, it broke it up. It's still operating but everybody is feeling quite bad about it." (IOPA member in April 1992)

The farmers who were advocating the use of composted septage left the organization and formed the Comox Regional Organic Producers Association.[sanctioning] They now have 13 members with six farms in their certification program. Their certification standards are based on the proposed provincial certification standards which allow for sewage sludge as a regulated production input. The membership of IOPA has now been reduced to 23 members with 18 farms on the certification programme. The majority are located in the Greater Victoria area.

While the composted septage issue was seen as the major impetus for the splitting up of the Vancouver Island region into two parts, it may have only accelerated the process. Due to the long distances that individual members needed to travel for meetings (sometimes taking up to 4 hours each way), there had been previous discussions about creating North Island and South Island chapters. With the most controversial issue now resolved, IOPA activities are now more directed towards networking, sharing information and grower education; and the production of a marketing flyer of IOPA farms for farm gate sales. Plans are to extend their activities to public educational workshops for consumers and other farmers. It is hoped that this new direction will stem the loss of organic grower members who have established markets and do not feel the need to invest the time or money in obtaining certification.

(7) Kootenay Organic Producers Association

With only three members in 1991, the Kootenay Organic Producers Association (KOPA) was the smallest organic certifying association contacted in this research project. Formed in 1990 in response to a need to sell organically grown produce outside the Nelson area, as described by their contact person,

> "It's like a little club. We are three really nice guys. Just homeboys that like to grow stuff. We are pretty informal."

While 12 people showed up for their initial meeting, only three were willing to do the work to develop a constitution and certification standards. It took 10 months to develop KOPA's standards which are primarily based on OFPANA standards (although more conservative).

Informality extends to their certification process in that they do not have a third party inspector and only sign affidavits at the local food co-op regarding their compliance to KOPA certification standards. Even so, the co-op has indicated they would like to see a more formal certification process but with only three members, there are just too few to justify the cost. While there is interest in more farmers wanting to join KOPA, one obstacle has been the unwillingness of anyone (current members included) to invest the time and energy in running a larger organization. In any event, the stated objective of the current members is that when an inspection programme is put in place it should be only a $20 or $30 fee for,

> "The thing is that you don't want to discourage the small guy from getting into growing organic vegetables. That's antithetical to the whole movement. It's a grass roots movement in the true sense of some of these little homesteads that might get developed into five or ten acres of something, they have clean land as well. I just hate to see people priced out or organized out of trying to become, trying to make a full time income because part of this thing also is the idea of regenerating the family farm."

(8) North Okanagan Organic Association

Since forming in June 1989, the North Okanagan Organic Association (NOOA) grew from 12 members to 58 members. While in 1991 there were 19 farms on their organic certification programme, in 1993, there are 32 farms. This rapid growth in the organization can be partially attributed to NOOA's strategy of having an educational programme with guest speakers at their meetings. As explained by their founding president,

> "We try to get rid of the business to start with. And we're trying to have guest speakers in there as much as we can just to keep things interesting. Because if you keep it to a business meeting, we've found that you end up with the top 10 people and you can't come to any decisions because there's only 10 there and they all feel that they can't make a decision for the other 40 people that are missing. So we found that after we did that twice, we found it a waste of time. But if we have guest speakers and sort of have an educational programme on it, then there's way more interest for people to come and listen to the business as well."

Communication with members is also facilitated through a quarterly newsletter.

Coping with the demands of a rapidly growing membership has in turn placed considerable demands on the organization's leadership. The first core group of five persons who worked hard to establish the organization from 1989 to 1991 in effect, "burned out" and have been succeeded by another core group. There are five directors and three committees (certification, by-laws and marketing) in NOOA. Decisions are made by a majority vote process. While NOOA has a large number of farms on their certification programme (3 year transitional period), the majority are small operations which sell at the farm gate and farmers markets. NOOA members have been featured in several local newspaper articles and organic farming was featured in a direct farm marketing insert (listing products sold and farm locations) distributed in March 1993 in the Vernon Morning Star newspaper.

NOOA employs a verification officer on a part-time basis. Usually two of the four member certification committee also participate in farm visits. Findings of the certification committee are kept confidential to the committee. While initially there was a grandfathering clause in the certification procedure, this was amended to require that certification status depends on the length of time the applicant has been on the land under consideration.

Marketing their products has always been a concern to NOOA members. In 1992, a group of five NOOA growers pooled their resources to set up a co-op stand in Enderby (independent of NOOA itself). In addition to providing an additional outlet for direct sales of organic product, the stand also has a walk-in cooler which could be used to store produce for shipment to wholesalers and suppliers. Efforts continue to be made in investigating other marketing and distribution channels to make organic farming "a viable alternative" in the area.

(9) Peace River Organic Producers Association

The Peace River Organic Producers Association (PROPA) is unique in that although its offices are in Dawson Creek, its bioregional basis for organizing means that it certifies growers in both B.C. and Alberta. The interested growers first considered forming as a chapter of the OCIA (Organic Crop Improvement Association) since that is the dominant certifying association in the prairie provinces. However, they decided that they preferred an alternative system to the OCIA checkoff fee system of .5% of gross sales which would have made certification too expensive. They also had concerns about rumours about the enforcement credibility of OCIA and sending fees to the OCIA international headquarters in the U.S. The recognized need for a reputable certifying organization under local control led a small group to place an ad in the local newspaper announcing an organizing meeting for an organic certifying association. Arrangements were made to meet in the Dawson Creek BCMAFF office but the BCMAFF employee forgot to show up to open the building. Instead the 16 farmers walked down the street to a coffee shop and after talking for four hours established that there was sufficient interest in an certifying association.

From that inauspicious start, PROPA has since experienced growth from seven certified growers in 1988, to 17 in 1990, and to 80 members in 1993 (12 of whom are in Alberta). The majority of the members are involved in grain and in livestock production (only one vegetable grower in 1991) thus accounting for the large amount of certified organic acreage in the region (50,000 acres in 1991). One reason for the rapid rate of growth is the large market differential for certified organic grains. For example, the organic premium for organic oats is 150% whereas the premium for wheat is 100% (when there isn't a market surplus). Compared to other B.C. organic associations, the economic motivation for organizing an organic certifying association is perhaps strongest in PROPA as the following statement by one of the executive members illustrates.

> "Our goal, overall, was to drag people into sustainable agriculture by their wallets and to provide a marketing centre for them. The best ones, the ones that can help the organization have that market incentive, have usually some other kind of expertise to bring into it or a lot of them aren't even full time farmers. They are people who are going to be able to help the organization along where it is going to have to go."

Once the certification standards were completed in 1989, the major task of the organization has been processing the large volume of organic certification applications. In 1991, the certification committee had to meet each week for 13 weeks to process 57 applications (4 per week). At that time there were two verification officers working full-time for four months. A student was hired for the summer months to do administrative work (eg., to set up the data base on growers) as well as to conduct soil tests on an IRAP government grant. A regular part-time staff members was to be hired (3.5 days per week) to take her place in the autumn. The president was spending most of his time in the PROPA offices in Dawson Creek working on administration, finances, hiring and supervising staff, and liaison with government and other groups. By 1992, a full-time secretary had been hired and a student was hired to be secretarial backup for the summer months. As explained by the president of PROPA, the rapid increase in membership meant that,

> "We had to get real serious hiring staff which means we have to get money. We had to learn how to run programmes."

There are nine directors in PROPA who meet monthly at open board meetings. There are a number of committees in addition to the certification committee such as a communications committee, marketing committee, etc. Decisions are made by majority vote as there is strong opposition amongst members to the consensus decision making process. In general, the decision making was done more by committee in its first year then became more centralized in its second and third years.

Membership in PROPA costs $50. Initially certification fees cost $100 plus the verification officer's travel time and expenses for two annual farm inspections -- a not inconsequential cost given the distances required to travel to each farm in this large region. In 1993, the method by which the certification fee was calculated was changed and is unique in B.C. There is an application fee of $30 but the certification fees are calculated as a percentage of the grower's gross income less any income from non-commodity based sources. To aid in the calculation of individual fees, a grower is required to submit income statements to PROPA. Growers also have to pay for a soil test on one field each year. In 1992, PROPA also instituted an "inactive organic" status for members who are not selling product (either because of finances or a lack of market) but wish to retain their certification status. As an "inactive organic" grower they do not have to pay for inspections but are required to keep current records. Again, this is unique amongst all B.C. organic certifying associations.

Member information and education is facilitated by a regular PROPA newsletter ("Ecological Alternatives for Northern Agriculture"); inserts in "Synergy", the Saskatchewan quarterly organic agriculture publication; and annual PROPA conferences. These two day conferences started in 1990 and are attended by over 130 people each year. The conference grew quickly from a local event to one which attracts speakers and attenders from across Canada. One result has been a high profile for PROPA in the press which has facilitated their obtaining government grant monies to defray costs. To help solicit government funds, the president asked one conference speaker, Dr. Stuart Hill of McGill University's MacDonald College to accompany him on meetings with federal and provincial agriculture ministries--a strategy which proved to be very effective in obtaining funds.[strategic candidate] Other acknowledged benefits have been increased "clout" with the BCMAFF and Agriculture Canada and interest from marketers and wholesalers in buying PROPA members' products.

To assist members in marketing their products, PROPA has developed a marketing intelligence file listing all brokers, distributors and processors interested in certified organic grain, livestock, vegetables and fruit. They also maintain a marketing bulletin board in their Dawson Creek office for all products requested and for sale. With the assistance of BCMAFF marketing personnel, a group of PROPA growers are setting up an independent marketing organization (which to avoid conflict of interest will be a separate legal entity from the certifying association). In April 1992, PROPA registered a table (at a cost of $375) at the Organic Farm Fresh Tabletop Exposition--Natural Products Expo West conference held in Anaheim, California. To facilitate members' export sales, they also negotiated reciprocal agreements with Oregon Tilth and CCOF which provide for the recognition of PROPA certified organic product.

Another area which PROPA has been involved in is the organization of government funded research projects to include organic farms. The largest one was the three year clover ploughdown soil improvement experiments funded by PFRA Soil Conservation and Ducks Unlimited. To balance out their workload in the off-season, PROPA verification officers were working on the PFRA Soil Conservation Project.

The primary issue concerning PROPA members has been obtaining recognition for their certification programme in the marketplace. To this end, they have been one of the earliest and strongest advocates of a government sanctioned accreditation programme under Bill 85. Since many of PROPA growers export their grains to the U.S. and Europe, they have had to contend with demands from organic certifying associations in those locations for a government endorsed certification programme. Another motivation for government recognition has been to forestall blocking by the OCIA whose affiliated marketers and retailers refused to recognize PROPA standards in 1990 (thus preventing grain sales by PROPA members through those outlets).[gatekeeping and lording] Throughout PROPA's history, OCIA has always represented a threat in that they have been active in trying to recruit PROPA members.[empire building]

Another issue concerns the operation of an association which crosses provincial jurisdictions. While the majority of PROPA members are in B.C., a significant minority operate in Alberta under different agricultural policies and programmes. In the case of lobbying the BCMAFF for a provincial organic certification programme under Bill 85, there is a question regarding how such a B.C. programme would relate to the Alberta members of PROPA since there is no similar legislation in Alberta. This raises a potential dilemma for the operation of the provincial government scheme in terms of both recognizing PROPA farmers who are under Alberta jurisdiction and enforcing the provisions of the B.C. legislation.

(10) Similkameen Okanagan Organic Producers Association

Originating in June 1986, the Similkameen Okanagan Organic Producers Association (SOOPA) is the oldest organic certifying association (and until 1991, the largest) in the province. As the first, SOOPA has played an important role in helping several other organic associations organize in the province. They have assisted by widely distributing their certification standards and constitution as well as being available for informal advice. The initial motivation to form SOOPA was the need for a local grower certification programme to export fruit to California. Four of the seven founding members also operated a wholesale trucking operation and while they had been certifying locally (through notarized grower affidavits), a change in California organic food legislation required that organic products needed to have a label saying "certified and conforming to code". With the cherry crop ripening and the urgent need to export fruit to California, speed in setting up an organization was essential. Initially, OFPANA standards were used and the SOOPA constitution was quickly drafted. The first president of SOOPA then went down to Victoria to register SOOPA as a society. The following quote illustrates the speed by which the whole process took place.

> "[First SOOPA president] spearheaded it. She threw together something, just literally threw together some standards, a constitution and a set of by-laws. She went down to Victoria and sat on the steps of Consumer and Corporate Affairs and wrote, went in and said, 'Is this okay?' 'No.' Went back out, wrote, went in, 'Is this okay?' Anyway she did it in a day, had it registered as a society."

Since then, SOOPA's by-laws and certification standards have been significantly revised but they were in place in time to export the cherry crop to California.

SOOPA is based in the Cawston-Keremeos valley which had the largest concentration of organic farmers in Canada. It grew quickly to 22 members in 1987 then 63 members (51 farms on the certification programme plus 12 associate members) in 1990 to over 68 members (56 farms) in 1992. In 1991, there were over 200 acres on the certification programme (5 year) with the majority being in tree fruit and vegetable production. There is one part-time verification officer and he is accompanied by two directors on initial farm visits. SOOPA has a strong bioregional focus and when NOOA formed in 1990, they encouraged their 12 members in the North Okanagan to join NOOA. They have declined to certify growers in the Kootenays and instead have offered to help them start their own bioregional associations. Membership fees in SOOPA are $150 for membership and certification (+ $25 for certification application fee) and $15 for associate membership.

There are eight directors who meet once a month and three operating committees (standard, certification, and crop management). There used to be a marketing committee but there is a strong belief amongst members that marketing and certifying should be kept separate. The general membership meets three times a year. Decision making is "mostly by consensus but not formally". As described by one person, achieving consensus is a learning process.

> "There's a lot of disagreement. You do get into a lot of conflict with people at meetings and it's good. I like us to get in a circle and really go at it, one by one. Some people really don't like that and people are learning to communicate with each other. I think that's part of SOOPA."

One change in the organization has been the greater inclusion of general members in the decision making process. At one time, there was only one membership meeting per year and directors' meetings were closed. One item on the agenda of the SOOPA president elected in 1987 was to have "more openness and communication between the board and general membership" and "a decentralized association with lots of member participation and interaction". To do so, director meetings were made open to all and the number of general meetings was increased. These meetings are also held in "neutral places" (the president's words) and not someone's home. So the general meetings are held in the Cawston Hall and the directors' meeting are held in the SOOPA office in Wild West Organic's Cawston packinghouse (at no charge). There has also been a constitutional change in the requirements for board membership. Initially, only certified growers could be directors. This was changed to allow transitional growers to be elected to the board (which has happened). Another change was allowing first, second and third year transitional growers to vote in organizational decisions.

SOOPA has undergone a number of leadership changes since its inception. The first president left her position once it was determined that there could be a perceived conflict of interest between her roles of grower and wholesale distributor. The second president was in office from 1987 to 1991. The focus at that time was on building the organization, promoting the SOOPA name in the marketplace, and "legitimizing organic farming in the valley". In 1991, the president and almost all of the directors were succeeded by a new board in a move to focus more on the educational and production needs of the growers (as several SOOPA members commented, the board was also "burned out"). In 1992, another person assumed the president role and he was actively involved in the development of the provincial organic certification system. Most recently in 1993, the second president has resumed his role as president of the organization.

One service which SOOPA provides for its members is information and education. They distribute the COGnition magazine (the subscription fee is included in their membership fee) and a newsletter. For the past five years, an annual one day Educational Forum is held in the Cawston Hall. Usually there are four speakers (research scientists and agriculture extension agents) on topics such as: cover crops, crop rotations, IPM, grading fruit and vegetables for international marketing, microbial inoculation, entomology (Dr. Stuart Hill of McGill University's MacDonald College has been one speaker). The forum only costs $8-$12 to attend (plus $3.50 for lunch) with the day ending with a potluck supper. In 1991, 60 persons attended.

In terms of environmental advocacy in the community, SOOPA joined others in opposing the building of a large garbage burning facility in the Similkameen valley. They have also organized a flag identification programme for organic farmers wherein they flag their property along roadsides to prevent herbicide spraying by the provincial Highways Department.

SOOPA (initially alone, and later with conventional orchardists) have lobbied the government for a Sterile Insect Release (SIR) programme to deal with the codling moth pest problem. For organic orchardists, crop loss of apples and pears due to codling moth ranged from 25% to 70%. The president of SOOPA (1987-91, 1993-present) was seen as instrumental in reintroducing the SIR program, as the following quotes from SOOPA members illustrates.

> "____ was mostly the one involved. ____'s directly involved in the SIR program. He was one of the really major pushers to get it back. They all told him he was crazy but he kept it up. And he became a real pain in the ass to them. The conventional organization of orchardists didn't want to get involved, but _____ has. _____ was actually on the board of the conventionals [BCFGA]. He became such a nuisance with his pressing for biological controls and whatnot that they finally got rid of him."

> "The SIR programme is largely due to _____. He kept it alive. He just kept hammering them and bugging them."

As a prerequisite to the SIR programme, existing codling moth populations need to be lowered significantly. In 1990, an Agriculture Canada Summerland Research Station experiment involving the use of codling moth pheromone confusion was conducted on 100 acres of organic orchards so that the effect of the pheromone confusion could be measured without the confounding effect of pesticide sprays. The successful results obtained in the first year of the experiment (losses due to codling moth were practically eliminated) resulted in the experiment being expanded in 1991 to 700 acres of both organic and conventional orchards. An $8 million facility has been built in Osoyoos to produce sterile codling moths and

1994 is slated for the programme to start in the South Okanagan and later to be extended to the North Okanagan and Kootenay regions.

In its history, the SOOPA executive have needed to deal with a number of certification issues. In its second year of operation, their verification officer died and was replaced by a person who was "cantankerous", "very strong and opinionated". Unfortunately, the new verification officer proceeded to base his conclusions on his own interpretation of organic farming requirements rather than the SOOPA certification standards. Within three months he had managed to alienate the majority of SOOPA members. Relations reached a crisis point when in a radio interview, the verification officer publicly criticized SOOPA and stated that "there were no organic growers in SOOPA". Given that SOOPA was still in its early stages of development trying to establish their credibility as a certifying body, the charges could not be ignored. The directors confronted the verification officer about his allegations, which he angrily denied.[assertiveness] An emergency meeting was then held about the matter. The next day, the verification officer presented a letter staging that he would be the final arbiter as to who was to be classified as organic and who was not and that it would be done according to his criteria. He delivered the ultimatum that if his conditions were not met, he would resign.[sanctioning] Needless to say, at another emergency meeting of the board, it was an easy decision for the board to decide to fire the verification officer.

This incident is noteworthy in that it is the only case thus far of a major confrontation between an organic certifying body and its verification officer. It also illustrates the unique position of verification officers who although they are technically an employee of the certifying association, they are not members. In the certification process, they are required to maintain a third party relationship to growers as the evaluator of whether a grower meets the criteria of the organic certification standards document which has been developed by the organization. In practice, the verification officer evaluates both a grower's farming practices and records and provides a subjective evaluation of the grower's knowledge of and commitment to organic farming. They also serve a quasi-extension function as the source of information and advice regarding grower practices and problems. However, verification officers only provide evidence and recommendations in their reports to certification committees which have the decision making authority. So the role of the verification officer is that of an arms length evaluator and auditor, serving as the external conscience to maintain the integrity of the certification process. In his actions to expand his authority and power, the SOOPA verification officer violated this established division of responsibility. By going public with his position as he did, he also threatened the perceived legitimacy of the organization during its critical early formative years and thus from the organization's perspective, needed to be stopped.[gatekeeping]

The directors of SOOPA had a more difficult time dealing with one grower who had abused the use of his certification stamps. In this case, the grower was in transition from conventional to organic production and was converting his land in parcels. Stamps are provided to identify boxes of produce originating from land which are at different stages in the certification programme. This grower had land that was in first year transitional and land that was in fifth year transitional. In the marketplace, the premium for organic food usually increases as it progresses from transitional to certified organic status. This grower's transgression was that he had stamped produce off of his 1st year transitional land with his fifth year stamp. Once the violation was identified, the directors held a special meeting and asked for the fifth year stamp back.[sanctioning] He did so but not before he had pre-stamped other boxes with it.[insurgency] No direct disciplinary action was taken but the grower chose not to rejoin the organization the following year. Given that misrepresentation of organic products in the marketplace is one of the primary reasons for establishing organic certifying associations, this incident illustrates the dilemma faced by such organizations in their policing of members. By their constitution they could have fined the grower or dismissed him from the association but they chose not to. That the abuse was identified quickly speaks to the merits of having local control and scrutiny to ensure that everyone adheres to the rules.

However, the close social and working relationships amongst growers which are necessary to support such a system make it more difficult to deal with those who violate their contracts. This in turn demonstrates the necessity for organic certifying associations to conduct both an objective evaluation of the applicant farmer's practices and knowledge as well as a subjective evaluation of their trustworthiness in complying with certification standards. In other words, to take a preventative rather than reactive approach to dealing with violations.

(11) <u>Shuswap Thompson Organic Producers Association</u>

In 1987, a small group of seven people "thought it would be a good idea to have a bioregional association" and formed the nucleus of the Shuswap Thompson Organic Producers Association (STOPA). Currently at 25 members (22 certified farms), STOPA operates in a fairly informal manner but one with a strong egalitarian and environmentalist ethic. For example, decision making is by full consensus both in practice and in their constitution. When registering as a society, they ensured that all "sexist" language was eliminated from the constitution by-laws. While the Society's Act requires the identification of five officers, STOPA, which does not have elections of officers, simply assigns five people to be listed as directors. In STOPA, there is a certification committee comprised of two growers and a part-time verification officer but unlike other certifying associations, recommendations are handled at regular meetings and everyone except first year applicants have access to all certification records and documents.

While there are no officers in the organization, it is generally recognized that three people do most of the work. Meetings are held three to four times a year in one of the member's houses (usually at one in particular because it is centrally located in the region) and include a potluck supper. The main purpose of the meetings is information sharing amongst growers.

> "Certainly when we have our meetings, there isn't any sort of view of proprietarism of ideas. People are very open and honest and share all of their experiences and problems and look for solutions from each other. And that's one of the really strong things about the organization, the way people work together in that sense."

There have been no public meetings as "no one has the time to organize it". The same reason is given for why they have not had more formal grower or public education or information activities. In collaboration with the Thompson Watershed Coalition in Kamloops, STOPA members have submitted a pesticide appeal regarding roadside spraying with Tordon (a herbicide) in the Chase-Nakusp Regional District.

Membership in STOPA costs $20 and for certification there is a $20 application fee plus $50 inspection fee. Plans in 1991 were to revise the certification standards which were essentially adopted from SOOPA with a five year transitional period. There is one farm visit a year under the STOPA certification process.

STOPA operates on a full consensus decision making model which as commented on by two members, is not without its drawbacks.

> "They talk a great deal, which is important, but we don't seem to get anywhere."
>
> "Consensus is slow."

As stated by one member, "STOPA is a hardcore bioregional association". Their philosophy was challenged in an incident over bioregional certification which involved BCARA. In this incident, an organic grower in the region had been refused certification because he used a herbicide on the area around his property and had leased blocks of his land to conventional ginseng growers (commercial ginseng production requires the use of chemical pesticides). He applied for certification for the parcel of his land on which he was growing organic carrots. The consensus reached by STOPA was that they could not certify the grower. They also noted that Wild West, an organic wholesaler, had also pulled the grower's certification status. However, STOPA members later found out that the same grower had applied for and received organic certification from BCARA which is based in the Lower Mainland/Fraser Valley region.[BCARA perceived as empire building] In STOPA members' minds what was particularly objectionable about BCARA's actions was that they had certified the grower without advising STOPA or asking STOPA or Wild West about the grower's history.

Summary Discussion

As these brief case studies show, the primary motivation for forming an organic farming association has been to establish a recognized and credible organic certification programme based on third party inspections. Other reasons most often cited have been providing support for organic farmers by being a vehicle to exchange information and/or inviting guest speakers to assist in grower education. For some associations more than others, the economic marketing needs of growers have been most prominent (most visibly in PROPA). In contrast there are organizations (eg., BOPA, STOPA) in which members view their organization as fundamentally part of a grass roots movement for political, social and economic change.

The process by which many organic farming associations in B.C. formed has generally followed the pattern of a small group of interested persons meeting informally to discuss their common interests. For many bioregional associations the birth of the organization took place around the kitchen table. The second stage of organizational development usually involved reaching out to other interested organic farmers in the bioregion to develop a critical mass to organize. In many organizations this involved placing a notice in the local newspaper announcing an organizing meeting, for others informal contacts were made. The first year of most organizations was spent working on the organization's constitution and the demanding task of developing the organic certification standards. Generally, the organic certification standards in each of the organic associations are very similar, largely because the certification standards committees did not start from "scratch" but sought out as many other standards as were available and used those as the basis for developing their own. One notable exception to this process is the Bio-dynamic Society which adopted the international bio-dynamic standards.

Once the organic certification standards were established, attention then turned to processing grower applications for certification. In those organizations which have experienced a rapid increase in membership (PROPA, BCARA, NOOA), reports of burnout of certification committee members is common as they struggled to keep up with the demand. The rapid increase in membership also appeared to accelerate the maturation of the organization in terms of evolving from an informal group operating solely on a volunteer basis to one with specialized committees, more formalized organizational procedures and in the cases of PROPA and BCARA, the hiring of staff to cope with the administrative workload. In the larger organizations, there is also a greater incidence of formal grower education initiatives either integrated as part of membership meetings or the staging of educational programmes open to the public (e.g., BCARA, PROPA, SOOPA). In those associations which have a large proportion of growers who sell at the farmgate, there often has been developed an informational flyer identifying member farms (e.g., BCARA, IOPA, SOOPA). Sensitive to perceptions of a conflict of interest between certifying and marketing (one of the major criticisms of early certification of growers by organic wholesalers), the organic associations have sought to keep these two functions separate and at arms length. Their role in this respect has been informational with some associations acting as a clearinghouse for marketing information and/or inviting guest speakers on the topic. In a few organic associations (e.g., BCARA, NOOA, PROPA), organic growers have joined together to form independent marketing co-operatives. Thus while the organization is not involved directly in the marketing of their members' products, the formation of the association facilitates the networking of organic farmers to initiate marketing vehicles.

Rapid growth has often meant a greater diversity within organizations in terms of the members' perceptions of the purpose and objectives of the organization. In organizations where growth has been slow, there appears to be a greater philosophical congruence within the membership. In the larger organizations, there has been a more internal conflict due to the greater diversity in their membership (both in terms of type and scale of production as well as philosophy of organic farming). Managing these conflicts appears to be more difficult in organizations which follow the consensus decision making model.

In those organizations where the environmentalist ethic is particularly strong, adherence to full consensus decision making is viewed as essential but one that does not happen easily or without conflict. As reports by those involved in such organizations attests to, achieving consensus is often a slow process subject to blocking by individuals. It is noteworthy that consensus decision making is more common in those organizations which have experienced a relatively slower growth rate thereby facilitating the acculturation of new members into organizational processes. On the other hand, adopting a unique decision making process such as full consensus may have served to limit membership growth in that those who are not comfortable with the process may leave or not apply for membership. In contrast, in those organizations where voting procedures are allowed for (although there is a desire to attain consensus), the decision making process does not hold the same symbolic importance. Instead, outcomes and action are viewed as more important and there is expressed an impatience with the often long and arduous consensus decision making process.

The conflicting views of different organic associations on government involvement in organic agriculture proved to be the most critical issue as they sought to form a provincial umbrella association to develop, among other things, provincial certification standards. As revealed in these case studies of the individual organic associations in B.C., there are significant organizational (size, activities, processes) and philosophical (mission, goals, objectives) differences between them preventing any overgeneralization. The nature and history of the struggle to develop unity amongst these disparate associations within the B.C. organic farming community are the subject of the account in Chapter 7 of interorganizational politics.

PART C. LEADERSHIP IN B.C. FARM ORGANIZATIONS

Given the importance attributed to leadership in the organizational behaviour literature (Bass, 1990, and others), one question to be addressed concerns the role of leaders in these farm organizations. Specifically, which leadership roles are most required in organizations which are predominantly voluntary associations? Are there differences in leadership roles due to the size and age of an organization? Is the leadership role different in organic associations as compared to those in mainstream agriculture?

To answer these questions, farm organization leaders were asked to complete the Organizational Leadership Questionnaire which is derived from Quinn's (1988) competing values framework of organizational leadership (a copy of the questionnaire is in Appendix E). This framework measures leadership along two dimensions (flexibility-control and internal-external focus) which capture the multiple and often contradictory demands within organizations. As stated by Quinn,

> "We want our organizations to be adaptable and flexible, but we also want them to be stable and controlled. We want growth, resource acquisition, and external support, but we also want tight information management and formal communication. We want an emphasis on the value of human resources, but we also want an emphasis on planning and goal setting." (Quinn, 1988, p. 49)

This diversity of organizational values or criteria for effectiveness are used by Quinn to delineate four organizational models and eight leadership roles. Each of these models and leadership roles emphasizes different aspects of organizational functioning and have their own set of strengths and weaknesses. The mark of the effective leader is in his/her ability to balance these simultaneously competing demands and values in ways which build on the strengths of each while minimizing their weaknesses. Furthermore, effective leadership is a dynamic process which often requires that one emphasize different leadership roles depending on the organizational context and the task at hand. The competing values organizational models and leadership roles which relate to each are as follows:

Human Relations Model (Flexibility--Internal Focus)

* Facilitator: emphasis is on participative decision making, conflict management, team building

* Mentor: emphasis is on interpersonal communication, understanding oneself and others.

Open Systems Model (Flexibility--External Focus)

* Innovator: emphasis on managing and living with change, creative thinking

* Broker: emphasis on negotiating agreement and commitment, selling ideas, building and maintaining a power base

Rational Goal Model (Control--External Focus)

* Producer: emphasis on productivity and motivation

* Director: emphasis on goal setting, taking initiative, delegating

Internal Process Model (Control--Internal Focus)

* Coordinator: emphasis on planning, organizing, controlling

* Monitor: emphasis on receiving and organizing information, evaluating and responding to routine information

Leadership Role Profiles of B.C. Farm Organization Leaders

A total of 31 organization leaders completed the Organizational Leadership Questionnaire. There were 16 leaders of organic associations (including the one bio-dynamic), 13 leaders of conventional farm organizations, and two managers of a conventional farm organization. For each of the 18 questionnaire items, leaders were asked to indicate the degree to which they performed each leadership behaviour on a scale of 1 (very infrequently) to 7 (very frequently). As the results of their responses contained in Table 6-8 indicate, average scores of all of the eight leadership roles were fairly high. There were no role scores below 3 which would indicate that that leadership role was not being performed to any significant degree.

TABLE 6-8. ORGANIZATION LEADERSHIP QUESTIONNAIRE: LEADERSHIP ROLE MEANS

LEADERSHIP ROLES	TOTAL LEADER SAMPLE (n=31) Mean (s.d.)	ORGANIC/ BD/O-C LEADERS (n=16) Mean (s.d.)	CONVENTIONAL LEADERS (n=13) Mean (s.d.)	CONVENTIONAL ORGN. MANAGERS (n=2) Mean (s.d.)
Flexibility -- Internal Focus				
Facilitator Role	5.6129 (.9461)	5.9063 (.7122)	5.2308 (1.1477)	5.7500 (.3536)
Mentor Role	5.1129 (1.0223)	5.1250 (.8466)	5.1154 (1.1575)	5.0000 (2.1213)
Flexibility -- External Focus				
Innovator Role	5.2903 (.9339)	5.1458 (1.1351)	5.4359 (.6856)	5.5000 (.7071)
Broker Role	4.5645 (1.2499)	4.2188 (1.3659)	5.0000 (1.0992)	4.5000 (.0000)
Control -- External Focus				
Producer Role	5.3710 (1.2039)	5.2813 (1.0160)	5.3846 (1.4882)	6.0000 (.7071)
Director Role	4.9892 (1.1303)	4.9375 (1.1432)	5.0769 (1.1953)	4.8333 (1.1785)
Control -- Internal Focus				
Coordinator Role	5.1935 (1.2889)	5.0625 (1.2093)	5.3077 (1.4936)	5.5000 (.7071)
Monitor Role	4.0645 (1.4762)	3.9688 (1.6070)	4.0769 (1.2722)	4.7500 (2.4749)

Responses on scale of: 1 (very infrequently) to 7 (very frequently)

One observation from these data would be that the leaders surveyed in this study are performing the majority of these different leadership roles to a similar extent. The roles which appear to be most frequently engaged in (by the total group of leaders) are that of Facilitator (mean = 5.61, s.d. = .95), Producer (mean = 5.37, s.d. = 1.20), Innovator (mean = 5.29, s.d. = .94), Coordinator (mean = 5.19, s.d. = 1.29), and Mentor (mean = 5.11, s.d. = 1.02). The least frequently performed role was that of Monitor (mean = 4.06, s.d. = 1.48). What is particularly interesting is that the two highest mean scores are for leadership roles which are directly opposite each other in the Competing Values Framework. The Facilitator role combines flexibility and an internal focus while the Producer role combines control and an external focus. This speaks to the challenge of being a volunteer leader who is elected by his/her peers . On the one hand, a volunteer leader needs to adopt a participative approach to decision making. On the other hand, he/she is also actively engaged in trying to motivate others (who are also volunteers) to work on organizational activities. Acting as a leader in a voluntary organization appears to require significantly less monitoring and processing of routine information, as is to be expected in organizations which are relatively small and informal.

Examination of data results for the leaders of organic farming associations reveals that the Facilitator role is the most dominant one (mean = 5.91, s.d. = .71) followed by the Producer role (mean = 5.28, s.d. = 1.02), Innovator role (mean = 5.15, s.d. = 1.14), Mentor role (mean = 5.13, s.d. = .85), Coordinator role (mean = 5.06, s.d. = 1.21) and Director role (mean = 4.94, s.d. = 1.14). These leaders are much less frequently engaging in a Monitor role (mean = 3.97, s.d. = 1.61) or Broker role (mean = 4.22, s.d. = 1.37). Given the importance placed on the consensus decision making process in many organic associations, it would appear that the primary role of their leaders is to facilitate that process. For some organic association leaders, they define their roles to be solely that of a Facilitator as the following quote illustrates.

> "My fundamental skill and philosophy is empowerment of people to have a voice in decisions that affect their lives. And so what I do best is democratic organization structure and consensus decision making, problem solving and so by demonstration, chairing meetings in a very democratic manner and consensus building. I've delimited my role in the association and I said that I would be president only on the basis that I would not be a full time president who would run the organization but I would basically be a facilitator and chair meetings and that's what I've done."

In another organization whose leader at the time was a counsellor by profession, a leader's facilitation skills are especially appreciated during the early formative years of an organic farming association. As remarked on by one member of this organic association,

> "He's really good as far as keeping people moving in the same direction and trying to find a common ground without taking over. He's really careful not to run things. He's a really good diplomat. He's trained to do what he does and he does it very well."

The next most frequently cited leadership roles were Producer, Innovator, Mentor and Coordinator. A comparison of the leadership role profile of organic association leaders to profiles of leadership effectiveness/ineffectiveness (Quinn, 1988) would suggest that the organic association leaders are closest to what Quinn describes as "Conceptual Producers". Conceptual Producers "are seen as conceptually skilled in that they work well with ideas. They seem to be particularly good at coming up with and selling new ideas" (Quinn, 1988, p. 101).

These effective leaders score equally high on all leadership roles except for the Monitor role where they fall below average. The only two deviations from this profile are the organic association leaders' high average score on the Facilitator role and slightly lower average score on the Broker role. This may be due primarily to a philosophical difference between these volunteer leaders and the business leaders studied by Quinn. For example, in many of these volunteer organizations a higher degree of facilitation skills are required as part of their philosophical commitment to the egalitarian values underlying the consensus decision making process. In regards to the Broker role, as delineated by Quinn the Broker role involves negotiating and influencing more senior organizational members or external parties to obtain resources. As independent organizations, this is not as applicable to the organic associations studied. With these two exceptions, it would appear that the Conceptual Producer characterization would fit many of the leaders in these organic associations who were actively involved in translating their initial vision of an organic certifying association into reality.

For leaders of conventional farm organizations, a slightly different pattern of leadership roles emerges. For these leaders, the most frequent leadership roles were that of Innovator (mean = 5.44, s.d. = .69), Producer (mean = 5.38, s.d. = 1.49) and Coordinator (mean = 5.31, s.d. = 1.49) with Facilitator being the fourth most frequent role (mean = 5.23, s.d. = 1.15). To a slightly lesser extent, they performed as a Mentor (mean = 5.12, s.d. = 1.16), Director (5.08, s.d. = 1.20), and Broker (mean = 5.00, s.d. = 1.10) but least of all as a Monitor (mean = 4.08, s.d. = 1.27). Scoring almost equally high on all but the Monitor Role, the leadership role profile of the volunteer leaders of conventional farm organizations fits that of Quinn's Conceptual Producers even more closely than do organic association leaders.

Group comparisons of average role scores between organic and conventional farm leaders showed only one statistically significant difference. Leaders of organic farming associations more frequently engaged in Facilitator role behaviour than did leaders of conventional farm organizations (t = 1.94, df = 27, p = .063). Examination of the means for the Broker role would suggest that leaders of conventional farm organizations more often engaged in these types of behaviours than did leaders of organic farming associations. This is to be expected given the heavier emphasis placed on government lobbying in conventional farm organizations. The following observations about two conventional farm organization leaders who scored high on this factor gives some insight into what the Broker role looks like in action when negotiating with government for financial assistance programmes.

> "But ________ is very intelligent to the point where he never lets you know what he's thinking. He can play the game with these Ministry guys. I think he enjoys that. They don't say something and buffalo them because he'll stop them right there. He's very quick-witted that way, to be able to stop these people in their tracks, and say, 'Wait a minute, back up'. _____ speaks his mind. He doesn't pull punches at meetings."

> "_____'s got a lot of guts. I remember one time what really impressed me about _____ is when we met with Whelan [federal Agriculture Minister] and we had a couple of meetings with growers. And _____ said, 'Look you fellows. We go up there and everybody is going to have a chance.'...So we had our meeting with Whelan and _____ said, 'This guy is a top speaker. You watch what you're saying, the guy could barbecue you. He will cut you to pieces. That's the way these guys are.' We had the honour of sitting there at the table with 40 other producers and we had the privilege of watching ______ literally cut Eugene Whelan to shreds. He barbecued Eugene Whelan in about 15 minutes.
>
> The issue was level playing field, competing with Americans and ___ said, 'You brought in so and so from Jamaica, some people into a farming community so they could work cheaper so that they could reduce their costs.' And he knew that _____ knew when, where, who the growers were that were involved in Bruce-Gray County. He'd done his homework. And Whelan wasn't feeling very good, he started to sweat, his aides tried to interrupt and _____ said, 'My father homesteaded that ground, we cleared off the sagebrush, we picked the boulders, we planted our ground and I'm here to tell you, sir, that if I go broke because of you, I will salt the ground so that nobody else will use it. And I will put up a memento on your behalf.' Mr. Whelan didn't say anything. It was unbelievable."

The confrontative style of these two conventional farm organization leaders contrasts with the political advocacy more often found in organic associations which eschew such tactics. Instead, when combined with a high commitment to collaboration and human relations values, the Broker role can take another form. In this instance, the organic farm organization leader was championing a biological control programme for Okanagan orchardists (specifically the Sterile Insect Release programme for codling moth pests).

> "________ has been looked upon by most of the industry as a real oddball but ______ has also been very steady, very persistent, pushing. He hasn't

> given up when he's been blasted by people. He's probably the best thing for the organic industry cause he takes that kind of, almost a martyr approach. He continued to go and push forward ideas whether they're accepted or not, when you know they're right. And he was right. Now they have $7 million."[quote by BCMAFF extension agent]

Thus, working from outside the mainstream agriculture, persistence appeared to be the key to this leader's successful championship of an alternative to the status quo. This contrasts sharply with the confrontative approach taken by the two conventional farm organization leaders who were negotiating for a continuation or expansion of existing benefits within an established relationship and context.

Comparisons between role scores of volunteer leaders and conventional farm organization managers failed to yield any statistically significant differences.

Leadership Roles and Organizational Size and Age

The influence of organizational characteristics such age and size on leadership roles was also examined. Organizations were allocated to four age categories (less than 5 years; 6-10 years; 11-20 years; and greater than 20 years) and five size categories (less than 26 members; 26-50 members; 51-75 members; 76-100 members; more than 100 members). The only leadership role difference in regards to organizational age was that leaders in very new organizations (less than 5 years) had slightly higher Facilitator role scores (mean = 5.86, s.d. = .71) than leaders in organizations that had been established for more than 20 years (mean = 5.14, s.d. = 1.23).[$t = 1.84$, $df = 23$, $p = .079$] In regards to organizational size, leaders in the smallest organizations (< 26 members) performed less of a Monitor role (mean = 4.67) than leaders in the largest organizations (> 100 members).[$F_{(4,26)} = 2.4162$, $p = .0743$] Leaders of the smallest organizations also performed less of a Coordinator role (mean = 4.28) than those in moderately sized (51-75 members) organizations (mean = 6.00).[$F_{(4,26)} = 1.9886$, $p = .1259$] All three differences were significant at the $p = .05$ level and there were no significant interaction effects between organizational age, size or type (i.e., organic vs. conventional). These results would suggest that in the early stages of organizational development, leaders are engaged more in team building activities and conflict resolution amongst members. Also, leaders in smaller organizations are less involved with the internal control functions than those in larger farm organizations. Data results concerning the Coordinator role scores indicate that this leadership role is most required in mid-size organizations. One explanation may be that in smaller organizations, there is less need to coordinate organizational activities while in the largest organizations, the coordination function may be being performed by others such as paid staff.

The Challenges of Leading in B.C. Farm Organizations

In as far as individual leader characteristics, there were negative relationships between age and reporting of the Coordinator role ($r = -.3438$, $p = .037$), Producer role ($r = -.3896$, $p = .049$), and Broker role ($r = -.2535$, $p =.097$). The following quote from one younger leader (age 34) of a conventional farm organization who scored high on all three leadership roles illustrates what this style of leadership looks like in practice.

> "I keep the organization going forward, a liaison with the government, to make sure the various committees stay on stream with the goals of the organization. Just facilitating and making sure everything is tied together. I don't know how you can do much more as a president to get the people interested. The things are quite important, but they're spread out over such a time frame that it's easy enough to keep handles on everything and that's the way you do it. You try to delegate but you end up taking it on which is unfortunate. But for me, it's easier for me to do it. You use two or three other people as sounding boards and try to give small things to other people so maybe they'll get started."

As related by this leader, one of the problems in leading in a volunteer organization is delegating work to others (Director role). One frequent result is that the leader tends to assume the major portion of the organizational workload as confirmed by this leader of an organic association.

> "The task of the president is to be well informed on all of the issues which are affecting the organization and then to prepare meeting agendas to facilitate the discussion of these issues and then coordinate any actions taken as a result of these issues. And also to be a spokesperson for the organization, travel around and represent it at various functions.... But I'm not very successful at getting people to do things. I like to let people do what they think they should do. I think if you present an opportunity for somebody to do something and they want to do it and it is in the realm of their possibilities, they will do it. I don't use high pressure. I don't like being hassled myself and I am not very good at hassling others."

Thus one real risk for the volunteer leader in a farm organization is personal burnout -- an outcome that was reported to have often happened to the founding leaders of organic farming associations.

In summary, the role of leaders in voluntary farm organizations appears to be a multi-faceted rather than specialized one. While admittedly a small sample of organizational leaders, these data confirm that leadership in organic farming associations is very similar to that in conventional farm organizations. The only major differences concern a greater involvement on the part of organic leaders in internal facilitation and the greater emphasis on their external negotiating or brokering role on the part of the conventional leaders.

CHAPTER 7. THE ORGANIZATIONAL POLITICS OF A SOCIAL INNOVATION IN B.C. ORGANIC AGRICULTURE

> "In the coming year, my government will develop legislation to address consumer concerns respecting the use of chemicals in food production and ensure environmentally sensitive food-processing methods. There are numerous opportunities in our agriculture and food sector to lead in this emerging market."
>
> -- Speech from the Throne, Province of British Columbia, 3rd Session, 34th Parliament, March 16, 1989.

These words in the 1989 Throne Speech marked the beginning of the provincial government's actions to develop a provincial organic certification and accreditation system. This announcement also started what would become the most disruptive and divisive crisis in the B.C. organic farming community to date. What prompted the Premier to add this to the legislative agenda? According to government sources, following his European tour in the winter of 1989, the Premier had been contacted by someone who wanted to promote the sale of organic beef in Europe. When contacted by the Premier's office about developing such a programme, the Ministry of Agriculture indicated that such action would be very difficult. Irrespective of their advice, the March 1989 Throne Speech stated the government's intention to develop such legislation (albeit in more general terms). As also remarked by BCMAFF personnel and others in mainstream farm organizations, during the tenure of Premier VanderZalm (compared to previous governments) "government policy was more often announced by the Premier's office without extensive consultation with Ministry staff or the agriculture industry" (BCMAFF personnel).

Forced to take action, the BCMAFF quickly conducted a survey of other North American jurisdictions for examples of legislation with similar intent and found that there were a few U.S. states that had organic certification legislation. They also held meetings with a group of organic certifying association representatives, the B.C. Federation of Agriculture, and major supermarket retailers in the province. The initial response of the organic associations was largely one of skepticism and concern that government regulations would be mandatory. The position of the B.C. Federation of Agriculture was that they would prefer not to have such legislation "because when you get into labelling food as being safe or nutritious or whatever, the implication is that the bulk of it over there isn't much good or it will kill you off if you eat it. Our people are very worried about that. And so, we're not against identifying food as long as it doesn't have negative implications." (B.C. Federation of Agriculture representative) The response of the supermarket retailers was essentially neutral although they expressed concern about the need for clear definitions and terminology in order to prevent consumer confusion.

The compromise solution arrived at by the BCMAFF was enabling legislation that would provide for the development of certification standards for not only organic farming practices but other agricultural and food processing practices (one identified example would be the certification of food produced using Integrated Pest Management practices). Bill 85, The B.C. Food Choice and Disclosure Act received royal assent on July 20, 1989. The introduction of such enabling legislation is unique in North America in its potential for application to a wide variety of practices as well as the onus it places on industry to initiate, develop and administer regulations. Rather than impose regulations on any sector, the BCMAFF's policy has been that they would not take a proactive approach in implementing the legislation therefore regulations would only be developed on application by industry. Recognizing that industry members were the most knowledgeable about such specialized practices, they would be the ones to develop the certification standards to be incorporated under the regulations, provided of course, that they were "reasonable and technically sound". As a means of differentiating and promoting a food product in the marketplace, the intent of the legislation was to focus on the extra food quality (not food safety) afforded by certifying an agri-food practice.

Specifically, Bill 85 provides for a recognized group to establish a programme whereby "farming, gathering, processing, packaging, selling or handling practices, as the case may be, certified as meeting prescribed standards and to receive a certificate as evidence that the prescribed standards have been met". Then only those who are certified would have the right to represent their product in the marketplace as meeting established regulations, and would have the sole rights to the use of a recognized trademark (word, phrase, symbol, label). In the event of violations of the regulations or misrepresentation by others (who are not participating in the programme but represent their product as meeting the certified standards), there are provisions for penalties (maximum $20,000 and/or 6 months imprisonment). There are also provisions that government can delegate discretionary power to persons "to administer a programme and make decisions respecting a certificate". In practice, this provides for the designation of a nongovernmental certifying body to administer the regulations on behalf of the government. However, government retains "oversight authority" to review and audit the system of accrediting member certification agencies and to ensure that qualified inspectors are employed to monitor compliance with the regulations. The regulatory process would be administered by the BCMAFF's Food Industry Development Department.

In many respects, Bill 85 was considered to be an innovation in government agri-food regulation. First, it was enabling legislation that provided for the regulation and certification of practices and processes rather than outcomes or products. Also considered to be an innovative feature of the legislation was the degree to which regulatory responsibility would be shared between government and industry. Industry, not government, would be the initiators of the regulations and the architects of the regulatory standards. Industry would also bear the primary responsibility (and expense) for the ongoing administration of the regulatory system. Government's role would be one of supporting industry and of ensuring that the regulations and regulatory system had integrity and were enforceable.

Guided by the Premier's initial request, organic certification was identified by the BCMAFF as the first programme to be introduced under Bill 85. With the establishment of the Alliance of B.C. Organic Producers Association in 1988, there appeared to be an appropriate group within the organic farming community that could start working to develop a provincial set of organic certification standards.

The process by which the organic agriculture regulations were developed is the focus of the remainder of this chapter. As will become evident, this longitudinal case study of a social innovation in government regulatory policy is one which is rich with examples of innovation championship and political acts at individual, organizational and interorganizational levels. While not part of the initial agenda of this research project, the issue of the Bill 85 initiative quickly emerged as one of the dominant issues facing the organic farming community in B.C. It also became quickly apparent that this was a unique research opportunity to conduct a longitudinal case study of the development process of a social innovation and interorganizational politics. In terms of the dynamics of organizational politics, the following research questions were explored:

> What has been the incidence and nature of organizational politics operating within interorganizational networks in organic agriculture? (Research Question 27)

In terms of the utilization of political tactics by innovation champions and nonchampions (including opponents), the following research question was explored.

> What is the incidence and nature of social innovation championship and nonchampionship in interorganizational networks? (Research Question 28)

While this case analysis involves only one social innovation, as demonstrated by others who have conducted longitudinal in-depth case studies of innovation development (Van de Ven & Pooley, 1992; Garud & Van de Ven, 1992), much can be learned from a fine-grained analysis. In the following parts of this chapter, a description of the context within which the Bill 85 initiative was introduced in provided in Part A. This is followed by a detailed description of the development of the initiative to develop organic agriculture regulations under Bill 85. This detailed description of the political action taken by both champions and opponents of the government policy is followed by an in-depth analysis of first, the flow and frequency of political activity occurring during the development phase of this social innovation, and second, the politics of innovation championship and nonchampionship. The chapter concludes with additional observations regarding the actions and perceptions of innovation championship.

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TABLE 7-1. ACRONYMS OF ORGANIZATIONS IN ORGANIC AGRICULTURE

Interorganizational Networks	
ABCOPA	Alliance of B.C. Organic Producers Associations
BCCOF	B.C. Certified Organic Farmers
COABC	Certified Organic Associations of B.C. (formerly BCCOF)
COUP	Canadian Organic Unity Project
IFOAM	International Federation of Organic Agriculture Movements
OCIA	Organic Crop Improvement Association
OFPANA	Organic Food Production Associations of North America
Individual Organic Farming Organizations in B.C.	
BD Society	Bio-Dynamic Agriculture Society of B.C.
BOPA	Boundary Organic Producers Association
BCARA	B.C. Association for Regenerative Agriculture
COPA	Cariboo Organic Producers Association
CROPA	Comox Regional Organic Producers Association
CVOPA	Creston Valley Organic Producers Association
IOPA	Islands Organic Producers Association
KOPA	Kootenay Organic Producers Association
NOOA	North Okanagan Organic Association
PROPA	Peace River Organic Producers Association
SOOPA	Similkameen-Okanagan Organic Producers Association
STOPA	Shuswap-Thompson Organic Producers Association

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PART A. THE ALLIANCE OF B.C. ORGANIC PRODUCERS ASSOCIATIONS

In the spring of 1988, three of the organic associations met in Cawston to discuss the formation of a provincial umbrella association for the newly formed bioregional associations. As described by one of its founding members, the original intent of the Alliance of B.C. Organic Producers Associations (ABCOPA or the Alliance) was as follows:

> "We had representatives from SOOPA and Creston Valley and the B.C. Association for Regenerative Agriculture, those were the three groups. We sat around for two or three hours and tried to figure out what we should call this organization and what it should do and we decided that it should be called the Alliance and that it should serve as a focal point for organic agriculture in the province. One of our mandates is the presentation of a unified image in the marketplace of the organic product and in order for there to be a B.C., to enhance that in B.C., there should be unified minimum provincial standards for all associations. That would also encourage other groups to start up in other bioregions as well."

They didn't meet for another year at which time STOPA also became a member. As the different bioregional associations established in B.C., each began to send representatives to ABCOPA meetings. In 1991, there were 10 organic associations participating in ABCOPA. The operating budget of ABCOPA has remained small as it costs only $300 for member organizations to join. The secretary of the organization receives a small honorarium ($100 per meeting).

The announcement of Bill 85 in July 1989, served to catalyze ABCOPA into becoming more than an informal gathering to exchange information. As a result, several meetings were held during 1989 and 1990 with one goal being the development of provincial organic certification standards. Appearing so early during the organization's formation, Bill 85 also tested the ability of the organization to resolve the philosophical, political and practical differences amongst its member organizations. It also proved to be a test of their commitment to the consensus decision making process which had been chosen as the modus operandi of ABCOPA.

From the beginning, ABCOPA members adopted a purely collaborative mode of operation based on a full consensus decision making. Usually there was a volunteer facilitator designated to assist in the operation of the meetings (the facilitators have changed and were often one of the participating representatives). In the initial formative period of the organization when the organization focused primarily on exchanging information and general concerns, the consensus format was viewed positively by almost all of its member associations. As in the majority of ABCOPA's member organizations, the consensus decision making process was symbolic of their commitment to the social and political agenda of the environmental ethic premised on egalitarian and participative collaboration. Other ways in which this ethic has been practised in ABCOPA is the identification and changing of sexist language in conversation and written communication. For example, members are encouraged to direct their conversations to both men and women and when talking about growers, not referring to them as "he". In interviews with several individuals, consensus decision making was generally regarded as a strong and positive process.

> "It is very encouraging to see the structure of the Alliance along consensual forms which is very unusual. We've made a very strong effort to maintain that."

> "I think voting just doesn't seem to fit anymore. It is very divisive, there are winners and there are losers. I think we've evolved past that point where we have to do that, where we have to get into power broking. The big guys against the little guys and whatever way that works out. We can work towards a common goal cooperatively. To me, it's just a more, a higher level, way of operating."

> "Traditionally, everything comes from the top down and you have the federal government and the provincial government and so on down, and the top tells the next step down what's going to happen, what they have to do. Whereas to get organic industry, especially the Alliance is trying to do just the opposite, that's a grass roots movement and the initiative has to come from the members. And the members tell their bioregion what they want and the bioregion tells the Alliance and I think a lot of members have problems with that. They just sit there and say what should we do now? Let the Alliance tell us how we do it. And that is still a problem within the group."

Frustration with the consensus process as it has occurred in ABCOPA has been expressed by both those who are in favour of consensus in principle and those who are opposed. For example, the following observations were made by individuals who are supportive of consensus in principle but conclude that in ABCOPA,

> "Decisions are made to do nothing rather than something. Decisions are made <u>not</u> to do this and <u>not</u> to do that."

> "The thing is that bioregionalism with the consensus format at the Alliance isn't working. When the suggestion was made that people were blocking, there was a hue and cry from [one bioregional association]

> people. They were blocking by default, blocking by refusal to deal with issues. And simply a refusal to deal with reality."

> "It was very exciting at first and then very frustrating and disappointing because the consensus model is not working because of the personalities. When the consensus model is working there is give and take on both sides, but right now we were at a position where people are scared and it became very childish. And that was on both sides."

Those who are philosophically opposed to the consensus process (and have since left ABCOPA) assert that it is an inappropriate model to follow in respect to the issues at hand.

> "To be quite blunt about it, they [ABCOPA] are involved in their own idea of the consensus process, decision making which is not fast enough for any business. The consensus model I really like for problem solving but when you get into a business structure, and I have seen a few models of it, they basically get stalled at the problem solving and they can't make a decision. We have tried talking with them and have come back disgusted and we would read the minutes and see that they were going around in circles. Their organization structure was bereft of direction, they had no vision of where they wanted to go."

> "It was disorganized chaos. It's a body without a head. It was improperly organized from day one. There was no organizational structure."

However even with the best of intentions, the reality of consensus decision making in ABCOPA has been that when faced with a major issue on which members hold strong and conflicting positions, consensus has been rarely, if ever, reached. As a result, decisions were often postponed and tangible outcomes are difficult to identify. In the case of ABCOPA, the issue of government organic certification regulations under Bill 85 proved to be just such an issue on which many members were not willing to compromise.

PART B. BILL 85 -- A CONTEST OF BELIEFS, PERSPECTIVES AND NEEDS

In ABCOPA, there was a diversity of beliefs amongst member associations as to whether government should be involved in organic agriculture at all, much less in regulating organic certification procedures and standards. As the following quotes illustrate, there were organic farming associations which opposed any semblance of cooperation with those they view as adversaries to alternative agriculture (i.e., government institutions, conventional producer organizations and agribusiness).

> "A lot of people don't have any faith in the government. We are a bunch of highly independent anarchist people, so just the thought of having anything to do with the government is just totally anathema to some of them."

> "Look around and see where the government's helping anybody and it's pretty hard to find, especially in the organic farming business. They spend money almost trying to drive us out of business. So why should we trust them to help us now? Particularly the government in power now [Socred party] makes some of us more suspicious than maybe we would be, but it probably wouldn't matter who the government was unless it was the Green party. We looked at the situation in Washington State and California, which was doing alright, it was a little confusing, they had pretty good integrity. Now the government, it seems that it was the largest agribusiness forces that put through the organic farming with the government in Washington State and allowed them to do with certified big farms that could never be considered organic, and they are dumping their produce in B.C. now."

In those organic associations which oppose government involvement in grower certification, their objections are generally of three types. First, government regulations are perceived as the "thin edge of the wedge" for centralized government control of the organic industry and thus a threat to the current independence and autonomy of the bioregional associations. As such Bill 85 represents an ideological threat to the political and social agenda of the organic farming movement for local control. There is also the fear that over time, larger and less environmentally committed farmers and agribusiness interests would be attracted to a government sanctioned programme and lobby for a weakening or lowering of organic production standards.

Second, there are perceived to be significant economic costs associated with government regulation of organic certification. Under the current bioregional system of certification, farmers need only pay certification fees to their local certifying association. Under a government regulatory system, certification fees would logically rise to finance the operation of a provincial accreditation system and auditing procedures. In addition, there are concerns that more time and money would need to be spent on completing the paperwork required by individuals and organizations in order to comply with the regulations. It is argued that this would place an inequitable burden on smaller farmers and those who have established local markets. Many of these growers would not have the money or need to participate. The additional paperwork and volunteer time required for the accreditation system is also viewed as placing an inequitable burden on smaller organic associations. For one organic association in particular, the requirement that a certifying association have a minimum number of certified members (5) in order to have voting status in the proposed system was objected to.

Third, there are objections that although it is stated that growers had a choice of whether or not to participate, the presence of a government sanctioned programme would place nonparticipating growers at an economic disadvantage in the marketplace (in terms of price and access to outlets). Over time, products bearing only the provincial certification stamp would gain prominence (and command higher price premiums) at the expense of products bearing only a bioregional association's certification stamp even if the bioregional standards exceeded the provincial ones. Last, but certainly not least, is the contention that the majority of organic farmers in the province did not wish to have (or need) government sanctioned certification. They contend that the regulations were only initiated by a small special interest group within the organic farming industry which is not representative of the majority's interests. They also assert that the process by which the regulatory system, regulations and standards have been developed has not been conducted in good faith.

In contrast, those who support cooperating with the provincial government on Bill 85 contend that,

> "The split is between the commercial growers and the backyard gardeners. When you get down to it, what we're really trying to create is an

> industry. And in an industry you sell stuff. And the people that are concerned with the commercialization of organic agriculture are misdirected. They don't want to commercialize it.
>
> "We have a need for credibility for export market. We have the need to move quickly now. We do not have the time to diddle around, we are not a coffee organization."

Arguments given in support of pursuing a government sanctioned certification programme generally focus on the economic benefits to be derived from increased legitimacy. Foremost is the argument that a government sanctioned organic certification programme is required for recognition and credibility in export markets. In Canada, the Canadian Organic Unity Project (COUP) had been working on a national organic accreditation system and certification standards since 1989. However, as detailed by Egri and Frost (1992), that process has been plagued by funding problems and delays throughout and there was uncertainty about whether the COUP would succeed in overcoming the individual and regional differences between participating associations. While several organic farmers in B.C. have participated in the COUP process, the position of those working on the provincial programme was that there was no duplication of effort in that standards developed at the provincial level would be compatible with the national system. It was also envisioned that the provincial accreditation organization would represent all of B.C.'s bioregional organic associations at the national level.

In the United States, the passing of the U.S. Organic Foods Production Act of 1990 (to be implemented in autumn 1993), is seen as part of the trend towards government accreditation systems. Early in the process, western U.S. states (Washington, Oregon and California) with state-wide certification programmes had indicated they were also interested in negotiating reciprocity agreements with provincial bodies rather than with individual organic certifying associations. For those who export to Europe, a major impetus for a government sanctioned programme was the EEC regulation (issued in 1991 to take effect in 1992, since extended) that imported organic food products be from sources accredited by government. This restriction on exports to the EEC was especially important for those farmers in the Peace River region who export grain to Europe.

A second rationale for supporting a government sanctioned programme was that the organic food industry would then receive the same level of government recognition and support as enjoyed by conventional agriculture. With a recognized provincial body, organic farmers would be better positioned to lobby government for support. One example given is the inclusion of organic foods on provincial food marketing initiatives and promotions. It is felt that the organic industry would receive more in the way of government extension services, education and research funds. There would be more resources for consumer and public education regarding organic agriculture and food as well. As a result of government promotion and backing, accessing mainstream retailers and major processors who sold primarily imported organic products would be facilitated.

Rather than seeing government regulations as limiting the growth of organic farming in the province, proponents see it as a positive development by providing an incentive for conventional farmers to convert thereby increasing the numbers practising organic agriculture. Another proposed benefit would be that a government regulatory system with penalties would reduce fraud and misrepresentation of organic food in the marketplace. Pressure would be placed on wholesalers and retailers to buy food that meets accepted standards while nonorganic growers would be prevented from making fraudulent claims about their products.

In general, those supporting the use of Bill 85 to provide provincial organic certification standards were much more comfortable working with government to achieve their objectives. They did not ascribe ulterior negative motives to the government initiative. Instead they agree with government representatives' statements that Bill 85 is only a marketing tool and the BCMAFF's intent is only to assist the industry to meet their economic marketing needs. In many respects, their vision of government's role in organic farming parallels that currently played by government in conventional agriculture. Specifically, that government should be a partner in marketing and promoting of their food products, providing education for growers and the public, assisting farmers through extension services, and funding industry research and development projects. Further, the ability of certifying associations to guard against fraud and misrepresentation in the marketplace would be enhanced through the threat of government penalties.

The four years that have elapsed since the introduction of Bill 85 in July 1989 have been ones of intense political conflict between those who oppose and those who support a government sanctioned organic certification programme. As is revealed in the following account, while some organic associations are more unified than others on their positions concerning the merits and/or disadvantages of a government sponsored certification program, consensus on the issue within associations has been rare. Thus the debate has occurred within and between organizations and the positions of individuals and associations has changed over time depending on the changing composition of an association's membership, changes in organizational leadership and perceived needs.

As with many social innovations, the introduction of Bill 85 prompted controversy over the motivations of its champions as well as its impact (both positive and negative) on the status quo. While the majority of those in the B.C. organic farming community shared the common goals of achieving common provincial certification standards and the growth of organic agriculture, the debate centred on choosing the appropriate means by which these goals should be accomplished. A major obstacle to achieving consensus amongst the different associations was the wide diversity of strongly held philosophical beliefs about the social, political and economic agenda of organic agriculture revealed in the parties' statements. The contest revolved not only around the nature of the agenda but also around which, when and how different parts of the agenda should be addressed.

Given the uniqueness of Bill 85 as enabling legislation and the fact that organic certification would be its first application, there was also substantial uncertainty about how to proceed and what would be the eventual result. Government was venturing into new territory as far as the process of regulation (industry self-regulation of a practice) and the focus of regulation (organic farming). Prior to the introduction of Bill 85, the BCMAFF had not dealt with organic farm organizations or organic farming in any formal sense. At the policy level, contact with the organic farming community had been nonexistent while at the practical level, agricultural extension services had been provided by only a few extension agents on their own initiative. For their part, the organic farming associations themselves were very young and still very much in the process of organizing and developing relationships with each other. As a result, both government and the organic certifying associations were not only learning the rules of a new game but also learning about all of the other players in the game.

The following account provides a chronological diary of the critical actions and events surrounding the introduction and development of this innovation in government regulation. As will become evident, this is also an account of the struggle of ABCOPA to remain the representative voice of all of the organic certifying associations in B.C. while dissatisfied member associations worked to form an alternative umbrella organization. Where appropriate, the political strategies and tactics have taken place are identified and highlighted in bold type. Given the sensitive nature of the issue, the small number of active players in the political contest over Bill 85, and assurances of anonymity given to informants, individual identifying characteristics have been avoided.

Autumn 1989

Following the passing of Bill 85 in July 1989, the next step for the BCMAFF was to determine whether there was sufficient interest in pursuing a provincial organic certification program. Informal contacts were made and letters sent to individual organic certifying associations throughout the province. Information regarding Bill 85 was sent to all of the BCMAFF regional offices in the province.

In September 1989, the BCMAFF sponsored a seminar on "Retailing Organic Foods" for retailers, wholesalers and processors. At the meeting, presentations on the B.C. organic food industry, Bill 85, and organic food programmes in Washington State and Oregon were heard. (Country Life in B.C., 1989, Nov.;

Johnson, 1989). Mention was made that the Alliance of B.C. Organic Producers Association was working on a set of certification standards for presentation to the BCMAFF. It was also mentioned that there was a May 1990 deadline to complete the certification standards for inclusion under the regulations.

Spring 1990

One of ABCOPA's goals for 1990 was to develop provincial certification standards. While individual associations worked separately on different commodity sections of the certification standards, ABCOPA had also invited applications from individuals to work on synthesizing the different standards on a contract basis. However no decision had been made as to who should be awarded the contract. In early 1990, the BCMAFF met with BCARA about the availability of government funds under the ARDSA programme ($45,000) to pay for the development of provincial certification standards. [Note that the ARDSA grant programme concluded on June 30, 1990.] Without consulting other ABCOPA members, BCARA wrote up the application with the intention that ABCOPA would be the administrators. At the time, the BCARA representative was acting as Chair of ABCOPA. They then approached ABCOPA about assuming responsibility for the grant and project [appeal to higher authority for support]. As related by one ABCOPA member at the time, ABCOPA declined the government's offer because:

> "The funding that was available had so many strings attached from the provincial government. Really bad. We were supposed to get a $45,000 grant and the way it came down was that anything that was produced would become the property of the provincial government. So we said, 'No, that's a pretty cheap way to get a set of standards created.' So we're doing all the work and they're getting all of the benefits. So we just elected to go on."

At least three of the associations had strong objections to accepting government funding because:

> "If you read between the lines, it was clear that if you accept government money, you accept government control."

In the end, the ABCOPA members decided to proceed without government financial assistance. They asked BCARA to withdraw from their commitment to ARDSA, which BCARA did.[gatekeeping]

In October 1990, PROPA's need for a provincial programme was made more urgent by the threat of some members leaving to join OCIA, a U.S. headquartered certifying association with affiliated chapters certifying organic growers in the prairie provinces. PROPA growers were unable to sell their grain crop because OCIA affiliated suppliers and marketers were refusing to recognize PROPA certification status [perceived as OCIA rule citing to empire build]. As related by PROPA's then president,

> "We were in pretty much a fighting mood because basically our backs were against the wall. The work we had put into the organization was about to be nil. We had some pretty angry people because we told them that we had good certification standards and then they were no good on the international [U.S.] market. So it was strictly practical, it was business."

When they learned about Bill 85, PROPA contacted their MLA about their problem and asked that he represent their case to the BCMAFF to press for a provincial certification program.[appealing to higher authority for support]

Winter 1991

At the next ABCOPA meeting in January 1991, BCMAFF representatives were present to explain the purpose and intent of Bill 85 and to express their willingness to assist ABCOPA if they wished to participate. They reiterated that government funding remained available to defray the costs of developing the certification standards and accreditation system. Those attending the meeting recalled that the BCMAFF personnel stated that there was no time deadline on the legislation and assured them that ABCOPA "would be consulted if any guidelines were presented". They also heard that the Ministry would only adopt the standards after there was majority acceptance by ABCOPA member associations. Furthermore, they recalled that before any regulations were implemented the BCMAFF would poll all of the organized organic farmers (with the requirement for a minimum of 70% in support of regulation).[reasoning and rational persuasion by BCMAFF]

As related by a number of those present at the meeting, after the BCMAFF representatives left, a heated debate occurred between those who supported the government's proposal and those who opposed it. While not fully consensed to, the conclusion of the group was that ABCOPA would continue to work independently on their provincial standards [gatekeeping]. Once the standards were finalized, they would then decide whether to take advantage of Bill 85. An ABCOPA member telephoned the BCMAFF manager responsible for administering the Food Choice and Disclosure Act and advised him of their decision. Also of note is that the new ABCOPA Chair selected at this meeting was the Bio-Dynamic Society representative who also was a member of IOPA.

However, BCARA and PROPA did not agree with ABCOPA's position and feeling that they could not afford any more delays, decided to independently continue to work on provincial certification standards project whilst keeping close contact with the BCMAFF about their activities [insurgency in response to perception of blocking by individual ABCOPA members]. Partial funding of their activities was also obtained through the ARDSA programme [eventually $42,300 would be paid by ARDSA for the Organic Certification Project (Project # 13008) which cost $47,000 in total].

Unfortunately for them, BCARA's and PROPA's decision to work independently on the provincial regulations and standards proved to be a controversial one. As related by one ABCOPA member, it is very difficult to keep secrets in a small community.

> "So the Peace River group got together with the BCARA group in secrecy. And with a great effort to keep it secret, they negotiated with the Department of Agriculture, and I guess they got the grant back. The two groups together then started to draw up regulations. It was through a slip that the rest of the groups found out about it. That really alienated. A leak of security so to speak. It was intended to be secret from the rest of the Alliance, very clearly. It was a reporter who got ahold of it somewhere and there was a one page blurb in the local newspaper in Peace River and it got down to the mainland somehow or somebody in Shuswap-Thompson got ahold of it, and that was being circulated."

Spring 1991

BCARA and PROPA's actions precipitated the calling of an emergency meeting in April 1991 during which the other ABCOPA members confronted BCARA representatives about their actions. The PROPA representative was unable to attend but the agreed upon strategy was that the two groups were "hoping to be able to do a good guy--bad guy trick so that the rich grain farmers in the Peace could be seen as the bad guys on the whole thing and BCARA could maybe then go in with the package that we had developed and be able to sell it" [use of rival camps]. Emotions ran high throughout the one day meeting as the different members expressed their reactions to the latest developments and argued over what should now be done. During the meeting, two alternative proposals were presented by different members in efforts to reach a compromise [attempts at building consensus]. One proposal presented by the ABCOPA Chair was for an Alliance organizational structure and certification guidelines which would be a private and industry controlled system. Another proposal was for ABCOPA to represent all of the certifying associations but to use BCARA and PROPA's work on the provincial certification standards. However, both proposals were not pursued at the meeting. In the end, both sides on the debate were unwilling to compromise on their initial positions.

Distressed by what was perceived to be unilateral action by the two associations, the other ABCOPA members asked the BCARA representatives to leave the meeting. The remaining members then drafted a letter to the two groups which outlined ABCOPA's position that ABCOPA was to be the representative body to the government and as such, BCARA and PROPA should "cease and desist" all independent activities in this regard. It was also requested that there be full disclosure to ABCOPA of all Ministry communications with BCARA. [counterinsurgency--intended as rational persuasion to build consensus; received as lording and blocking]

The two groups subsequently advised ABCOPA that they were committed to working on the provincial standards under Bill 85, with or without ABCOPA's approval [assertiveness]. In an intensive three day meeting the next week, BCARA and PROPA representatives worked with BCMAFF personnel to produce the first draft of provincial certification standards to be implemented as regulations under Bill 85. They also produced a proposed constitution of a new provincial organic farming organization named "B.C. Certified Organic Farmers" (BCCOF) which would serve as the governing body for organic certifying associations participating under Bill 85. Both documents were then submitted to the BCMAFF for review and comments. Now committed to working with Bill 85, BCARA received a marketing initiatives grant ($11,250) from the BCMAFF for various marketing and education projects to assist with the implementation of the Food Choice and Disclosure Act [budgeting].

At the time, the architects of the new BCCOF envisioned that there could be two umbrella organizations in B.C. organic agriculture. ABCOPA would serve an advocacy and education role for the organic farming industry while BCCOF would serve the interests of commercial growers who required government recognized certification for marketing organic food products. The organizational structure of the BCCOF differed significantly from that of ABCOPA. It would be a non-profit society which would accredit member organic certification agencies whose members would use the phrase "B.C. Certified Organic" on agricultural product labels. The Board of Directors of the BCCOF would consist of one representative of each participating certification agency, one representative from each wholesale/retail/distributor/processor association that markets organic food products, and one representative from the BCMAFF (in a non-voting advisory capacity). The BCCOF Board would select an executive committee. Certification agencies with less than five farms enrolled in their certification programme would be accorded non-voting associate certification agency status. Membership in BCCOF would cost $300 with associate memberships costing $150.

Unlike in ABCOPA, decisions by the BCCOF Board of Directors and general members would be determined by a 75% majority vote with a quorum of 75% of members being required. There would be an audit committee comprised of two members of BCCOF certification agencies, one member representing consumer/ environmental advocacy groups and one member representing retailers/wholesalers/ processors.

The organic certification standards of the member agencies would have to meet and/or exceed BCCOF's production standards. While the responsibility to certify growers remained the domain of the individual certification agencies, the BCCOF would conduct audits of first, the certification procedures, regulations and standards of the certification agency (on application and annually); and secondly, of the implementation of the certification procedure by the certification agency (selected on a random basis, one-third of the certifying agencies would be audited each year). The second level audit process would involve reviewing the certification records, inspection process, and certification committee records for a sample of a minimum of three farms (to a maximum of 1% of farms in each member's certification programme). In turn, the BCMAFF would retain the right to audit the process of accreditation carried out by the BCCOF. There was a provision for appeals of audit committee decisions by written submission with a $250 deposit. If the appeal was successful, the deposit would be returned. The final decision on an appeal would be by a majority vote of the full BCCOF membership. BCCOF would also be responsible for the training and certification of verification officers (through examination) of the member certifying agencies.

As earlier discussed, the BCCOF proposal contained several features which were objected to by those who preferred fully independent self-regulation. The key features included: the provision for majority vote for decision making; the inclusion of government representation on the board; the requirement for two level audits; an appeal process which would be outside of the public courts; associate membership status for small certifying associations; and high penalties for contravention of the regulations (maximum $20,000). In regards to the certification standards themselves, there has been little controversy. The BCCOF standards are regarded as generally consistent with existing ones with the exception of the inclusion of sewage sludge as a regulated material (a provision that is strongly objected to by both IOPA and the B-D Society). However, unlike many of the certification standards in the province, the drafters of the BCCOF standards purposefully edited out any statements or references to the philosophical objectives of organic farming and recommended (as opposed to required) organic farming practices.

The BCCOF proposal was circulated to all organic certifying associations for their comments and input [attempt at networking to build coalitions of support]. Notably, the documents were sent to the associations directly rather than through their ABCOPA representatives. One reason given was that BCARA and

PROPA questioned how representative ABCOPA delegates were of their organizational memberships [defending against perceived gatekeeping of information by ABCOPA reps]. In the meantime, citing significant philosophical and practical differences, PROPA directors had voted to withdraw from ABCOPA [withholding support]. COPA chose to join the BCCOF while retaining membership in ABCOPA. Their rationale for maintaining dual membership and having a member of the BCCOF steering committee was as follows:

> "The point is to keep our agenda clear on what we want to see which is a province-wide definition of organic incorporated into the government bill. And so, who's going to get there first? Well, we want to have somebody in each of those vehicles. Yes, we are organizing our best, but in another sense maybe each of those organizations will have different importance in different areas and that's fine. One may be much more towards marketing and one may be towards a different agenda." [in colloquial terminology, "hedging one's bets" through interlocking directorships]

Another consideration was that fact that within COPA there was a split between members who supported the Bill 85 initiative and those who strongly opposed it [managing rival camps].

The BCCOF Steering Committee was comprised of representatives from BCARA, PROPA and COPA with a BCMAFF employee serving as facilitator (note that this is the same individual who is also an ex-officio Director of BCARA). They worked throughout May and June on subsequent drafts of the BCCOF policy, structure and standards documents. By 11 June 1991, six drafts had been circulated to the other organic certifying associations by the BCCOF facilitator.

Meanwhile the Chair of ABCOPA had completed a draft of his own proposal for a private and industry controlled organization to accredit organic certification associations. Unlike the BCCOF proposal, this proposal included a preamble concerning the philosophical intent and goals of organic agriculture. The production guidelines were derived from IFOAM (International Federation of Organic Agriculture Movements) guidelines which have international recognition. The proposed organizational structure itself was derived from the Swiss VSBLO (Federation of Swiss Organic Agricultural Organizations) which featured a General Assembly (1 person per bioregional association, 1 person per 50 licensed enterprises and associate non-voting members). Licensed enterprises (processors, wholesalers, retailers, importers and manufacturers) would have input to the

General Assembly. Reporting to the General Assembly, there would be five to seven executive officers and directors supported by a staff and auditors. In parallel, there would be a 10-14 member panel of experts (bioregional associations, researchers and scientists, consumer groups, environmental groups, lawyers) and reporting to the panel would be an evaluation committee to conduct research and prepare technical and legal reports. The proposed organization would hold the licence to the trademark "Certified Organic". This document was sent to all ABCOPA representatives for comments on May 16, 1991.[attempt at coalition building; use of IFOAM and the Swiss VSBLO as models is an example of the use of strategic candidates]

A copy was also sent to this author for information purposes with the invitation that: "Should formation of an organization as envisioned in this draft proceed, then the Alliance might be in need of both assistance in its organizational development, as well as finding the right people to act on the panel of experts and evaluation committee" [attempt to develop a champion]. The offer was declined. In his letter to members, the Chair also expressed support for the ABCOPA Secretary's proposal to Alliance members on 2 May 1991 that they consider the development of a "two-tier system" in which bioregional associations be allowed to have freedom of choice. In effect, those associations which felt the need for a government sponsored system should be free to do so while those who did not could organize under an alternative independent system.[attempt at reconciliation between rival camps]

Adding additional urgency to BCCOF's efforts, on 24 June 1991, the European Economic Communities passed EEC Regulation No. 2092/91 (Article 11) which required that imports of organic agricultural products and foodstuffs need to be equivalent to EEC production and inspection conditions. One requirement of the regulation was that only public (i.e., government) authorities can apply for recognition of equivalency. The deadline for applications was set as July 23, 1992.

By the end of June, the BCCOF Steering Committee submitted their proposal to the BCMAFF for government regulations under Bill 85. In an effort to gain wider acceptance for the BCCOF proposal, during the summer and fall of 1991 members of the BCCOF Steering Committee travelled throughout the province to meet with the different bioregional associations. BCMAFF representatives also attended the meetings.[efforts to build consensus and coalitions of support]

Autumn 1991

Within the BCMAFF, progress on the BCCOF proposal was proceeding very slowly. Part of the delay was attributed to the uniqueness of Bill 85 as enabling legislation which provided for a system of self-regulation rather than following a more traditional model of direct government regulation. Without established precedents to follow, the task for BCMAFF personnel drafting the regulations was a challenging one. During a period of fiscal restraint, another issue was the allocation of financial and staff resources to administer the regulations and to provide organic extension services [political game of budgeting within the BCMAFF]. Another concern was the still existing division between the organic associations on their support for BCCOF. Last but certainly not least, as a result of the provincial election in October 1991, there had been a major shift in political power in the legislature with the ruling free enterprise Socred party being replaced by a majority social democrat NDP government.

While no comments had been forthcoming on the ABCOPA Chair's proposal for a private provincial accreditation system, ABCOPA applied to the Ministry of Consumer and Corporate Affairs for registration of their name as the "B.C. Organic Alliance". Their application was rejected by Consumer and Corporate Affairs -- the reason given was that the "B.C." portion of the name was being reserved for B.C. Certified Organic Farmers under Bill 85 [the result of networking for the purposes of gatekeeping]. ABCOPA wrote a letter back challenging this decision. They argued that B.C. was already within the registered names of the Bio-Dynamic Agriculture Society of B.C. and the B.C. Association of Regenerative Agriculture therefore there was no basis for the rejection of their application [rational persuasion in defense against perceived selective use of objective criteria].

For PROPA, the threat of OCIA encroachment on their territory heightened as 13 PROPA growers stated that they would join OCIA if the BCCOF initiative failed [threat of sanctions]. However, there was good news for the BCCOF Steering Committee in that NOOA decided that they would join BCCOF [successful coalition building].

Winter 1992

January 1992 hallmarked the start of several attempts to both promote and block the BCCOF initiative. After numerous revisions, the proposed BCCOF regulations, organization structure and certification standards were finally submitted to Legislative Council. BCCOF had negotiated reciprocity agreements with organic associations in Washington, Oregon and California for recognition of their certification programme.

In January 1992, a member of IOPA (who would soon become the new Chair of IOPA and of ABCOPA) wrote to the facilitator of the BCCOF Steering Committee indicating her objection to the inclusion of sewage sludge as a regulated material in the BCCOF standards [assertiveness]. She pointed out that sewage sludge was prohibited under the draft national organic standards developed by COUP as well as IOPA [rational persuasion and use of strategic candidates]. Copies of the letter were sent to the Deputy Minister of Agriculture, the Chair of ABCOPA, the Chair of IOPA and the West Coast Environmental Law Society [indirect appeals to higher authority for support]. The Minister of Agriculture responded in a letter explaining the use of sewage sludge in the BCCOF standards and referred her to the BCCOF Steering Committee for further discussion of the issue. He also advised her that participation in the provincial programme was voluntary.[resistance of appeal for support]

In February 1992, another meeting of ABCOPA was held with representatives from the B-D Society, IOPA, SOOPA, STOPA and BCARA attending. The primary focus was on the latest developments concerning the BCCOF initiative. While the BCARA representatives reiterated their position that they would continue to pursue

BCCOF [assertiveness], a consensus was reached that members of ABCOPA would work towards reconciling their differences and establishing a new relationship with government [initiating negotiation]. An ABCOPA Steering Committee was set up to pursue these goals.

Dissatisfied by the delays within government on the BCCOF proposal, PROPA wrote a letter to the Minister of Agriculture stating that the majority of organic associations in the province were in support of Bill 85 and needed the process to be speeded up [appeal to higher authority for support with attempt to frame perspectives regarding support for position]. The Minister of Agriculture responded thanking PROPA for their role in initiating the Bill 85 process and indicating that progress was being made. The President of BCARA also increased the pressure by "cornering" the Minister of Agriculture at the LMHIA Growers Short Course (he has the keynote speaker) and stating the need for quicker action on Bill 85 [assertiveness]. In March, the organic regulations would go to the Attorney General's Office with the hope for Provincial Cabinet approval by late May.

For their part, ABCOPA members were working hard to present their case to various government officials. A request to the West Coast Environmental Law Association to evaluate Bill 85 was turned down because of a conflict of interest with the WCELA's previous work on the Bill 85 standards for BCARA [attempt at use of expertise blocked by control of expert resource by BCARA]. On learning about PROPA's letter to the Minister of Agriculture, two members of ABCOPA telephoned the Minister to dispute the contents of the letter and express their opposition to Bill 85 (note that one of the telephone callers had previously been the constituency president of the Minister's riding association) [appeal to higher authority to neutralize attempt to frame perspectives].

In early March 1992, the new Chair of ABCOPA wrote a series of letters to a number of provincial politicians [appeals to higher authorities for support].[1] She wrote a letter to the Minister of the Environment asking for a separate

[1] Photocopies of these letters and subsequent correspondence were obtained by the researcher from various informants.

meeting concerning the BCMAFF and Bill 85 (which he subsequently declined). Separate letters were written to the Premier of the province, the Minister and Deputy Minister of Agriculture stating that all of ABCOPA member associations opposed Bill 85 and objected to the process by which it was being applied [neutralization--universalizing a singular position as one shared by everyone]. In her letter, the Chair of ABCOPA also stated that ABCOPA, not BCCOF, represented the majority of organic farmers in the province [framing perceptions of rival camps].

The response of the BCCOF members to the ABCOPA Chair's letters to the government was angry and explosive. At the BCARA general meeting held in March 1992 (which this author attended), copies of the letter were circulated amongst the membership. They felt that the letters contained inflammatory and erroneous information. For example, they disputed the small number of growers which the Chair stated belonged to BCCOF. They also objected to the statement that all of ABCOPA members opposed Bill 85 given that BCARA was an ABCOPA member which supported the BCCOF initiative [challenging neutralization tactic]. They challenged the authority of the Chair of ABCOPA to send the letters given that the consensus at the recent annual general meeting of ABCOPA was to review Bill 85, not criticize it. Thus they charged that the Chair had acted solely on her own initiative and had violated the consensus procedure of ABCOPA [rule citing]. A motion was passed at the BCARA meeting to send a letter (to be drafted by a BCARA member who was also a member of the BCCOF Steering Committee) to the ABCOPA Chair stating that she misrepresented consensus and overstated the objection to Bill 85 [assertiveness]. In the letter, they also asked that she send another letter "correcting" her statements to those she had written earlier. Further, they asked that she resign her position as Chair of ABCOPA. Photocopies of the complete letter were also sent to the BCMAFF and ABCOPA member associations [counteracting attempt to frame perspectives of higher authorities]. A summary of the contents of the original letters and BCARA's response was also published in the BCARA newsletter.

From the view of the Chair of ABCOPA, BCARA's action in sending copies of their letter to her to the BCMAFF was viewed as an attempt to undermine her credibility with the Ministry [labelling]. She also saw BCARA's action to print their account of the episode in their newsletter (which has a wide circulation) as "intimidation" [labelling in public]. She refused to resign her position or send letters retracting her earlier letters [assertiveness]. Instead she wrote to BCARA saying that "If unity in the organic movement, which is what they professed when they came to the Alliance meeting, if that was their goal, it was inappropriate to send that letter out to the Ministry of Agriculture". With the exception of BCARA's letter asking for her resignation, the ABCOPA Chair sent copies of all of her correspondence with the government to the IOPA membership (of which she was also Chair) who supported her actions at their general meeting [coalition building].

By the end of the month, NOOA would vote to withdraw their membership in ABCOPA [withholding support] and work solely through BCCOF. BCCOF would also undergo a name change to "Certified Organic Associations of B.C. (COABC)" to avoid confusion in the marketplace with product certified by CCOF (California Certified Organic Farmers). The name change was in response to a concern expressed by CCOF representatives to a BCARA member at the Asilomar sustainable agriculture conference in California. It was also learned in March that due to the unforeseen administrative work involved, the EEC had extended (indefinitely) their July 23, 1992 for applications for equivalency of organic certification standards.

The dispute over the letters to government politicians and bureaucrats set the stage for a meeting called by the Assistant Deputy Minister of the BCMAFF. This was prompted by a concern within the BCMAFF over the growing rift between ABCOPA and COABC which, in turn, was threatening the Ministry's position that there needed to be unanimous support for Bill 85 before regulations would be implemented [attempt to build consensus between rival camps]. Chaired by the ADM, the meeting was set for 13 April 1992 to be held in the provincial legislature's cabinet chambers. ABCOPA and COABC representatives arranged for a pre-meeting in Victoria on 12 April with the intent being "to work out a compromise so that we could present a united front to the government" [negotiation to build consensus]. All but two members of COABC were able to attend the pre-meeting. By the end of the day, a compromise agreement was reached on five points to present to the BCMAFF on Bill 85. Agreement by the COABC representatives was made conditional on agreement by their absent members.

The next day, the meeting started with the ADM's statement that the legislation had to be industry driven and be perceived as such. As described by those attending, the meeting became very "confrontational" and "emotional" when the COABC representatives (who had arrived late to the meeting) announced to the others that: "The deal is off. There's no compromise. We're going through with the original proposal."[maintenance of rival camps by refusing to negotiate] Both groups proceeded to present their positions -- the COABC with their original position and the ABCOPA with the compromise solution discussed the previous day. While no agreement was reached on substantive issues (i.e., government involvement), there was agreement that an independent facilitator would be hired by the BCMAFF to manage the next stages in the process.

On April 15, BCARA voted at their general meeting to withdraw from ABCOPA because: "The Alliance blocked efforts to obtain provincial certification under the Food Choice and Disclosure Act" [sanctioning in response to perceived blocking]. On April 16, four members of SOOPA wrote to other ABCOPA and COABC members "to propose a conciliatory position to the CBs [Certifying Bodies]". They proposed that they all continue to work towards Bill 85 and a certified organic trademark using the COABC draft certification procedures. However the Alliance would be recognized as the provincial body under Bill 85 and there would be no audits of certifying bodies. A deadline of September 1992 was proposed.[attempt to build consensus]

On May 5, the ADM of BCMAFF requested a meeting for May 12 of all B.C. certifying associations on Bill 85 [attempt to build consensus between rival camps]. The same day, the Chair of the ABCOPA Steering Committee on provincial certification sent a letter to all B.C. organic certifying associations identifying the benefits and drawbacks of official government recognition of organic agriculture. He proposed a conference call for the bioregional groups to discuss: the earlier SOOPA proposal; obtaining an independent legal assessment of Bill 85 (to be conducted by the West Coast Environmental Law Association); and whether to accept the BCMAFF offer for a May 12th meeting in Vancouver.[attempt to build consensus] The COABC member organizations rejected the proposal and restated their intention to continue to pursue the COABC initiative as proposed [assertiveness].

A meeting was finally arranged to be held on May 22 at the Italian Cultural Centre in Vancouver. The Bio-Dynamic Society advised the BCMAFF that they were boycotting the meeting to protest the way in which the BCMAFF was proceeding. STOPA also did not send a representative.[sanctioning, withholding support] With the aid of a professional facilitator, the two groups identified their areas of agreement (organic agriculture motivations) and disagreement (details and tactics). They each presented their positions on provincial accreditation and certification. BCMAFF representatives gave a presentation on the history and intent of Bill 85 and answered questions about special features of the organic regulations. In contrast to the adversarial tone of the April meeting, the process was much more controlled and productive. At the end of the day, there was agreement on several issues [negotiation]. First, they would adopt the COABC proposal for the certification guidelines, which would be changed to meet the needs of local producers and those exporting to international markets. Second, the BCMAFF would contract and pay for an independent legal assessment of the Food Choice and Disclosure legislation. Third, a task force of six would be established to deal with future issues and to visit each bioregional association. Members of the COABC task force included representatives from BCARA, COPA, NOOA, PROPA, SOOPA and IOPA. While appointed to the task force, the IOPA representative never did attend any task force meetings [withholding support].

Up until this time, the disagreements within the organic farming community had largely remained private. However, a front page article in the June 1992 issue of the B.C. agricultural newspaper, Country Life in British Columbia (Schmidt, 1992c) made their problems public. Entitled "Organic assn split over certification", the article identified that "efforts to obtain a provincial organic certification standard has led to a major rift among B.C. producers". Quoting members of BCARA, NOOA and a BCMAFF employee, the article listed the organizations which are working for provincial certification and the individuals and associations (IOPA and SOOPA) who are "leading the fight to block provincial certification". The BCARA President is quoted as saying, "These groups are arguing from purely philosophical grounds and not on a practical basis", going on to say that one of the persons blocking provincial certification has "no regard for commercial producers since she only has a quarter acre organic garden" [labelling]. The article appears to have written based solely on information obtained at the April 15 BCARA monthly meeting since no mention is made of the developments resulting from the May 22 meeting in Vancouver.

Appearing when it did, the newspaper article did little to encourage the hard fought for spirit of collaboration between ABCOPA and COABC members. By singling out and identifying individual organizational leaders who are opposed to Bill 85 and including comments which cast doubts on their credibility without providing their point of view, as related by two of these organizational leaders it also did little to mend the hard feelings which still existed between several parties.

Summer 1992

During June 1992, the parameters and questions for the independent legal assessment (ILA) were developed by the BCMAFF in consultation with the newly formed Task Force. Murray Rankin, a University of Victoria Law Professor, was chosen to conduct the ILA. The expectation of the BCMAFF and COABC was that the ILA would confirm the validity of the legislation whereas the expectation (and hope) of the Bill 85 opponents was that the ILA would reveal "fatal flaws" in Bill 85 and the organic certification regulatory system. In a related vein, a member of ABCOPA contacted this author inviting her to present an analysis of the organic farming community in B.C. and as it relates to the rest of Canada. It was proposed that this would help them tie in with the ILA recommendation "as a basis to chart future directions" [attempt to develop a champion]. The request was declined.

Rankin's report in August 1992 did not identify any major legal problems with Bill 85 as enabling legislation or with the regulations, processes and standards as proposed. Rankin confirmed that it would be an infringement of a registered trademark to use the term "B.C. Certified Organic" but not to use other terms such as certified organic, organic, etc. The regulation would not limit bioregional groups from continuing to issue certificates. In general, the legislation and regulations received the "clean bill of health" that the BCMAFF and COABC had hoped for.

Following the distribution of the results of the independent legal assessment, the ABCOPA Chair challenged the report by saying that Rankin had been selected by the BCMAFF (during the May 1992 meeting she had requested but had been denied veto power over the appointment of the person to conduct the ILA). She also contacted the B.C. Ombudsman Office to review the BCMAFF's handling of the Bill 85 process [appeal to higher authority for support]. There were 27 allegations of wrongdoing including charges of administrative unfairness by dealing with a special interest group in the organic farming industry. While the ABCOPA membership would later decide in October not to pursue their complaint with the Ombudsman office, the Ombudsman continued the investigation and in mid-June 1993 concluded that the BCMAFF was not guilty of wrongdoing.

Autumn 1992

In September 1992, newspaper articles about the COABC and the organic certification programme under Bill 85 appeared in the Vancouver Sun (Johnson, 1992) and in Country Life in B.C. (Schmidt, 1992f). The articles basically reported on the progress being made by the COABC Task Force (acting as the Interim COABC Board) in getting the programme in place for the spring of 1993. In contrast with the June article in Country Life in B.C. (Schmidt, 1992c), the newspaper articles offered more balanced accounts by presenting the points of view of those who remained opposed to the initiative.

It should be noted that the COABC, and in particular BCARA and PROPA, have sought to enhance the perceived legitimacy of their actions through public visibility. In contrast, the remaining ABCOPA members have a policy of not talking to the press. The strategy of developing ongoing relationships with the media (in the B.C. agricultural media, the reporter has often been David Schmidt while the Vancouver Sun reporter has been Eve Johnson) has served them well in the political game of impression management to those outside of the organic farming community. One typical example is the following quote from the former President of PROPA.

> "'Those producers who wish to use the approved phrase (likely B.C. Certified Organic) will buy into the program and its regulations and those who don't want or need it won't have to join,' Smith emphasizes, adding 'all of this is a marketing thrust. You don't need certification to grow organically.'
>
> He notes the producers who most need provincial accreditation are those whose markets are far from their farm gate and blames dissension within the industry on 'vested interests'. "They feel this new legislation will impose on their established markets but I don't think that will happen,' Smith says." (Schmidt, 1992f)

In this way, the COABC have utilized the media to promote their point of view which stresses the rationality of their actions while making negative comments about those who oppose them [labelling] and downplaying the merits of their objections.

Winter 1993

On 4 February 1993, the COABC Board made a presentation at a session on Bill 85 and organic certification at the LMHIA Growers Short Course in Abbotsford. Included in the session were the representatives from the BCMAFF Food Industry Development Services and Oregon Tilth. It was announced that six of the nine organic certifying associations in B.C. were now members of COABC -- BCARA, COPA, CROPA, NOOA, PROPA and SOOPA.

Spring/Summer 1993

ABCOPA is continuing to operate as an ad hoc support and liaison group. They have a new Chair (the BOPA representative) and their membership includes the

B-D Society, BOPA, IOPA, SOOPA and STOPA. One of their current projects is to develop an information pamphlet for consumer education.

After 43 drafts of the COABC framework and standards, the Provincial Cabinet passed an order-in-council approving the "Organic Agricultural Products Certification Regulation" and the COABC policy, structure and standards on June 17, 1993. Work still needed to be done on the COABC constitution (voting structure, membership criteria) and enforcement procedures, and the BCMAFF has not yet committed the extra resources to implement the programme. As a result, the programme may not be operational for the 1993 growing season. On July 6, the Organic Agricultural Products Certification Regulation (B.C. Reg. 200/93) was published in The British Columbia Gazette and the Minister of Agriculture issued a news release announcing the "B.C. Certified Organic" programme (The Vancouver Sun, 1993, July 10).

As a final postscript to this account of the development of government sanctioned organic certification standards, it is useful to examine the relationship between the provincial system and the national system which has been developed. The desire of the COABC and BCMAFF is that the COABC be recognized as the provincial representative on the newly established Canadian Organic Advisory Board (COAB). However, the COAB constitution does not recognize provincial accreditation bodies (B.C. is the only one where one exists) and states that where there is more than one certifying agency in a province, the selection of a representative is by alphabetical order. Therefore, the B.C. representative is the Bio-Dynamic Agriculture Society of B.C., a certifying association which is not a member of COABC. As a result, COABC can only attend COAB meetings as an observer while the B-D Society representative (a strong and vocal opponent of COABC) sits on the COAB Board of Directors [rule citing]. Another implication of the COAB's lack of recognition of provincial accreditation bodies is that in order to receive national accreditation, COABC certifying associations would have to pay twice -- once for provincial accreditation and once for national accreditation. So far, COABC's and BCMAFF's lobbying efforts for rule changes have been unsuccessful. In their favour is the current uncertainty about when (or whether) the COAB will become operational for as of July 1993, the COAB was experiencing funding problems and had not received final legislative approval.

Ongoing political games and strategies

Over the four years from inception to the implementation of the organic certification standards, over 45 separate episodes involving the play of power and politics were identified. This is by no means all of the political influence strategies which took place. In addition, there was an almost continuous stream of the use of labelling to promote the validity of one rival camp's position at the expense of the others'. Labelling by supporters of Bill 85 followed the themes of size ("big farmers" vs. "backyard gardeners") and professionalism ("real farmers" vs. "flaky hippies"). Such a tactic did little to help resolve the conflicts between the two groups. It did prove to be an integral part of the ongoing conflict over who was or should be the representative voice to government. Those who supported Bill 85 considered organic farming to be an "industry" whilst those who opposed government involvement considered organic farming to be a "grass roots movement".

The political game of selective use of objective criteria was also used by both sides in the debate. A comparison of background and farm operation data obtained in this study is useful to gauge the merits of each group's assertions. For example, those involved early in the BCCOF initiative (BCARA and PROPA) cited that their members operated the largest organic farms in B.C. A comparison of the average acres under production of those surveyed in this study proved them to be correct with the average acreage of the two groups being 300 acres compared to 49 acres for the other certifying associations in the province, as a group ($t = 3.46$, $df = 61$, $p = .001$). In regards to BCARA's and PROPA's assertion that they were the "real farmers", a comparison of the number of years of farming experience (total and organic) showed that BCARA/PROPA members had a greater proportion who had always farmed for a living (36% compared to 8.5%: Chisquare $= 6.3469$, $p = .012$). They also had a significantly greater average number of years of total farming experience (19 years compared to 13 years: $t = 2.03$, df =61, $p = .047$) due to the fact that they were also, on average, six years older (48 years compared to 43 years: $t = 2.29$, df = 61, $p = .026$). However, there were no significant differences between the two groups' members in terms of their years of organic farming experience (BCARA/PROPA average = 12.86 years whilst the others averaged 10.96 years). In terms of the degree to which they were full time farmers, only 29% of BCARA/PROPA members (compared to 58% of the rest) were employed off the farm. They also worked off the farm for an average of four weeks per year compared to 16 weeks for the other groups combined ($t = -2.18$, $p = .033$). If one defines "real farmers" as those who have farmed longer and were full-time farmers, then BCARA and PROPA's claims can be supported.

However, if the criterion for representation is to be the number of organic associations and the absolute number of association members, as was the claim of those who initially opposed the Bill 85 initiative, then the picture changes. In addition, this group also claimed to represent the interests of the majority of organic farmers who were not involved in any formal certification programme. In 1990 when BCARA and PROPA first sought out government support, they represented only 8.3% of the number of organized organic farmers in the province (in total 158). By the time that they were working on the BCCOF proposal (and with the addition of the COPA membership) they could claim to represent 41% of organized organic farmers. This percentage would rise to 50.7% of organized farmers by May 1992. This rapid increase can be partially attributed to the success of their active networking with the other organic associations (the addition of both COPA and NOOA) but primarily to the rapid membership growth in PROPA (from 17 member farms in 1990; 50 in 1991; 68 in 1992) and NOOA (from 12 member farms in 1990; 19 in 1991; 32 in 1992). However, the fact remains that despite their assurances that they would deal with the organization which represented the majority of organic farmers in the province, the BCMAFF's initial support (financial and otherwise) was given to a coalition of two organic associations which represented only 8% of the organized organic farmers in the province. And if one uses the absolute number of associations belonging to an organization as the criteria for providing government support, then it wasn't until Autumn 1992 that the BCCOF/COABC coalition could claim the support of the majority of organic associations (7 out of the 11 that were active).

Another claim made by those opposed to Bill 85 was that they were more motivated by environmental concerns whereas those who worked for Bill 85 were motivated primarily by economic marketing concerns. The question then is: To what extent did either group represent the "true organic farmer"? Using this study's questionnaire data, a comparison of the strength of each groups' beliefs and values concerning organic farming, agrichemicals and the environment was conducted. Using the Organic Farming questionnaire data, there was found only one statistically significant difference between the two groups. BCARA/PROPA members (mean = 4.21, sd = .70) agreed less strongly with the statement that "organic farming improves the quality of food produced" than the other groups' members did (mean = 4.65, sd = .64) [t = -2.19, df = 60, p = .033]. On the Environmental Opinion Survey, there was a statistically significant difference on only a single item, that is, "mankind is severely abusing the environment". On this item, BCARA/PROPA members (mean = 6.12, sd = 1.64) disagreed to a lesser extent than the remaining organic farmers (mean = 6.73, sd = .58) [t = -2.11, df = 55, p = .039]. On the Use of Agrichemicals in Farming questionnaire, there were more significant differences. Focusing on the summary variables only, BCARA/PROPA members (mean = 2.26, sd = 1.26) were more supportive of the effectiveness of agrichemicals for pest control than members of the other associations (mean = 1.66, sd = .81)[t = 2.05, df = 56, p = .045]. They were also less negative (mean = 2.23, sd = .95) about the negative impact of agrichemicals on the environment than the others (mean = 1.52, sd = .90) [t = 2.49, df = 56, p = .016]. What should be noted is that while the pattern of questionnaire scores were generally that BCARA/PROPA members were less environmentally "radical" than members of the other groups, there were very few statistically significant differences with the only major differences concerning perceptions regarding synthetic agrichemicals. It should also be noted that the scores of both groups scored well below those of conventional farmers and were in the direction of strongly held environmental values, support of the benefits of organic farming, and negative evaluations of agrichemicals. Thus one cannot confidently generalize that one group is any less environmentally committed than the other.

PART C. INTERORGANIZATIONAL POLITICS: DETAILED ANALYSIS AND DISCUSSION

One lesson to be learned from this case involves the difficulty which loosely organized interorganizational networks such as ABCOPA have in maintaining unity amongst a diverse membership. As a means of maintaining the status quo, a purely collaborative model of organizational functioning based on the principle of consensus proved to be ill-suited to defending against an adversarial competitive strategy for change. Being philosophically adverse to employing competitive tactics, ABCOPA members were often placed in a defensive position. In contrast, those who were more comfortable with competitive strategies were able to employ a wider range of political influence tactics to their advantage. As observed in other studies of innovation champions (Frost & Egri, 1991; Howell & Higgins, 1990; and others), innovation champions' flexibility and adaptability to ongoing challenges to their ideas or products improve the chances for its success.

A closer examination of the individual political tactics and games which took place over the course of the development of the organic agricultural product regulations reveals additional insights regarding the dynamic interplay of power and politics between the various players in this case of social innovation. Following the lead of researchers at the Minnesota Innovation Research Program (MIRP) (Garud & Van de Ven, 1992; Van de Ven & Poole, 1990; Van de Ven & Pooley, 1992), a temporal analysis of political tactics was conducted. In their detailed longitudinal case studies of innovation development within organizations, the MIRP researchers code individual incidents or events involving an innovation in terms of five variables: (1) positive or negative outcomes; (2) continue or change prior action course; (3) resource controller's interventions; (4) outcome criteria shifts; and (5) context events. A time series analysis of the events (eg., 325 events over a five year period for one technological innovation) is then conducted to examine temporal relationships amongst these variables.

Substituting political tactics for events, a similar (but more modest) approach was undertaken to analyze the power and politics surrounding the Bill

85 initiative. The 43 episodes of political were identified from the time of inception (March 1989) to enactment (July 1993) of the organic agricultural products regulations. Within each episode, single or multiple political tactics may have been employed. Whereas episodes are defined as events or incidents involving political action, political tactics are defined as individual actions or influence attempts initiated by one actor or group towards another actor or group. Political tactics were coded according to the actor initiating the tactic (eg., government, ABCOPA, BCCOF/COABC, etc.); whether the tactic was competitive or collaborative in nature (as per Frost & Egri, 1991; Howell & Higgins, 1990; and others); whether a tactic was successful, failed or mixed (both elements of success and failure) in achieving its initiator's intended effect. Each political tactic was also coded as to whether it was initiated in support of or in opposition to the Bill 85 initiative. Events originating in the external environment (i.e., outside of B.C. agriculture) but which were regarded as relevant to the course of the social innovation and which influenced action were also coded as to whether they were regarded in support, in opposition or mixed (support and opposition) to the development of the organic agricultural products regulations (as was also done by MIRP researchers of technological innovations). Given the difficulty in determining the specific sequence of events (complete detailed data was sometimes unavailable) as well as the protracted nature of some of the episodes of political activity, political tactics were aggregated according to season of the year for analysis.

While obviously some episodes and political tactics are more influential or important than others, a weighting of each was not conducted. This follows the advice of Van de Ven and Pooley (1992) who found that weighting a priori could bias subsequent analyses of relationship patterns. Instead, they suggest that the relative importance of events be derived from qualitative interpretation following quantitative analysis, as was done in this case analysis.

A total of 105 individual political tactics and/or influence attempts were coded for analysis. Note however, that this data set does not include the total population of political tactics which occurred over the 52 months of the case.

Excluded from the analysis were the ongoing political tactics of labelling and selective use of objective criteria which were utilized by the majority of the actors (both sides) in the case. Also absent from the analysis are those events and political tactics which were not identified to this researcher. Therefore, the 43 episodes involving 105 political tactics need to be regarded as a minimum set of data. However, this sample does offer an indication of the type and flow of political tactics which occurred throughout the case. Appendix F contains a detailed listing of all of the political episodes and coded political tactics which are the basis for the subsequent analysis of first, the incidence, flow and nature of surface politics; and second, the political nature of the innovation championship which took place in this case of a social innovation in an interorganizational network.

The Incidence, Flow and Nature of Surface Politics

The first research question to be explored in this analysis is: What has been the incidence and nature of organizational politics operating within an interorganizational network in organic agriculture? (Research Question 27). As Van de Ven and Pooley (1992) and Van de Ven and Garud (1992) found in their analyses of critical incidents and events in the development process of technological innovations, the pattern of actions tends to be an episodic one with low activity levels during the initial gestation period of the innovation followed by a significant increase in activity (occurring in discontinuous bursts) during the subsequent stages of innovation development. This leads us to consider the following question regarding the flow of political activity during the development of the organic regulatory system under Bill 85.

> Is the level of political action surrounding a social innovation in an interorganizational network either continuous or episodic?(Research Question 27a)

If the flow of political activity is found to be episodic in nature, the next question to be addressed concerns what initiates an episode of political actions in these contexts. Is a political episode initiated in response to a change or event originating in the external environment (actors, institutions, technological change)? Or is it in response to developments or actions (either positive or negative) within the relevant arena of action? The research question to be addressed in this respect is as follows:

> Are episodes of high levels of political activity in interorganizational networks more likely to be triggered by events/actions exogenous or endogenous to the environment of those involved in the innovation unit? (Research Question 27b)

Following this tack, if political action is episodic in nature, another relationship to be explored is the temporal relationship between political episodes and changes in courses of action. In this case, changes in course of action are regarded as changes in actors' political strategy and/or changes in goals or criteria for the innovation (as per Van de Ven and Pooley, 1992).

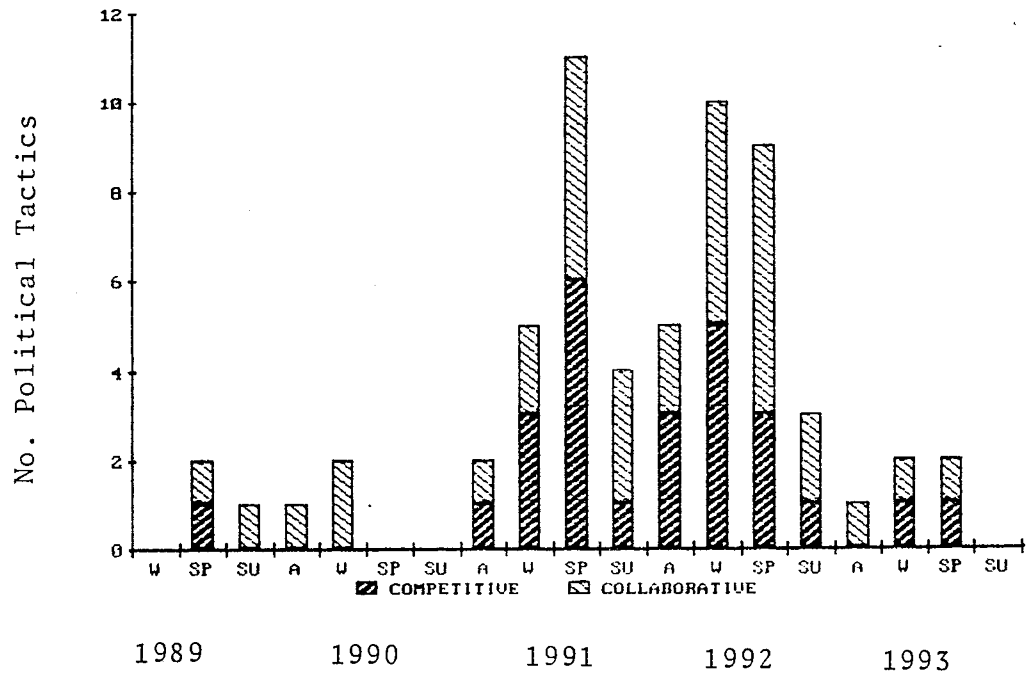
> Are episodes of high levels of political activity in interorganizational networks a result of a substantive change, a part of a substantive change, or a precursor to substantive changes in the course of action concerning a social innovation? (Research Question 27c)

As evident in Figure 7-1, a counting of the number of political tactics occurring during the course of the Bill 85 initiative confirms to some extent the episodic nature of innovation development. The pattern of political activity in this case of social innovation appears to be bimodal in nature. The initial gestation or agenda setting period during which the idea of a government sanctioned organic certification and accreditation systems was conceived and being put forward by government officials appears to have lasted 21 months (March 1989 to December 1990).

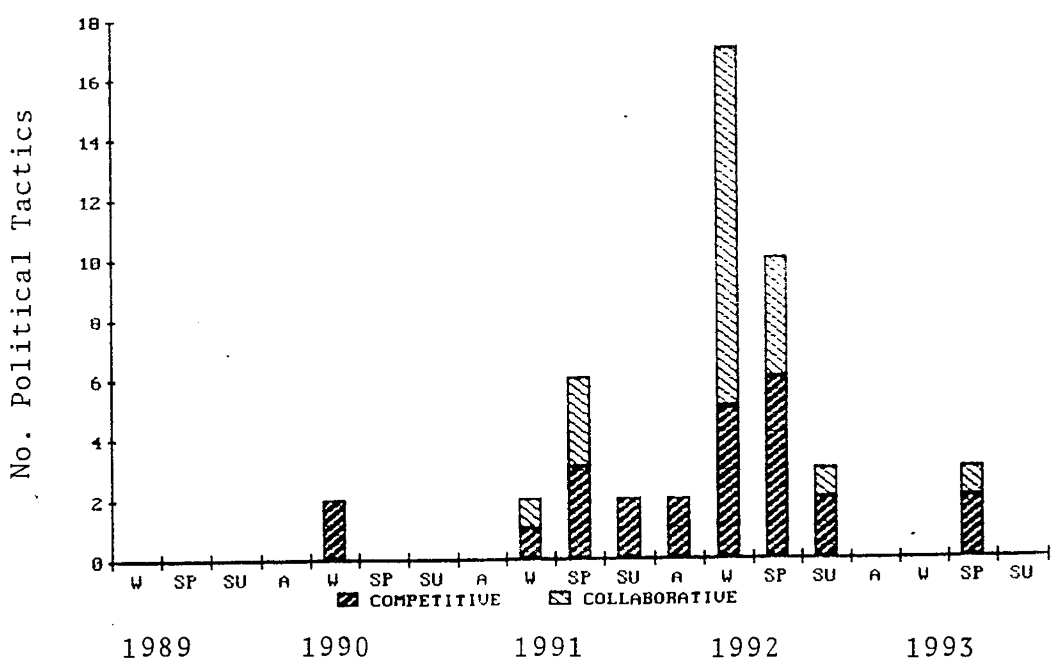
A key event in the development of the Bill 85 initiative (in terms of political activity and changes in courses of action by both government and the organic farming associations) was the January 1991 ABCOPA meeting. The key event which triggered this episode of political activity appears to have been the actions taken by OCIA against PROPA (i.e., soliciting PROPA growers for OCIA membership and blocking the sale of PROPA certified organic products through OCIA affiliated market distributors). This in turn led to PROPA's appeal to their local MLA to pressure the BCMAFF to more actively pursue a government sanctioned organic certification and accreditation system. This led to the confrontation at the January 1991 ABCOPA meeting between PROPA/BCARA members and

FIGURE 7-1. POLITICAL TACTICS SUPPORTING AND OPPOSING BILL 85 INITIATIVE

Political Tactics in Support of Bill 85



Political Tactics in Opposition to Bill 85



representatives of the other organic certifying associations and the political interplay during the Winter and Spring of 1991.

The second episode of high political activity illustrated by Figure 7-1 occurred one year later during the Winter and Spring of 1992. In this instance, one event which triggered significant political interplay appears to have been the Chair of ABCOPA's letters to provincial politicians which challenged the legitimacy of the BCCOF and the process by which the organic agricultural products regulations were being developed. This proved to be a pivotal event in spurring numerous attempts to negotiate a compromise between BCCOF/COABC and ABCOPA members. Two other events originating in the external environment also appeared to have been integral to the renewed political activity surrounding the Bill 85 initiative. First, at the national level, the Canadian Organic Unity Project had restarted in late fall of 1991 and was progressing once again towards developing a national system of organic certification and accreditation. By this time, those who opposed the provincial system were also the strongest supporters of the national system. Thus, in their view, a viable alternative would soon be available. They further believed that the national system would make the provincial system redundant.

In contrast, the BCCOF/COABC champions regarded their proposal as being complementary to any national system and therefore, not a threat. The primary motivation for a speedy implementation of the provincial system was the EEC's July 1992 deadline for organic standards equivalency applications by government bodies. This was an especially critical issue for PROPA producers who exported grain to Europe. Therefore, in regards to this second period of high level and intensity of political activity, it appears to have been triggered by actions and events which were both endogenous and exogenous in origin.

What then is the temporal relationship between each episode of intense political activity and substantive changes in action courses? The high level of political activity occurring during the Spring of 1991 can be traced in large part to a significant shift in strategy by both the BCARA/PROPA representatives and by the BCMAFF. First, there was the decision by BCARA and PROPA to work independently and around their ABCOPA counterparts. For the government, their earlier strategy of working with all of the organic farming associations as a group to only working with a small subset of certifying associations represented an even greater strategic shift. Contrary to their earlier statements, the BCMAFF now was taking a proactive role in developing the regulations and were dealing with a minority group within the organic farming industry. Their definition of "majority" support was now apparently amended to mean the majority of organic farmers within an organic certifying association rather than the majority of all organic farmers (organized and unorganized) in the province. Thus, in this instance, it appears that the high level of political activity which occurred during the Spring of 1991 was a result of a substantive change in course of action.

In regards to the second intense period of political activity which occurred from March to May of 1992, it would appear that political activity was initiated and intertwined with a substantive change of strategic action. One effect of the Chair of ABCOPA's actions in sending letters to the provincial politicians was that there was a renewed effort by several parties (notably SOOPA, ABCOPA and BCMAFF) to negotiate a compromise. Up until that time, both the ABCOPA and BCCOF/COABC groups had been operating in parallel with very little formal interaction. The substantive change in strategic action for ABCOPA members in particular was to attempt to change an adversarial relationship to one of collaboration (or detente). It also represented a re-commitment by the BCMAFF towards obtaining majority support amongst all organized organic farmers rather than a subset of organic certifying associations. This period is also noteworthy in that the BCMAFF once again was playing a visible and active role in the development process.

In many respects, the BCMAFF's role is analogous to that of the management sponsor or champion of an innovation who intervenes during periods when an innovation is being threatened (Frost & Egri, 1991). The actions taken by the BCMAFF in this case of social innovation also provide support for Van de Ven and Pooley's (1992, p. 96) hypothesis that "negative outcomes at time t-1 trigger interventions from external resource controllers at t, which subsequently lead to changes in the prior course of action". In this case, the BCMAFF operated as a resource controller by providing funds to the BCCOF/COABC for development purposes. They also financed the two formal meetings between the ABCOPA and COABC representatives (including hiring a facilitator) -- all actions which played a significant part in changing the prior action courses of the process.

The Political Nature of Social Innovation Championship

A second set of research questions to be explored is whether there are differences and/or changes in the natural of political tactics utilized over time by those parties who supported the Bill 85 initiative and those who opposed it. In their study of product innovation champions, Howell and Higgins (1990) found there was a positive relationship between championship and frequency of influence attempts. They also found that champions utilized collaborative tactics (in particular, coalition building and reasoning) more often than did nonchampions. No difference was observed between champions and nonchampions for strategies such as assertiveness, bargaining, sanctioning or appeals to higher authority. As found in several studies of upward influence tactics (Mowday, 1978; Schilit & Locke, 1982; Yukl, Falbe & Youn, 1993), there is a preference for rational and informational persuasion tactics over less rational and sanction based tactics. Falbe & Yukl (1993) also found that collaborative political tactics were more effective than competitive ones.

Whereas these findings were based on studies of politics operating primarily within a corporate context, to what extent are they generalizable to situations involving interorganizational politics? Further, how generalizable are these findings in regards to the championship of social innovations in public policy? Therefore, two research questions to be explored in this analysis of political tactics involved in this case of social innovation within an interorganizational network are:

> Do innovation champions initiate a greater number of political tactics than nonchampions of a social innovation? (Research Question 28a)

> Do innovation champions differ from nonchampions in the types of political tactics (collaborative vs. competitive) they initiate? (Research Question 28b)

Recognizing that the frequency of political activity can be episodic and change during the development of an innovation, the following questions regarding the pattern of champions' and nonchampions' political tactics over time are also of interest.

> Does the frequency of political tactics initiated by champions and by nonchampions change or remain relatively constant over the course of a social innovation's development? (Research Question 28c)

> Does the nature of political tactics initiated by champions and by nonchampions change over the course of a social innovation's development? (Research Question 28d)

Based on the data regarding identified political tactics initiated throughout the development of the organic agricultural products regulations (see Figure 7-1), it would appear that the champions of this social innovation were reported to have used a greater number of political tactics than those who opposed the initiative. A total of 60 separate political tactics in support of the Bill 85 initiative were observed while only 45 political tactics were employed by their opponents. While it appears that these innovation champions were more politically active than their opponents (employing on average 3.5294 political tactics per season compared to an average of 2.7647 tactics per season for their opponents), this difference was not statistically significant (Chisquare = 14.04444, p = .17).

In regards to the types of political tactics that were utilized by each group, there were 26 competitive (43.3% of the total) and 34 collaborative (56.7%) political tactics employed in support of the Bill 85 initiative. In contrast, there were 23 competitive (51.1%) and 22 collaborative (48.9%) political tactics employed by those opposing the government programme. In total, 46.7% of all identified political tactics were competitive in intent. As such, no clear conclusions can be made regarding the overall nature of political action. However, there is modest support found for the findings of Howell and Higgins (1990) in that champions of this social innovation utilized relatively more collaborative rather than competitive political tactics. Furthermore, when comparisons between groups are made in terms of the different types of political tactics employed over the total course of the development process, the champions of Bill 85 employed a slightly greater number of competitive tactics (Chisquare = 9.85714, p = .08) and significantly greater number of collaborative tactics (Chisquare = 16.83077, p = .02) than opponents of the initiative.

In as far as the individual tactics which were utilized in this case, there were very few differences between those championing and those opposing the initiative. Both groups utilized collaborative tactics such as building consensus, coalition building and negotiation to the same extent. Where they differed to a modest degree was in regards to networking, reasoning/rational persuasion (both greater for champions) and the use of strategic candidates (greater for opponents). In respect to the different types of competitive political tactics which were evident in this case study, there were substantially more differences between the two groups. Champions of the initiative were much more likely to have utilized the competitive political tactics of budgeting, insurgency, labelling, impression management and assertiveness. Those in opposition to the initiative were reported to have used relatively more gatekeeping, blocking and appeals to higher authority tactics. Both groups were equally likely to have employed the political tactics of withholding support, use of rival camps and rule citing. Recognizing that definitive conclusions are not possible due to the small data set available in this case study, these innovation champions appeared to have employed a more proactive political strategy while those who were opposed utilized a more defensive strategy.

To explore changes in the frequency and type of political action initiated by each group over the course of the innovation, a comparison between groups was conducted. At the level of total political tactics, the champions of the innovation were clearly the more active players during 1989 and 1991. During 1989, the Bill 85 champions engaged in more competitive and collaborative tactics than their opponents who were operating in a nonpolitical way at that time.[Chisquare = 6.0000, p = .05] During 1990, the groups were equal in the total number of political tactics employed. However, closer examination of the differences in types of political tactics shows that during the Winter of 1990, champions' collaborative efforts were counteracted by their opponents' competitive tactics.

Throughout 1991 (and especially in the Spring), champions consistently employed both more competitive and collaborative political tactics.[Chisquare = 8.000, p = .09] In contrast, the picture of politics in 1992 reveals that these innovation champions were less active than their opponents in the Winter season and almost equal during the Spring and Summer. During the winter and spring months, the more active political players were opponents of Bill 85 who initiated relatively more collaborative tactics in the Winter and more competitive tactics during the Spring.

And finally, during 1993 when the innovation was in its final stages of development, its champions were the more politically active until the incident concerning the national system of organic certification and accreditation. However, this does not detract from the actual passing of the provincial regulations but rather has implications for its future operation.

Several insights can be drawn from the observed pattern of changes in level and types of political activity over the course of this social innovation's development. First, this pattern suggests that a "first political mover" strategy (both competitive and collaborative) early in the development process can be advantageous. As the innovation progresses, shifting to a relatively more collaborative mode helps to solidify support for the innovation. In contrast, for those opposing an innovation, waiting until late in the process to either influence or stop an innovation's development appears not to be an effective strategy. One explanation for this dynamic can be found from the literature on escalation of commitment amongst entrepreneurs and for corporate innovations (Staw, 1981; Van de Ven & Pooley, 1992). Namely, over time, champions of a project become increasingly committed to their cause and continue even in the face of negative feedback and obstacles placed in their path. This appears to also have been the case for the BCCOF/COABC advocates who, during 1992, consistently rejected attempts to abandon or change their proposal.

In addition, the timing and type of political action which occurred in this case has implications for the public policy making process. In some respects, this pattern of influence tactics mirrors the interorganizational politics that occurred surrounding the development and implementation of pay equity legislation in Ontario during the mid-1980s (Egri & Stanbury, 1989). As found in that case analysis of what was recognized as a radical departure in public policy (more so in form and scope rather than in intent), proponents of the legislation were also active early in the policy development process. Last ditch efforts by opponents of the policy proved to be ineffective in stopping or substantively changing what had already been placed in motion. While admittedly the case of the Bill 85 initiative is only one example of government policy making, it would suggest that in instances involving the introduction of innovative government policies, the advantage goes to those who are more active early rather than late in the policy development process. For those who oppose such initiatives, waiting until late in the process to become involved is relatively ineffective in counteracting the momentum of advocates' and government's escalation of commitment.

Concluding Observations

Another observation to be derived from this case analysis is how earlier conflicts between associations set the stage for the subsequent battle over Bill 85. As revealed in the case studies of the individual organic farming associations, BCARA had demonstrated a willingness to certify farms in other bioregional associations' territories. That they did so without advising (either before or after) the local bioregional association created additional antagonism. The perception in those bioregions affected, and in others, was that BCARA's ambition was to eventually become the provincial certifying body thereby destroying the current system of bioregional certification associations. Their name alone, the B.C. Association of Regenerative Agriculture, does little to dispel the perception that BCARA is positioned and willing to empire build. Thus when BCARA became one of the primary champions of a provincial certification association over the objectives of those who strongly adhere to the bioregional tenet, the perception of self-serving interest was reinforced thereby creating one more obstacle to collaboration.

This case demonstrates the importance of boundary spanners in networking and developing coalitions of support. While there was a strong referent and friendship network operating within the camp which opposed Bill 85, the COABC group benefitted from networking and channelling of information by the presence of three boundary spanners who championed the initiative. This case of social innovation confirms the findings of other studies (Becker, 1970; Tushman & Katz, 1980; Utterback, 1974; and others) regarding the efficacy of informal and verbal modes of communication in innovation championship. For example, one person who worked hard on the BCCOF proposal was both a BCARA director and a member of COPA. Another person who had been one of the founding members of BCARA and their verification officer had moved in 1991 to the North Okanagan and became active in the NOOA organization. Perhaps most instrumental in their relations with the BCMAFF was the BCARA ex-officio director who was also a BCMAFF employee. While not given official sanction or responsibility to work on the project, this individual has a strong interest in organic agriculture and has been a part of BCARA since its inception. Recognized as a technical leader within BCARA, he was an integral member of the team which drafted the BCCOF/COABC proposals. He became the coordinator of the BCCOF Steering Committee and has championed the concept with his colleagues in the BCMAFF. While his support was regarded as invaluable by those who supported the COABC initiative, it was regarded with suspicion and resentment by those who opposed Bill 85. Given the division between the organic associations on the issue, the high visibility of a BCMAFF employee working with one group did little to support the BCMAFF's contention that they were a neutral party.

As the debate progressed, other BCMAFF actions were identified as evidence of their partisanship towards the BCCOF/COABC group. For individuals who were distrustful of government's motivations (in general and in this particular case), it was not hard for them to make the BCMAFF out to be the villains. One ABCOPA member charged that: "I was definitely lied to about how the process was working. About consultation, that we would be consulted if any guidelines were presented. They were the Alliance guidelines and that we would be consulted." This leader and others at the January 1991 ABCOPA meeting recalled that they had been assured by the BCMAFF representatives that application for regulations would have to have the support of the majority of the organic associations in the province, and that there would be a poll of organic farmers (which was not conducted). Furthermore, that there were no deadlines for an application. And yet, they recall, even after ABCOPA had told them that they were not interested at that time, the BCMAFF provided funds for work on the BCCOF proposal to two individual associations shortly thereafter. Those who oppose Bill 85 were quick to accuse a "few BCMAFF bureaucrats" of being personally ambitious and using Bill 85 as a way of promoting their careers [making it]. ABCOPA's attempts to circumvent these individuals by appealing to higher placed politicians and other Ministry officials proved to be unsuccessful. In rejecting government assistance (financial and administrative), those in opposition to Bill 85 were also placed at a relative disadvantage to their counterparts who were championing Bill 85. For example, ABCOPA opponents did not have the resources to finance travel to personally meet with and present their case to members of other bioregional associations as the BCCOF/COABC and the BCMAFF did. They also did not have the administrative support (both BCMAFF and internal) which proved to be essential for coordinating the development of the organic certification and accreditation system. All of these factors (lack of financial, human and information resources) constrained their ability to influence others within the organic farming community to oppose Bill 85.

Given the origin of the legislation and its stated intention, the position of the BCMAFF was unenviable. Charged by the Premier to implement regulations for organic products and facing a legislative deadline for its application (otherwise it would become inactive), there was sufficient motivation to work with supportive organic associations in the hope that the others would be brought onside later. Efforts to include all the organic associations in the process of developing the BCCOF proposal were made by circulating each draft (6) for their comments. BCCOF members and BCMAFF employees also travelled to the various bioregions to present their proposal in an effort to gain wider support. Later the BCMAFF would initiate meetings between ABCOPA and BCCOF/COABC member associations to try to work out a compromise agreement. They accommodated the groups' request for a professional facilitator at the May 1992 meeting. They also paid for an independent legal assessment to be conducted on Bill 85. From their perspective, they have been patient and accommodating throughout a very slow and painful process. Irrespective, members of ABCOPA remained convinced that the BCMAFF had taken a partisan role and asked for an investigation by the B.C. Ombudsman Office.

When asked what they would have done differently if they had to do it all over again, one comment by BCMAFF representatives is that perhaps more outreach or extension could have been done on the legislation in the early stages. It was also commented on by several in the BCMAFF that, in retrospect, the selection of organic certification regulations as a test case for the enabling legislation may not have been the most prudent choice. As summarized by one BCMAFF representative,

> "I think we could have probably come up with one or two simpler, simpler in the sense of narrower, practice issues than organics as a way of getting it started. And then with some success, it might have been easier to build consensus or to have consensus emerge on the organic side. The organic industry is such a complex industry that we may have had a false assumption that we would ever gain consensus there. Knowing the philosophical basis, that they were driven from a different perspective than perhaps what was leading the writing of the legislation. We underestimated the complexity of that industry, the various needs."

Thus they may have been a little naive about the perceived unity within the organic farming industry and how different some organic farming associations were from those in mainstream agriculture.

In some ways, it is ironic that as an interorganizational network ABCOPA has gone full circle. Initially, ABCOPA's design for collaboration was that of appreciative planning, a forum for the exchange of information to advance a shared vision of organic agriculture (Gray, 1989). Informed by an assumption of common interests and goals, the choice of the consensus decision making process was seen as a way to ensure unity amongst its members. Reflective of their philosophical opposition to hierarchy and conflict, all member associations would be equal participants irrespective of their size or type. The introduction of Bill 85 served to shatter this illusion of unity of interests and lack of conflict. Instead of advancing a shared vision through an appreciative planning process, a group of members were pressing to become partners with government to develop a joint agreement. To these individuals, the consensus process became symbolic of the others' resistance to growth, change and progress. To those who hold fast to the vision of appreciative planning, the consensus process was symbolic of their commitment to egalitarian principles and nonhierarchical forms of organizing. What evolved was an escalation of conflict over means and numerous attempts at negotiated settlements over regulation. In the end, there are two interorganizational networks each serving a different need for their members and each using a different process for realizing those needs. For its five member associations (B-D Society, BOPA, IOPA, SOOPA, STOPA), ABCOPA is once again operating as an ad hoc support and liaison group with a renewed focus on consumer education. Meanwhile, the COABC is preparing to start the accreditation process of certifying associations and developing marketing and education initiatives for its members which now include BCARA, COPA, CROPA, IOPA, NOOA, PROPA and SOOPA. In the end, the hard fought consensus of the majority of organized organic farmers in B.C. has finally been attained.

CHAPTER 8. INSIGHTS INTO B.C. FARM ORGANIZATIONS

Why do farmers organize? What roles do farm organizations serve for their members? As learned in the previous chapters in Section IV, there are many answers to these questions. In one respect the farm organizations have a specialized focus on promoting and protecting the interests of their members. Often the basis for organizing is the type of commodity being produced or the method of marketing farm products. In the case of farm interest groups, organizing is defined on a geographic basis rather than product or market specialization. Others are organized on the basis of both commodity product and geographic location.

While in many ways the farm organization population is fragmented, they are united in their advocacy of the importance of agriculture in the Canadian society and economy. One characteristic which sets the agricultural industry apart from other industrial sectors is the predominance of small, independent and geographically dispersed commodity producers (Browne, 1988; Egri, 1994, forthcoming; Forbes, 1985). For the farm organizations involved in the marketing board system, membership is mandatory for farmers growing regulated products to be sold through institutional marketing channels. For other types of farm organizations, membership is voluntary thus raising a greater challenge to organizing and retaining members. As learned in Chapter 6, volunteer leadership in farm organizations is often a demanding job requiring the performance of many roles for little, if any, remuneration.

In this chapter, two aspects of B.C. farm organizations will be discussed. First, the differences between B.C. farm organizations involved in organic agriculture and those involved in mainstream conventional agriculture will be discussed. Second, given the high degree of government involvement in the agriculture industry (both desired and undesired), a discussion of farmers' perceptions as to what should be government's role in agriculture will be presented. Also included in this section is a discussion of the impact of recent changes in BCMAFF farm extension services from the perspectives of both farmers and BCMAFF extension agents. Finally, the chapter concludes with observations as to potential future challenges for farm organizations in B.C. agriculture.

PART A. DIFFERENCES BETWEEN ORGANIC FARM AND MAINSTREAM FARM ORGANIZATIONS

To what degree are the organic farming associations similar to those existing in conventional agriculture? Do they operate as farm interest groups, product commodity groups, marketing associations or educational organizations? Like other farm interest groups, organic farming associations have members who produce a variety of food products. At the bioregional level, they are similar to the local farmers institutes in their representation of members' concerns to the public, local politicians and other parties in agriculture. However unlike other farm interest groups, the organic farming associations are more narrow in their advocacy of organic agriculture rather than of agriculture in general.

The organic farming associations operate like a specialized food commodity group when one considers their representation of organic food products as a category distinct from food produced through conventional agricultural practices. Like other food commodity groups, organic associations provide for member education and information about farming practices, products and marketing. They also work to promote their members' products by providing information to the consuming public about organic food and organic production methods. However unlike other food commodity groups, the organic associations have a greater degree of direct control over members' actual farming practices. While some conventional farm organizations have farming codes of conduct motivated by a desire to avoid government regulation (e.g., the B.C. Cattlemen's Association code of environmental practice), their enforcement is of an informal nature and only invoked in response to reported abuses. In contrast, the organic certification process necessitates that the organization be proactive and perform a formal detailed audit of individual members' farming practices on an ongoing basis.

In terms of being an educational farm organization like the LMHIA, only PROPA and SOOPA have yet to stage similar events open to the public. Instead the majority of grower education has been similar to that which occurs in food commodity organizations.

To prevent perceptions of conflict of interest between certification and marketing (as has happened in the past with organic wholesalers), the organic farming associations have taken extra steps ensure that any marketing activity is kept legally separate from the certifying association. Thus they avoid functioning as farm product marketing organizations like those operating in the regulated food products sector.

Like other farm organizations in mainstream agriculture (farm interest groups, product commodity groups, regulated marketing organizations), organic farming associations include political advocacy as part of their mission. Although in varying degrees, common to all the organic farming associations is their advocacy of organic agriculture to the general public and others in agriculture (farmers, farm organizations, retailers, wholesalers, etc.). Where they differ from farm organizations in mainstream agriculture (and between each other) is in terms of what they perceive to be the desired role of government in agriculture. Only two of the organic associations (BCARA and PROPA) have accepted government funds and assistance while the rest have operated independently. As illustrated in the debate surrounding the implementation of organic certification standards under Bill 85, a few organic associations (notably BOPA, CVOPA, IOPA, KOPA, STOPA) have especially strong philosophical objections to government involvement of any kind in organic agriculture. This contrasts sharply to the organizations in mainstream agriculture which actively lobby government to provide commodity subsidies, income insurance programmes, and/or research and development grants. There is no such debate in conventional farm organizations as to whether or not to accept financial assistance from government.

PART B. <u>PERCEPTIONS OF GOVERNMENTS' ROLE IN AGRICULTURE</u>

More specific information as to what individual farmers perceive to be the desired role of government in agriculture in general and in organic agriculture are contained in Table 8-1. In response to this open-ended question, there were several farmers (25 in total) who stated that they would like to see less government interference in agriculture. This view was most strongly held by organic (10), organic-conventional (3) and biodynamic (7) farmers who were skeptical about government's past record in agriculture (in particular, support of conventional agriculture). As one organic farmer stated, "I have a lack of faith in government. I don't need government money. If I can't make it on my own, I won't stay farming." This free market sentiment was shared by a few conventional farmers (5), one of whom stated that government should: "Just get out of it. Let it be the survival of the fittest. Whoever stands, stands. Whoever falls, falls."

However the majority saw some role to be played by government in agriculture. Both organic and conventional farmers advocate that government needs to provide more and better agricultural extension services (21 responses). While both organic (28) and conventional (9) farmers identify the need for more government funded research, they differ on the direction which government research should take with organic farmers advocating that government redirect their research activities to address problems in organic agriculture. That government recognize organic agriculture as a viable means of production is high on the list for organic farmers (17 responses). In addition to research, they would like to see such recognition being supported by government financial assistance during the organic conversion period (20 responses), the provision of information on organic farming (14) and organic markets (3), and the provision of a government backed organic certification programme (in total 17).

TABLE 8-1. FARMERS' PERCEPTIONS REGARDING DESIRED ROLE OF GOVERNMENT IN AGRICULTURE

ROLE OF GOVERNMENT	TOTAL SAMPLE (n=117) No. (%)	ORGANIC FARMERS (n=54) No. (%)	CONVENTIONAL FARMERS (n=44) No. (%)	ORGANIC-CONVENTIONAL FARMERS (n=6) No. (%)	BIODYNAMIC FARMERS (n=9) No. (%)	OTHER (n=4) No. (%)
General						
1. Need less government interference in agriculture	25 (21.4%)	10 (18.5%)	5 (11.4%)	3 (50.0%)	7 (77.8%)	--
2. Public education re: agriculture	22 (18.8%)	12 (22.2%)	6 (13.6%)	1 (16.7%)	1 (11.1%)	2 (50.0%)
3. More/better agric. extension	21 (17.9%)	9 (16.7%)	10 (22.7%)	1 (16.7%)	--	1 (25.0%)
4. Regulate food imports	13 (11.1)	2 (3.7%)	8 (18.2%)	1 (16.7%)	--	2 (50.0%)
5. Abandon cheap food policy	11 (9.4%)	5 (9.3%)	4 (9.1%)	1 (16.7%)	--	1 (25.0%)
5. Conduct research	11 (9.4%)	--	9 (20.5%)	--	--	2 (50.0%)
7. Seek international harmonization of pesticide regulations	9 (7.7%)	1 (1.9%)	7 (15.9%)	--	--	1 (25.0%)
8. Farmer education	7 (6.0%)	4 (7.4%)	1 (2.3%)	1 (16.7%)	1 (11.1%)	--
9. Facilitating marketing	5 (4.3%)	3 (5.6%)	--	2 (33.3%)	--	--
9. Provide crop insurance	5 (4.3%)	--	4 (9.1%)	1 (16.7%)	--	--
11. No change/maintain status quo	3 (2.6%)	2 (3.7%)	--	1 (16.7%)	--	--
Regarding Organic Agriculture						
1. Conduct research on organic methods	28 (23.9%)	25 (46.3%)	--	1 (16.7%)	2 (22.2%)	--
2. Provide financial support during organic conversion period	20 (17.1%)	7 (13.0%)	9 (20.5%)	1 (16.7%)	1 (11.1%)	2 (50.0%)
3. Recognize organic agriculture	17 (14.5%)	15 (27.8%)	--	--	2 (22.2%)	--
4. Provide information on organics	14 (12.0%)	10 (18.5%)	--	--	4 (44.4%)	--
5. Government certification of organic product (support current initiatives)	13 (11.1%)	12 (22.2%)	--	1 (16.7%)	--	--
6. Provide minimal organic guidelines	4 (3.4%)	3 (5.6%)	--	--	1 (11.1%)	--
7. Provide information on organic markets	3 (2.6%)	3 (5.6%%)	--	--	--	--

Consistent with their identification of the critical problems in agriculture, conventional farmers were more likely to advocate that government take an active role in regulating food imports (8 responses), seeking international harmonization of pesticide regulations (7) and providing crop insurance (4). For these farmers, all they wanted was a "level playing field" with their international competitors. A number of both organic (5) and conventional (4) farmers advocate that the government abandon its cheap food policy and let market forces determine the "real" price of food reflecting the actual costs of production.

As this summary of individual's perceptions of what government's role should be in agriculture reveals, their farm organizations are to a large degree reflecting the interests of their memberships in their political advocacy efforts (with the exception, of course, of the strong free market supporters). That only three farmers were satisfied with the status quo (2 organic, 1 organic-conventional) reveals that the large majority would like to see changes in how government is addressing the needs of the agricultural community.

Despite the identified need by many farmers for an expansion of agricultural extension services, the reality is that this is one area which has suffered under government fiscal restraint. Government downsizing has meant that staff vacancies in field extension offices often remain unfilled and as a result, the remaining extension agents are hard pressed to provide ongoing technical advice to help farmers with their production problems.

Another constraining factor is the BCMAFF's shift away from providing general agricultural and horticultural extension services in each region to a system where individual extension agents are designated as regional or provincial product specialists (usually 1 or 2 per commodity). Whereas before, individual extension agents were only in contact with farmers in their regional areas, as provincial specialists they must field calls from farmers throughout the province. This specialist role is in addition to their general extension role for their local area, which often suffers. As commented on by many farmers, they rarely see their extension agents anymore.

For their part, the extension agents themselves report that they would like to provide more general field extension services but feel stretched to the limit as it is. This is often accompanied by the complaint that while the field staff has been cut, administrative staff has increased and their demands on field staff has also increased. One overworked field extension agent made the following summary of what his work environment is like today.

> "BCMAF paperwork has gotten worse in the last five years. Our Ministry has gone from about 800 staff to 400 now and yet we have more administrators now than we had in 1980. So obviously they're generating more paper and forms that we have to fill out and surveys they're doing, memos to us and it is just unending....Horticultural services are reduced, even without the paper load, those 400 positions that are gone, most of them went out of the field.....Nobody comes out to see the farmer anymore. That's where we're losing it. We're being buried in paper and policy and bureaucracy. We're just not helping these people anymore. I could have five people doing what I do. Now granted, there is less money around but all the money that is around is being eaten up by bureaucrats, people that just generate paper. The studies that come out of there, we are just studied to death in this country. And agriculture certainly isn't any different. My ideal? Blow up Victoria and put all those bodies in the field."

Another change affecting field extension services has been BCMAFF's and Agriculture Canada's shift away from doing applied research. For example, there is significantly less government research on testing new crop varieties and the extension agent is often put in the following position,

> "If somebody comes to me and says I want to grow a new hot shot corn variety. Well, we haven't done any testing on corn so we just say get a seed catalogue and pick one you think you like and try it out and if you fail, you fail. And if you win, you win. And that's all the advice that we can give them....So there's a possibility that we'll reach the stage that nobody's testing varieties anymore and the farmers just have to take their chances. And the thing is with breeding going on all the time, there's all kinds of new varieties coming along, more so than ever. So that has been singled out as the one area of applied research that governments particularly don't like."

Without independent evaluations of new crop varieties, farmers are forced to rely more heavily on the claims of the sellers of these critical production inputs. Thus from the farmers' perspective, the quality of service from their BCMAFF extension office is further diminished.

Yet farmers still have a need for some form of field extension services. While they would prefer that government provide the same or higher level of service as has been the case in the past, farm organizations are having to take on more of this function. The larger product commodity organizations have more resources to provide this service for their members. Unfortunately, farmers who are independent producers, have smaller mixed operations or produce less common products are less able to fill the gap created by a cutback in government extension services and advice.

PART C. FUTURE CHALLENGES FOR B.C. FARM ORGANIZATIONS

To some extent, the relationships between farm organizations within the agriculture industry can be likened to that of a (very) loosely coupled interorganizational system (Cummings, 1984; Trist, 1983). In turn, farm organizations themselves (with the exception of those involved in regulated product marketing) act as loosely coupled voluntary networks of individual producers. Linked primarily by the meta-goal of protecting agriculture's and farmers' place in modern society, the diversity of organizations and individuals is a major challenge to achieving coordinated effort and action. While the B.C. Federation of Agriculture is the most formalized network of farm organizations, as learned in that case analysis, maintaining unity amongst member organizations is not an easy task. However, there was a high degree of homogeneity in organizational structures and decision making processes in the conventional agriculture organizational field (DiMaggio & Powell, 1983; Tolbert & Zucker, 1983). For example, all of the mainstream farm organizations have elected boards of directors (minimum of 5 directors) as required by government legislation for registered nonprofit societies. In the case of organizations involved in the marketing of regulated food products, the legislative requirement is even more explicit. Another common characteristic of conventional farm organizations is their committee system for addressing specific issues and performing different organizational functions. This latter structural characteristic is indicative of conventional farm organizations' modelling themselves after those which are viewed as more successful or legitimate. For example, leaders of a number of newly formed conventional product commodity organizations stated that they had adopted the organizational model of the B.C. Cattlemen's because it was a successful exemplar of an agricultural product commodity group. Similarly, while more restricted in geographic scope, leaders of local regional farm interest groups stated that they operated in similar ways to the provincial B.C. Federation of Agriculture.

Within B.C. organic agriculture, there was initially presumed to be a unity of interests and forms. As related in the case study analyses of the recent formation of the individual organic certifying associations, the majority were initially organized on the SOOPA organizational model and had adopted (with minor modifications) the SOOPA constitution, by-laws and certification standards. It should be noted that the SOOPA organizational model and procedures were derived from other established organic associations located in the United States. However, the experience surrounding the development of provincial certification standards made visible the diversity in organizational philosophies and forms which had evolved within this organizational field. In those organizations which espoused a more radical environmentalist philosophy, there had been a movement towards more egalitarian, consensus based organizational processes coupled with more restrictive organic certification standards. In those organizations which adopted a less radical approach, there was the adoption of organizational structures and processes reflective of those which existed within the conventional agriculture organizational field. As often stated by members of these organizations, one of the primary motivations for organizing was to obtain legitimacy for organic agriculture with the public and with the government. On the other hand, this goal was significantly less important for those organic certifying associations which viewed government legitimation as a threat rather than an advantage in promoting an agenda for social, political and environmental change in agriculture.

Returning to Whitt's (1979) framework of power, the emerging divergence within the organic agriculture organizational field can be framed as a contest between ideological perspectives concerning the operation of power within society. As evidenced by the statements and actions of those in certifying associations which supported the government initiative to legitimate organic food production methods, members of these organizations viewed themselves as operating within an organizational field which was continuously shifting and where the state operates as a broker between competing interests (pluralistic model of power). It is important to note that the government employees involved in developing the organic food regulations also shared this perspective on their role in agriculture. In contrast, those within certifying associations which opposed government intervention were more philosophically predisposed to viewing society as operating on a power elite model or a class dialectic model. For these players, there was nothing to gain and much to lose by collaborating with institutional elites or societal institutions which they regarded as self-serving and antagonistic to fundamental social and political change.

One insight that can be derived from this case study of organic agriculture is that the process of institutionalization is facilitated by ideological congruence within an organizational field. In organizational fields where there is an ideological contest over the need for and nature of organizational legitimacy, two outcomes are possible. One outcome is that the ideological contest can delay or postpone isomorphic change processes to gain legitimacy. An alternative outcome is that the organizational field becomes fragmented into parallel sub-fields organized on the basis of ideology rather than on products or services. Both outcomes were observed in this case study. What longer range predictions can then be made as to the legitimacy and survival of each sub-field of organic agriculture in B.C.? In their study of civil service reform by cities, Tolbert and Zucker (1983) found that the adoption and diffusion of a change in formal organizational structure was more rapid when required by law. Therefore, one prediction for the organic agricultural field in B.C. is that the introduction of government sanctioned regulations will facilitate the adoption of the COABC organizational model rather than the ABCOPA model. Over time, the organizational field will become even more homogeneous through the dual processes of coercive isomorphism (political influence and mandate) and mimetic isomorphism (imitation of those viewed as more successful and legitimate).

Another challenge to farm organizations concerns the economic viability of the agriculture sector itself. In the view of many of the farmers interviewed, if political, social and economic trends continue in their current direction, farmers themselves are an endangered species in the Canadian economy. The farm population in Canada has been declining at a steady rate over the past 40 years (although B.C. appears to be a recent exception with an increase in the farm population in the last 5 years). As a result of rapidly increasing production costs and land prices coupled with declining product prices at the farm gate, many question whether farming is an economically viable livelihood. Within this context of economic threat, the relationship between government and the agriculture industry could be characterized as a turbulent one. On the one hand, the majority of farmers and their farm organizations collaborate closely with government agencies and are the beneficiaries of numerous government programmes. On the other hand, they also frequently identify government policies and lack of support for agriculture as sources of their financial distress, whether it be at international (GATT, free trade, international subsidies), national (withdrawal of tariffs and financial support programmes, government research, pesticide regulation), provincial (government regulations, extension services, the ALR) or local (urban encroachment, municipal restrictions and services) levels. For those farm organizations which include political advocacy as one of their primary roles, their purpose is clear -- to protect the interests of their members in the face of economic adversity. For as one farm organization leader pointed out, if the B.C. agriculture industry "goes down" then so does the membership and influence of farm organizations in the province.

In contrast to this scenario of distress, there is evidence within the B.C. agriculture industry of growth and optimism. Those who have diversified into specialty products for niche markets are perhaps the most optimistic about their personal future as farmers. Others who are more positive about the future are also more likely to operating smaller diversified farms and selling outside of established marketing and distribution channels. Operating outside of the mainstream of government agricultural support programmes appears to be working for these individuals. Their organizations are generally small and have a narrow pragmatic focus with little of the internal difficulties of their larger counterparts.

Whether the small diversified and independent farmer will become the norm rather than the exception in B.C. agriculture remains to be seen. But if such were the case, it would mean a significant realignment in the roles and operation of the current population of farm organizations.

SECTION V. FUTURE INNOVATIONS IN AGRICULTURE

New technological innovations are sometimes heralded as "breakthroughs" which will radically change the status quo for the better. Biotechnology is no stranger to claims that it will revolutionize the type and way food will be produced. Biogenetic engineering techniques can accelerate the natural breeding and selection process of organisms, plants and animals. Biogenetic engineering techniques can provide greater control in the selection of which genetic qualities are to be enhanced. Through genetic manipulation, scientists can also create new life forms by combining the genes from different species.

As discussed in Chapter 2, biotechnology is being promoted by industry and government as the new wave of agricultural innovations which will transform agricultural practices and products. Amongst the many potential changes that have been identified are the reduction or elimination of the use of synthetic agrichemicals for fertilization and pest control. This would be facilitated by the introduction of bioengineered nitrogen fixing and pest resistant crop seeds and the development of bioengineered biological controls. If this outcome is realized, it could mean a radical shift away from agrichemicals and the environmental problems resulting from their use. Whether new environmental problems would be created by bioengineered products is a highly contested issue (Doyle, 1985; Hobbelink, 1991; Kenney, 1989; Rifkin, 1983; OECD, 1988; among others). Irrespective, agricultural systems based on bioengineered solutions to traditional production problems have the potential to radically transform current ones -- conventional and organic.

One question concerns whether biotechnology has the potential to transform the social and political structure of the agricultural sector. Will it prompt a redistribution of power and influence amongst sectional interests in agriculture? Specifically, will biotechnology change the current relationship between individual farmers and agribusiness interests? As Clegg (1989, p. 215) observes in his description of the third circuit of power which provides for system integration through domination,

> ...changes in the process of innovation...always pose potential transformations for the extant structuring of empowerment and disempowerment, dependent upon extant techniques of production and discipline. The techniques are not only carriers of innovation but almost invariably bearers of domination. Thus, domination is never eternal, never utterly set in time and space: it will invariably be subject to processes of innovation which may as readily subvert as reproduce its functioning. (Clegg, 1989, p. 215)

To what degree then is biogenetic engineering technology a vehicle for transforming the structure of agriculture? Do these innovations represent opportunities for empowerment or disempowerment for individual farmers?

This examination of biogenetic engineering technology innovations is conducted at the level of the individual farmer. By doing so, comparisons with similar individual level data concerning organic farming and synthetic agrichemicals can be made. There is also an interest in learning how a new innovation is being received at the level of the potential adopter. Given that there are very few bioengineered products currently in the marketplace, this permits an analysis of perceptions about a set of innovations prior to their adoption. Therefore, this is an evaluation based on prospective claims rather than observation or experience. From this analysis of farmers' views on biogenetic engineering technology, projections can then be made as to future acceptance or rejection of the products of this radically new direction in agricultural research.

CHAPTER 9. BIOGENETIC ENGINEERING TECHNOLOGY IN AGRICULTURE

While biogenetic engineering is the latest direction for innovations in agriculture, it is also one of the most controversial -- an expectation which was realized in this research study. The analysis of respondents' views concerning biogenetic engineering technology follows a similar tack as the analysis in Chapter 5 which focused on organic farming and synthetic agrichemicals. It involves first ascertaining farmers' level of knowledge (Part A) and sources of information (Part B) about biotechnology; second, ascertaining farmers' beliefs and attitudes regarding biogenetic engineering technology (Part C); and third, determining farmers' willingness to adopt specific bioengineered agricultural products (Part D). An additional measure of farmers' perceptions regarding the risks associated with biotechnology, as compared to synthetic pesticides, is provided by their assessment of government's regulatory role regarding both sets of innovations (Part E). From the perspective of the enduser of both sets of innovations, should the regulation of biotechnology be stricter, the same or less than the regulatory system currently in place for chemical pesticides? Given the relationship between biogenetic engineering and patent protection, farm organization leaders were also asked their views and involvement with the federal Plant Breeders' Rights Act.

As discussed in Chapter 3, during the initial innovation awareness stage, mass media communication channels are relatively more important than at later stages of the innovation diffusion cycle (as per Rogers, 1983, and others). For a new innovative technology such as biogenetic engineering, one question concerns the degree to which this observation can be supported. Thus, the first research questions to be explored in this chapter on biogenetic engineering technology concern sources of information:

> What communication channels do farmers access for information concerning biogenetic engineering innovations? (Research Question 5)
>
> For farmers (conventional and organic), the primary sources of information about biogenetic engineering innovations will be through mass media communication channels.(Research Question 5b)

Of particular interest in this analysis is whether there are differences between conventional and organic farmers in their assessments of biogenetic engineering technology and if so, the nature of and reasons for those differences. Also of interest is whether a farmer's attitude towards biogenetic engineering technology is more related to his/her socioeconomic characteristics. In regards to perceptions about biogenetic engineering technology, Chapter 2 identified that there is significant debate and conflict within the scientific community and between biotechnology researchers and environmentalists about the practical and ethical implications of biotechnology. Of interest in this research study of perceptions about innovations is the degree to which organic and conventional farmers are aware of this controversy and their positions in the debate. Thus, the following research questions are explored in this chapter:

> Are there differences between organic and conventional farmers in how they perceive biogenetic engineering technology in agriculture? (Research Question 12)
>
> Are organic farmers different from conventional farmers in respect to their perceptions of the potential benefits (Research Question 12a) and/or the potential costs/risks (Research Question 12b) associated with biogenetic engineering technology?

The next focus for inquiry is farmers' perceptions and evaluations of specific attributes of biogenetically engineered agricultural innovations. In the preliminary analysis of perceived innovation attributes in Chapter 3, it was suggested that biotechnological innovations in agriculture represented a positive constellation of attributes for both conventional and organic farmers. Given that biotechnology research is being primarily conducted by the industrial producers of synthetic agrichemicals (see Chapter 2), many of the products of this line of research are being promoted as complementary to existing conventional agricultural production methods. For those practising organic farming production methods, biotechnology represents a nonchemical alternative to facilitating agricultural production and as such, bioengineered products could be easily integrated into existing organic farming practices. On the other hand, the ethical controversy surrounding this new technology may moderate the acceptance of bioengineered agricultural products by both organic and conventional farmers. As the potential end users of bioengineered products, one measure of farmers' attributions is ascertaining which types of bioengineered agricultural products conventional and/or organic farmers would be interested in trying or alternatively, not willing to use and why. Thus the following research questions are identified for investigation:

> Are there differences between organic and conventional farmers in their evaluation of the perceived attributes of biogenetically engineered agricultural products? (Research Question 13)
>
> Both conventional and organic farmers will hold positive beliefs about the relative economic advantages of biogenetic engineering innovations. (Research Question 13a)
>
> Both conventional and organic farmers will view biogenetic engineering innovations as being compatible with their existing agricultural practices.(Research Question 13b)
>
> Both conventional and organic farmers will attribute low complexity to the incorporation of biogenetic engineering innovations with their existing agricultural practices.(Research Question 13c)
>
> Biogenetic engineering innovations in agriculture will be perceived by farmers (conventional and organic) to require incremental changes to their existing agricultural practices.(Research Question 13d)

At each stage in the analysis it is also instructive to determine whether there are relationships between different information sources and farmers' attitudes towards biogenetic engineering technology and willingness to adopt bioengineered agricultural products. In this way, one can track the influence of various communication modes on attitude formation concerning a new set of innovations.

> What is the influence of various information sources on farmers' attitudes towards and stated intentions to use bioengineered products? (Research Question 14)

In addition to conducting comparisons based on agricultural production method (conventional vs. organic), this analysis also explores the possibility that acceptance or rejection of agricultural bioengineered products may also be related to other aspects of farmers' personal contexts. Therefore, the research question to be addressed is:

> To what extent is a farmer's willingness to try out biogenetically engineering agricultural innovations related to his/her socioeconomic characteristics, agricultural production experience, and assessment of biotechnology's projected benefits, costs and risks?
> (Research Question 15)

The data regarding sources of information and perceptions of biotechnology lead into an exploration of questions regarding the championship (or nonchampionship) and the influence of that championship (or nonchampionship) on potential endusers. Based on a preliminary analysis of literature on biotechnology (see Chapter 2), it would appear that at this stage of development, biotechnology is being championed by organizations and interest groups rather than individuals. One question to be addressed in this study is whether farmers also perceive the championship of biogenetic engineering technology to operate in the following ways:

> The championship role for biogenetic engineering innovations will tend to be diffused among organizations and/or societal interest groups and will more closely resemble that of the management innovation champion. (Research Question 16c)
>
> Champions of biogenetic engineering innovations are centrally situated in societal level sociometric and communication networks. (Research Question 16d)

In this analysis, there is an interest in ascertaining whether farmers, as the potential adopters of bioengineered agricultural innovations have witnessed or been involved in political action to promote biotechnology and supportive legislation such as the Plant Breeders Rights Act. Based on evidence in the research literature, it would appear that champions of biogenetic engineering innovations would have the resources to be able to employ a wide range of collaborative and competitive political tactics in the promotion of this technology.

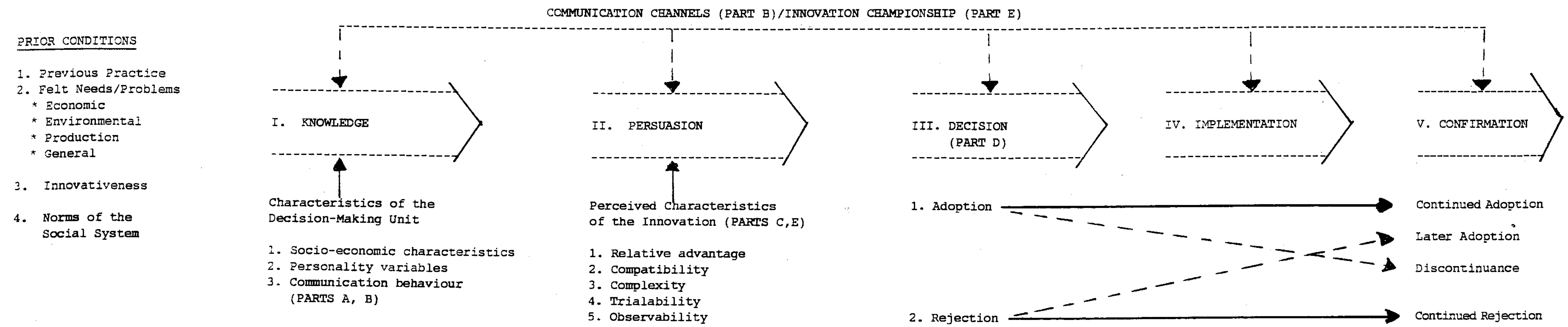
> Championship of biogenetic engineering innovations will encompass both competitive and collaborative political strategies. (Research Question 17b)

The last feature of innovation championship to be addressed in this chapter concerns the interrelationship between social and technological innovation. As observed by Frost and Egri (1991), the need for supportive social innovations is particularly important when championing a radically new technological innovation. As discussed in Chapter 3, while biotechnology represents a radically new direction in scientific research, it also benefits from being championed by established parties in research, industry and government. Compared to organic farming, biotechnology does not challenge existing power relationships amongst key players in the agricultural sector and thus there is lesser need for social innovations in organizing and influencing others. An integrative analysis of the results of this inquiry into this facet of innovation championship is guided by the following research questions:

> To what degree does the championship of biogenetic engineering technology involve social innovation? (Research Question 18)
>
> Individual and organizational champions of organic farming will exhibit a greater propensity than champions of biogenetic engineering to develop new social innovations in the way they interact and influence others to engender public and governmental support for their proposed changes. (Research Question 18a)

In total, this chapter offers an integrative analysis of biogenetic engineering technology in agriculture from the perspective of the potential adopters of its products. As such, preliminary predictions can be made regarding the potential acceptance or rejection of this set of agricultural innovations.

FIGURE 9-1. ANALYSIS OF DECISION MAKING PROCESS REGARDING BIOGENETIC ENGINEERING TECHNOLOGY IN AGRICULTURE



4. Norms of the Social System (Organic vs. Conventional Farming)

3. Communication behaviour (PARTS A,B)
- knowledge of biotechnology (RQ# 5b)
- sources of information re: biotechnology in agriculture (RQ# 5b)

Perceived Characteristics of the Innovation (PART C)
- benefits (RQ# 12a)
- costs/risks (RQ# 12b)
1. Relative advantage (RQ# 13a)
2. Compatibility (RQ# 13b)
3. Complexity (RQ# 13c)
4. Trialability (RQ# 13d)

* Perceptions X Information sources (RQ# 14)
* Benefits & Risks (PART E)
  - Regulation of biotechnology (RQ# 13)

III. DECISION (PART D)
1. Adoption
2. Rejection

- stated intention to use bioengineered products (RQ# 14, 15)
* Use intentions X Information sources (RQ# 14)
* Use intentions X Socioeconomic characteristics (RQ# 15)
* Use intentions X Perceived Benefits and Costs/Risks (RQ# 15)

INNOVATION CHAMPIONSHIP (PART E)
- Identified champions (RQ# 16c)
- Champions' location in sociometric & communication channels (RQ# 16d)
- Championship of plant breeders rights legislation:
  - type of politics (RQ# 17)
  - development of social innovations (RQ# 18a)

PART A. KNOWLEDGE OF BIOGENETIC ENGINEERING TECHNOLOGY IN AGRICULTURE

Given the newness of biotechnology research, it was expected that there farmers interviewed would not be very knowledgeable about biotechnology in general or bioengineered agricultural products. The overall level of farmers' knowledge or awareness of biogenetic engineering technology within agriculture was assessed on a three point scale (2 = yes, well informed; 1 = yes, a little knowledge; 0 = no prior knowledge). Of the 112 respondents who answered questions regarding biogenetic engineering technology, the majority stated that they were relatively well informed (57.1%); a lesser number said that they knew a little (37.5%) and only six respondents (5.4%) said they had no prior knowledge of this technology in agriculture. [see Table 9-1]

Statistical analyses were also conducted to determine whether socioeconomic characteristics (age, gender, education level) or work experience variables (number of years farming experience, number of years organic farming experience, size of farm operation, geographic location) were related to overall knowledge about biotechnology. With the sole exception of general education level, there were no statistically significant differences in terms of prior knowledge level about biotechnology. Analysis of variance intergroup comparisons based on education level revealed that individuals with post-graduate university education (mean = 1.70) had significantly ($p = .05$) greater prior knowledge about biotechnology than individuals who did not have any post-secondary education [grade school education (mean = .50); partial high school (mean = 1.25); high school graduation (mean = 1.31)]. Individuals with partial university/college diplomas also scored higher on prior knowledge level than individuals with high school graduation. Intergroup comparisons based on production method (organic, bio-dynamic, conventional, organic-conventional) failed to yield statistically significant differences regarding prior knowledge about biotechnology at the $p < .05$ level ($F_{(4,108)} = 1.5292$, $p = .1988$).

TABLE 9-1. KNOWLEDGE CONCERNING BIOGENETICALLY ENGINEERED PRODUCTS AND RESPONDENT PRODUCTION TYPE

KNOWLEDGE LEVEL	TOTAL GROUP No. (%)	ORGANIC FARMERS No. (%)	CONVENTIONAL FARMERS No. (%)	ORGANIC-CONVENTIONAL FARMERS No. (%)	BIODYNAMIC FARMERS No. (%)
Well Informed (2)	65 (57.5%)	38 (69.1%)	21 (48.8%)	2 (33.3%)	3 (37.5%)
A little knowledge (1)	42 (37.2%)	14 (25.5%)	20 (46.5%)	3 (50.0%)	5 (62.5%)
No prior knowledge (0)	6 (5.3%)	3 (5.4%)	2 (4.7%)	1 (16.6%)	0 (00.0%)
TOTAL	112 (100%)	55 (100%)	43 (100%)	6 (100%)	8 (100%)
Means	.4780	.3636	.5581	.8333	.6250
Std. dev.	.5990	.5889	.4897	.7528	.5175

In regards to the specific types of biogenetically engineered products which respondents were aware of, the most often cited product categories were crop seeds/plant root stocks (64 responses); genetic resistance to pests and diseases (47); new animals (30); and new organisms to deal with pests (21). Less often mentioned were plants with enhanced nitrogen fixating qualities (8) and Bovine Somatropin (BST), a genetically engineered hormone to enhance milk production in dairy cows (5). Between groups analysis of variance revealed no statistically significant differences (at $p < .05$ level) in product category knowledge based on the farmer's production method (organic, bio-dynamic, conventional, organic-conventional). However, knowledge of individual product categories did prove to be correlated with a number of socioeconomic characteristics. Specifically, respondents with higher general education levels more often mentioned genetic resistance to pests and disease ($r = .2275$, $p = .009$, $n = 108$) and nitrogen fixating in plants ($r = .2204$, $p = .011$). Respondents who were in organizational leadership positions were more knowledgeable about new crop seeds/plant root stock ($r = .2031$, $p = .015$) and new animals ($r = .1555$, $p = .05$). Women were relatively more knowledgeable than men in regards to nitrogen fixating in plants ($r = .1848$, $p = .025$) and new animals ($r = .1582$, $p = .047$).

In terms of production method type, the newer organic farmers (i.e., those with fewer years experience organic farming) were more knowledgeable about new crop seeds/plant root stock ($r = -.2078$, $p = .014$) but less knowledgable about nitrogen fixating in plants ($r = .1991$, $p = .017$). Significant positive correlations between scale of farm operations (number of acres) and knowledge concerning new organisms to deal with pests ($r = .1653$, $p =.041$)), BST ($r = .405$, $p < .000$), and new animals ($r = .2187$, $p = .011$) were found.

<u>Discussion</u>. It appears that general education level, scale of operation, gender, leadership role and organic farming experience have some degree of influence on the level and type of biogenetic product knowledge held by farmers. These findings are consistent with two of Rogers' (1983) summary generalizations about early versus late knowers of innovations. Specifically, earlier knowers of an innovation have more education and have more social participation (as measured by farm organization leadership status) than later knowers. This analysis also suggests that younger farmers operating larger sized farms are the more active seekers of information about this new technology.

PART B. SOURCES OF INFORMATION ABOUT BIOTECHNOLOGY

The next stage in this analysis concerns which sources of information have been utilized by farmers to learn about biotechnology. Respondents cited an average of 1.708 (s.d. = 1.02, n = 113) different sources of information regarding biotechnology. The most often mentioned sources of information regarding biotechnology were agricultural publications (31.6% of all sources mentioned) and the electronic mass media (television in general, 28%; CBC programme "Nature of Things with David Suzuki", 5.7%) [see Table 9-2]. The next most often mentioned sources of information were education courses and conferences (8.8%), scientific researchers (8.3%), and farm organizations (6.2%). Other farmers (4.1%), government (government extension agents (2.6%), government publications (1.5%)) and suppliers of agricultural products (2.6%) played a much lesser role as sources of information regarding this new technology.

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TABLE 9-2. SOURCES OF INFORMATION REGARDING BIOTECHNOLOGY IN AGRICULTURE

INFORMATION SOURCE	No.	(%)
Other Farmers	8	(4.1%)
Farm Organizations	12	(6.2%)
Agricultural Publications	61	(31.6%)
Industrial Suppliers	5	(2.6%)
Education Courses/Conferences	17	(8.8%)
Scientific Researchers	16	(8.3%)
Government Extension Agents	5	(2.6%)
Government Publications	3	(1.5%)
Television -- General	54	(28.0%)
Television-- "Nature of Things"	11	(5.7%)
Other	1	(0.5%)
Total number of Sources	193	(100.0%)
Average per Respondent	1.71	
No. of Respondents	113	

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Intergroup comparisons based on production method and farm organization leadership position (leader vs. member) revealed no statistically significant differences in terms of the total number of different information sources mentioned. Neither were there significant differences that could be traced to other socioeconomic characteristics such as age, gender, or farming experience (total and organic). However, geographic location is related to the total number of different sources accessed for information. Respondents located in the Vancouver Island (mean = 1.92) and Lower Mainland/Fraser Valley (mean = 2.47) regions utilized a significantly greater number of different information sources than those in other regions of the province [$F_{(6,106)} = 3.0531$, $p = .0085$]. While there were no observed differences in knowledge level by geographic location, the utilization of a greater variety of information sources appears to contribute to an individual's overall level of knowledge regarding biotechnology ($r = .4586$, $p = .001$). Therefore, closer proximity to an urban centre appears to offer greater opportunities to access different information sources and contribute to one's knowledge level. Given the observation that early adopters of an innovation are also more active seekers of information than later adopters (Rogers, 1983, and others), this finding would suggest that farmers located closer to urban centres have greater potential to be early adopters of biogenetic engineering technology innovations.

An examination of the relationship between socioeconomic characteristics and individual information sources revealed few significant correlations. Respondents who indicated industrial suppliers tended to be older ($r = .2137$, $p < .05$) and have more years total farming experience ($r = .1987$, $p < .05$). Amongst those respondents with organic or bio-dynamic farming experience, those with fewer years organic farming experience cited education courses and conferences more often as a source of information about biotechnology ($r = -.2062$, $p < .05$). Farmers with smaller sized farms (total acres) also tended to rely more on television as a source of information ($r = -.2154$, $p < .05$). However, there appears to be a relationship between a respondent's general education level and the type of information source cited. The two conventional farmers with only grade school education cited only other farmers as an information source regarding biotechnology (mean = .50, s.d.= .71). For farmers with high school graduation (mean = .15, s.d. = .37), these farmers relied more on other farmers than did farmers with university bachelor degrees (mean = .04, s.d. = .20) or farmers with post-secondary education [college/partial university (mean = .03, s.d. = .17) or post-graduate education (mean = .10, s.d. = .32)] [$F_{(5,102)}$ = 2.7975, p = .02]. Respondents with post-graduate education (mean = .50, s.d. = .53) were also more likely to cite scientific researchers as a source of information than respondents with lower levels of education [$F_{(5,102)}$ = 2.7189, p = .0239]. There were no significant differences between production method groups on this variable.

To partially test Research Question 5a which proposes that mass media communication channels would be the primary sources of information regarding biogenetic engineering technology, three statistical procedures were conducted. First, a factor analysis (principal components analysis, varimax rotation, Kaiser normalization) revealed there to be five factors with eigenvalues in excess of 1.00 [see Table 9-3]. Individual information source items loading in excess of + or - .50 on a factor were as follows:

Factor 1. Farmer Information Sources
- Other farmers
- Farm organizations

Factor 2. Government Sources/Industrial Suppliers Sources
- Government extension agents
- Government publications
- Industrial suppliers

Factor 3. Mass Media Sources
- Television
- CBC program "The Nature of Things"

Factor 4. Education and Research
- Education courses and conferences
- Scientific researchers

Factor 5. Agricultural Media
- Agricultural publications

TABLE 9-3. BIOTECHNOLOGY INFORMATION SOURCES -- FACTOR ANALYSIS
(Principal-Components Analysis, Varimax Rotation)

Information Sources	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
1. Other Farmers	.80988	-.07691	-.06716	.05503	-.20939
2. Farm Organizations	.81802	.07062	.04184	-.03774	.12050
3. Agricultural Publications	-.12736	.24111	-.11595	.14975	.68962
4. Industrial Suppliers	.17060	.55961	-.25374	-.17724	-.19873
5. Education Courses/ Conferences	-.21326	-.21976	-.28882	.67004	.24650
6. Scientific Researchers	.16063	.05096	.21739	.76255	.13413
7. Govt. Extension Agents	-.14065	.62821	-.22335	-.11204	-.04616
8. Government Publications	.05242	.75348	.17360	.14998	.22379
9. Television-- General	-.37381	-.17123	.72650	-.09299	-.07079
10. Television-- "Nature of Things"	.21955	-.06604	.65476	.11963	-.22585

FACTOR	Eigenvalue	Pct. of Variance
1	1.78162	16.2
2	1.63445	14.9
3	1.16093	10.6
4	1.14369	10.4
5	1.03684	9.4

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While the variables loading on Factor 2 appear to be counter-intuitive (that is combining public sector and private industrial sector sources), it could be argued that each provides technical advice in response to specific problems. Based on these factor analysis results, new summary variables were computed representing each factor grouping. The results of the nonparametric test (Friedman two-way analysis of variance by ranks) conducted to determine whether there were significant differences between these five types of information sources are shown in Table 9-4.

Examination of the mean rankings indicate that Mass Media and Agricultural Media sources are substantially higher than those of Farmers/Farm Organizations, Government, and Education and Research information sources thus lending support to Research Question 5a that mass media communication channels (as represented by television and industry level print media) are the most relied upon sources of information regarding biogenetic engineering technology. This also confirms the summary findings of Rogers (1983) that during the early knowledge awareness stage of an innovation, mass media communication channels are relatively more important than interpersonal communication channels.

The next aspect of information sources to be addressed concerns how each contributes to overall and specific product knowledge levels. Analysis of variance tests between type of knowledge (general level and specific product categories) and individual information sources revealed only three significant correlations at the p = .05 level. Those farmers citing scientific researchers as a source of information about biotechnology were also more likely to have a higher general knowledge level [total group: $F_{(2,109)} = 5.484$, $p = .005$; conventional farmer subgroup: $F_{(2,40)} = 5.1163$, $p = .0105$]. Mention of television as an information source also contributed to farmers' statement that they were well informed regarding biotechnology [total group: $F_{(2,109)} = 3.253$, $p = .042$]. A positive correlation between knowledge of new biological controls to combat pests and disease and the citation of agricultural publications ($r = .2585$, $p = .01$) as a source of information was also found.

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TABLE 9-4. NONPARAMETRIC TEST OF SOURCES OF INFORMATION REGARDING BIOGENETIC ENGINEERING TECHNOLOGY

Information Source	Mean	Std.dev.	Friedman Mean Rank
Farmers/Farm organizations	.17699	.48606	2.60
Government	.07080	.29022	2.42
Mass media	.57522	.63815	3.51
Education and Research	.29204	.52917	2.89
Agricultural Media	.54867	.51740	3.58

Chi-Square = 49.9875, df = 4, p < .0000

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Discussion. In addition to confirming the research question that mass media communication channels are the most important information sources during the early knowledge awareness stage of the innovation decision making process, these findings suggest a linkage between education level and communication behaviour during this stage. As earlier found in this analysis, there was a positive relationship between farmers' education level and their knowledge level, a finding which confirms that of other researchers of the innovation diffusion process (see Rogers, 1983). The finding that those with higher education levels were less likely to rely on interpersonal information sources and more likely to have had contact with scientific researchers (potential change agents) conforms to the profile of earlier adopters of innovation therefore suggesting that those with higher education would be more likely to give positive attributions and indicate a greater willingness to try new bioengineered agricultural innovations. That there were no significant differences in knowledge levels and type of information source between conventional and organic farmers suggests that the same would hold true for both groups. However, knowledge of an innovation is not, in and of itself, neutral -- the extent to which one's knowledge is of the positive or negative attributes of an innovation can significantly influence its adoption as will be explored in the following parts of this chapter.

PART C. BELIEFS AND ATTITUDES REGARDING BIOGENETIC ENGINEERING TECHNOLOGY

To determine their general beliefs and attitudes regarding biogenetic engineering technology in agriculture, farmers were asked what they perceived were first, the potential benefits to be realized from this technology and second, the potential costs or risks associated with biogenetic engineering technology. The summary results of these two open-ended questions are provided in Table 9-5.

A significant proportion (30%) of respondents stated there were no benefits to be derived from biotechnology in agriculture and an additional 10.6% stated benefits would be short term only. Many of these farmers were those practising organic or bio-dynamic farming methods. Amongst the most commonly identified benefits were: enhanced plant resistance to pests and diseases (30.1%); increased production yields (23.0%); and the reduced need for agrichemicals (17.7%). There were significant positive intercorrelations between the identification of genetic plant resistance to pests and reduced need for agrichemicals ($r = .2359$, $p < .01$) and enhanced food quality ($r = .2389$, $p < .01$) as well as between the identification that biotechnology is more environmentally sound and the reduced need for agrichemicals ($r = .2711$, $p < .01$) and enhanced food quality ($r = .4932$, $p < .001$).

Examination of these data indicate that there are a substantial number of farmers ($n = 34$) who saw no benefits associated with biogenetic engineering technology in agriculture. These farmers do not believe that biogenetic engineering technology will reduce agrichemical use ($r = -.2906$, $p < .001$), increase production yields ($r = -.3539$, $p < .001$) or increase the quality of food produced ($r = -.2179$, $p < .05$). They also do not feel that scientific progress as represented by biotechnology is necessary ($r = -.2179$, $p < .05$).

TABLE 9-5. PERCEPTIONS OF BENEFITS AND COSTS/RISKS OF BIOTECHNOLOGY and ATTITUDES TOWARDS BIOTECHNOLOGY RESEARCH

	TOTAL GROUP (N = 112)	ORGANIC FARMERS (N = 55)	CONVENTIONAL FARMERS (N = 43)	ORG.-CONV. FARMERS (N=6)	BIODYNAMIC FARMERS (N=8)
	Means (s.d.)	Means (s.d.)	Means (s.d.)	Means (s.d.)	Means (s.d.)
Perceived Benefits					
1. Don't know	.1150 (.3205)	.0909 (.2401)	.1860 (.3937)	.0000 (.0000)	.0000 (.0000)
2. No Benefits	.3009 (.4607)	.4364 (.5005)	.0698 (.2578)	.3333 (.5164)	.6250 (.5175)
3. Short term benefits only	.1062 (.3095)	.1636 (.3734)	.0465 (.2131)	.1667 (.4082)	.0000 (.0000)
4. Genetic plant resistance to pests	.3009 (.4607)	.1636 (.3734)	.4651 (.5047)	.3333 (.5164)	.3750 (.5175)
5. Increase production yields	.2301 (.4228)	.1091 (.3146)	.4186 (.4992)	.1667 (.4082)	.0000 (.0000)
6. Reduce need for agrichemicals	.1770 (.4060)	.0909 (.3482)	.3023 (.4647)	.0000 (.0000)	.2500 (.4629)
7. Grow plants in different areas	.0442 (.2066)	.0364 (.1889)	.0465 (.2131)	.1667 (.4082)	.0000 (.0000)
8. Uniformity in production	.0177 (.1324)	.0182 (.1348)	.0233 (.1525)	.0000 (.0000)	.0000 (.0000)
9. Enhance nitrogen-fixating	.0088 (.0941)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.1250 (.3536)
10. Reduce labour costs	.0088 (.0941)	.0000 (.0000)	.0233 (.1525)	.0000 (.0000)	.0000 (.0000)
11. Is more environmentally sound	.0354 (.1856)	.0182 (.1348)	.0698 (.2578)	.0000 (.0000)	.0000 (.0000)
12. Enhances food safety	.0088 (.0941)	.0909 (.2901)	.0233 (.1525)	.0000 (.0000)	.0000 (.0000)
13. Enhances food quality	.1062 (.3095)	.0727 (.2621)	.1395 (.3506)	.0000 (.0000)	.0000 (.0000)
Perceived Costs/Risks					
1. Don't know	.0280 (.1659)	.0000 (.0000)	.0280 (.1659)	.0000 (.0000)	.0000 (.0000)
2. No costs/risks	.0935 (.2924)	.0727 (.2621)	.0935 (.2924)	.0000 (.0000)	.0000 (.0000)
3. Loss of genetic biodiversity	.2710 (.4466)	.3636 (.4855)	.2710 (.4466)	.5000 (.5477)	.2500 (.4629)
4. Vertical integration of agribusiness	.2150 (.4127)	.2545 (.4396)	.2150 (.4127)	.1667 (.4082)	.3750 (.5175)
5. Tradeoffs with positive features	.1963 (.3990)	.2000 (.4037)	.1963 (.3990)	.3333 (.5164)	.2500 (.4629)
6. Will not reduce agrichemical usage	.0935 (.2924)	.1636 (.3734)	.0935 (.2924)	.0000 (.0000)	.2500 (.4629)
7. Will be too expensive	.0841 (.2789)	.0182 (.1348)	.0841 (.2789)	.1667 (.4082)	.0000 (.0000)
8. Unpredictability of envir. outcomes	.2710 (.4466)	.3273 (.4735)	.2710 (.4466)	.3333 (.5164)	.5000 (.5345)
9. Problems of controlling new organisms	.2523 (.4364)	.2727 (.4495)	.2523 (.4364)	.0000 (.0000)	.1250 (.3536)
Attitude toward Biotechnology Research					
Positive					
1. Scientific progress is necessary	.1062 (.3095)	.0727 (.2621)	.1395 (.3506)	.1667 (.4082)	.0000 (.0000)
Negative					
1. Research should be in other areas	.1869 (.3917)	.2364 (.4288)	.1869 (.3917)	.0000 (.0000)	.6250 (.5175)
2. Unknowns about research outcomes	.2710 (.4466)	.3273 (.4735)	.2710 (.4466)	.1667 (.4082)	.3750 (.5175)
3. Is unnatural	.2243 (.4191)	.3273 (.4735)	.2243 (.4191)	.1667 (.4082)	.5000 (.5345)

In respect to perceived costs or risks associated with biotechnology in agriculture, only 9.4% of farmers stated they saw none. The most frequently mentioned potential costs/risks were: unpredictability of long term environmental outcomes (27.1%); the loss of genetic biodiversity (27.1%); problems with controlling new organisms upon release into the natural environment (25.2%); the threat of vertical integration of business (21.5%), and tradeoffs with quality and other positive features in products (25.2%).

Those costs/risks which were most closely associated with each other were tradeoffs with positive features and loss of genetic diversity ($r = .3607$, $p < .001$). The threat of vertical integration of business was closely associated with the belief that it will not reduce the use of agrichemicals ($r = .4126$, $p < .001$) and the unpredictability of environmental outcomes ($r = .2119$, $p < .05$) thus indicating some level of distrust of those involved in biotechnology research.

In comparison to the 10.5% of farmers who stated that scientific progress as represented by biogenetic engineering was necessary, 22.4% of farmers stated that such research was "unnatural" while 18.7% felt that research should be directed towards other areas or problems. Intercorrelation analysis revealed that those who felt such scientific progress was necessary also identified biotechnology was environmentally sound ($r = .2598$, $p < .01$). In contrast, the belief that biotechnology research was unnatural was closely associated with statements that such research will lead to a vertical integration of agribusiness ($r = .1767$, $p < .05$), that research should be in other directions ($r = .3510$, $p < .001$), and that it will not reduce agrichemical usage ($r = .2449$, $p < .01$).

Discussion. As these data indicate, while farmers identified several potential benefits to be derived from biotechnology research, they identified many more costs and risks. Their major concern can be traced to a perception that the enhancement of production resulting from biotechnology will come at the prices of a more vertically integrated agribusiness (i.e., more corporate control over prices and supply of production inputs), tradeoffs with current positive product features, and the loss of genetic biodiversity. Many farmers also expressed serious environmental and ethical concerns with biotechnology research and for these reasons, several advocated avoidance of this line of research.

The following quotes provide illustrations of the wide range of favourable and negative responses which the concept of bioengineering technology evoked. Some of the farmers were very enthusiastic about the potential production benefits of bioengineered plants.

> "I'm getting into it. I am interested in it. The potentials are fantastic especially in ways of faster producing, producing evener plants where you have 1000 plants and you don't have any cull plants, an·evener, more uniform grown, more uniform production. Spraying pesticides is going to be eliminated. [Q: Any potential costs or risks?] No. We can't turn the clock back anymore. We have to go ahead with technology." (Conventional greenhouse vegetable & tree fruit farmer)

> "As far as I'm concerned I'm very interested in it. I think the benefits are if we can develop strains or breeds of blueberry plants that would be resistant to certain fungal diseases, there are some but they take so long to breed by the natural process. If we can quickly genetically engineer new ones and then raise them through tissue culture, then just five to 10 years compared to 20, 40 for other methods. So disease resistance is probably one of the biggest ones mainly because of the fact that we're restricted to the number of chemicals that we can use for disease. Also herbicide resistance but I don't think that's a very crucial one in the long run. The cost is really great but I think the benefits would be so much greater." (Conventional blueberry farmer)

> "Pretty excited about it. It's almost too good to be true. They talk about plants that are resistant to certain diseases so that would mean that I no longer have to spray for this disease, I don't have to worry about it so that's a big relief. It's like a person not having to worry about catching a cold! It's one less thing to worry about." (Conventional vegetable farmer)

Conventional farmers were not alone in their enthusiasm for bioengineered products. There was a very small minority of organic farmers who also supported the concept.

> "I think it's the future. I've said a couple of times already that I think conventional and organic are coming together, that's one of the reasons why. The ability to increase disease resistance, to increase pest resistance is phenomenal. It's the future of organics." (Organic vegetable farmer)

However, the majority of organic and bio-dynamic farmers were adamantly opposed to bioengineering technology. Frequently identified reasons were the ethical and moral questions which it presents to them.

"It flies in the face of Nature's biotechnology! It's just so darned insulting! It's synonymous with saying we'll control the weather. I wouldn't touch any of these with a 10 foot pole." (Organic livestock farmer)

"It's just unnatural. Philosophically I just feel it's garbage! Nature has already provided all the things that do all this stuff. Why can't we just use what Nature's already provided? It's like nothing that's natural is good enough without being changed and altered and manipulated. It's almost like trying to be God." (Organic vegetable farmer)

"Oh, God, that's a nightmare! Lord help us all! My thoughts are that they're tampering with something that they don't have a clue what they're doing. To create a genetically completely new entity around resistance to chemicals is absurd! It's almost as bad as the chemicals themselves. Maybe it's worse. It's a nightmare waiting to happen." (Organic mixed farmer)

"The earth was a perfectly functioning organism. You know that's why we're here. Because it functions so perfectly. I don't know if it can be improved upon. I think it's truly God-like to think through biogenetic engineering we can improve on the systems that have functioned until we screwed them up!" (Organic mixed farmer)

The analogy of biogenetic engineering to nuclear fusion and human's limited capacity to prevent disastrous consequences was made by a number of organic farmers.

"I think it's very very risky. I think it has the same sort of risk potential as playing with nuclear fusion. I think it's very close to that level of risk." (Organic vegetable farmer)

"It's directly analogous, synonymous with our involvement with the nuclear, it's the same splitting. We don't have the maturity to deal with the consequences and it'll end up killing us. If something is going to sink us, it'll be something like that. We'll invent some strain of bacteria that will get so totally out of control that it will be the end of the world." (Organic livestock farmer).

There were also a few conventional farmers who opposed biogenetic engineering on ethical and moral grounds.

"I'm totally against it. I don't think it's man's place to be playing God. We are to be stewards of the land, not to abuse it, not to take any animal organism and subjugate it...Personally I think God has enough on this planet to make it perfect for everybody. The reason that it's not perfect is because of what man has done to it. And I'm not an environmentalist per se but then again I am. We've really messed things up." (Conventional tree fruit farmer)

A counter argument to the moral question was given by one conventional grower as follows.

"I have no trouble with it at all. The moral ideas that you're going to manipulate God's creations don't bother me in the least. I think you've just got to go with it. If you're going to use the moral persuasion argument about it, God gave you your mind the right to think of these things, to do these things." (Conventional vegetable farmer)

For others, while they were generally positive, there were limits on their support for different types of bioengineered products.

> "Basically I don't have a great deal of problem with it. I think it's a lot better way than using chemicals if you can produce crops that are resistant to this and that by using engineering work. It's much safer. You're not engineering the whole plant, you're just engineering one little bit of it. If you can genetic engineer to produce antiviral drugs, that's great. If you use it in animals, that gets a little spooky and that's where the horror stories come from." (Organic livestock farmer)

> "As long as they don't get too weird about it. It doesn't bother me to see them producing flax that we could spray Roundup on or potatoes that can produce something that's going to get rid of the flea beetle or whatever. But if they start changing potatoes into oranges, forget it!" (Conventional vegetable/poultry farmer)

A common theme which emerged in all types of farmers' comments was the motivation of those funding biotechnology research. Several mentioned that they would prefer it were done by government researchers rather than private interest groups. There was a fair degree of skepticism amongst conventional and organic farmers alike about how many of the predicted benefits would flow to them as opposed to agribusiness.

> "I'm very concerned who controls it. I hate seeing these oil companies buying up all these seed companies. The oil company owns all the chemical factories and does the chemical research. They're the only ones who have the money to do it nowadays because the government can't do research anymore. So it's up to private business to do it. And it's the giant multinational companies that have the money to do this research. So they're going to control the fuel to grow the crop. They're going to control the chemicals to put on the crop. They're going to control the seed source. And they control the marketing. They'll control all the inputs so they can set the price of the inputs. We're already seeing that with seed, seed has become very expensive. For example, brussel sprout seed used to cost $7 per pound, now it costs $500 to $700 per pound." (Conventional vegetable farmer)

> "The potential benefit will be for the people that own the rights to the product. I'm not really sure if there would be a benefit to the farmer because of the chemicals relating directly to the seeds. I don't think that that would be that great of an advantage for an ordinary seed variety. I know they've researched it a lot in Europe. I'm afraid that when a company starts to control the outlet for your seed that basically they can ask any price that they want. And the way I understand it they are also starting to target certain varieties to certain areas. And those certain varieties will be under control of maybe one of the elevator companies so you're not going to have a free market anymore once it gets to that point. That's bad news for farmers." (Conventional grain farmer)

> "Working through the competitive marketplace, if you're going to compete with the person using that technology, you're at a disadvantage if you don't but you're very much locked into working with specific chemicals. I suppose it's a way of imposing vertical integration on the whole industry through the back door." (Conventional vegetable/grain farmer)

One bio-dynamic farmer who was interviewed and had worked for Ciba-Geigy for 20 years offered this opinion.

> "I think it's [biogenetic engineering] very very dangerous. Do we know anything about it? Yes. Well I worked a certain number of years with Ciba-Geigy and I know how they go about registering new pesticides. And they're there to make a buck and not to try to protect people for anything. Their prime interest is making money. And with this bioengineering and so on, it's exactly the same thing. People are just out to make more money and they really don't care what the consequences are. Because if they did, they wouldn't be doing anything. The consequences are that you are interfering with nature and nature is not a thing that has come about just by chance. There is a very very deep wisdom at the base of our natural environment. And interfering with this wisdom without having it is just like playing with a powderkeg. You don't know if it's going to blow up in your face." (Bio-dynamic mixed farmer)

Similarly, other farmers were skeptical about the long term benefits of biotechnology. Some saw it purely as a short term solution with long term negative repercussions for the environment and genetic biodiversity.

> "I don't think it will be the silver bullet that most people think because most resistance occurs because of creating something that is static, is the same. For example, splicing Dipel into tomatoes was unsuccessful because resistance developed. In the long run, I think we're going to suffer from it because we are going to eliminate our genetic diversity or reduce it." (Organic-conventional tree fruit farmer)

> "Unfortunately we have people touting the benefits that are far beyond realism. What we are hearing today is the same kind of <u>selling</u> of biogenetic engineering that we heard with <u>selling</u> of the chemical solution after WWII. And what people don't understand is exactly the same dangers are there. You can kill a pest with a chemical and develop a resistance to that chemical. The point is that the same forces that develop a resistance to chemicals will develop resistance to new bioengineered varieties as well. They're the same that exist in nature all the time. There's something of a myth that if you have a natural defense, you don't evolve resistance to it. But we know that's not true. Co-evolution is a basic principle of how systems exist and yet in the literature I've read, I've gone down to U.B.C. to read the journals, I've seen no debate of the question of how the evolution of resistance applies to biogenetic engineered things....To develop by biogenetic engineering a variety is very dangerous because we're going to be losing a lot of the genetic variability that exists in nature. And then we start planting large acreages of these things and lose it. Whereas I think that the solutions are developing complex agricultural ecosystems that are more stable. Then you don't evolve resistance to it." (Organic tree fruit farmer)

Not only is there distrust of the companies sponsoring biotechnology research, this distrust extends to the scientists who are conducting the research.

> "I just don't see any pressing need for it. It seems to be one of those things that is driven by scientists' egos more than any practical need or use. It was interesting with these hybrid corns that were developed. Just look at what has been done with the hybridization of seed crops and this 'marvellous' green revolution. We are eliminating biodiversity in the natural world and then we are turning around and trying to remanufacture it in the lab." (Organic tree fruit farmer)

Thus at this stage in the analysis, there is significant evidence that this sample of farmers are knowledgeable about both the positive and negative implications of biogenetic engineering technology. However, there is also preliminary evidence of the operation of selective perception in that in general, organic and conventional farmers appear to be giving different weight to perceived benefits and costs/risks of biotechnology.

Summary Analysis of Perceived Benefits and Costs/Risks of Biotechnology

To facilitate comparisons between groups, summary indices of perceived benefits, perceived costs/risks, and attitudes (positive and negative) towards biotechnology research were also calculated. These categories are not mutually exclusive given that three individual items had relevance to two categories. In order to eliminate double-counting which would overstate the weight of a cross-boundary item, each of these items was divided in half for the summary index calculation.

Economic Benefits Index =
Increase Production Yields
+ Enhance Food Quality
+ Consistency/uniformity in production
+ Enhance ability to grow plants in different areas/climates
+ Reduce agricultural labour costs
+ (Reduce need for agrichemicals / 2)
+ (Enhance nitrogen-fixating in plants /2)
+ (Enhance plant resistance to pests and diseases / 2).

Environmental Benefits Index =
Enhances food safety
+ Is more environmentally sound
+ (Reduces need for agrichemicals / 2)
+ (Enhance plant resistance to pests and diseases/ 2)
+ (Enhance nitrogen-fixating in plants /2).

Economic Costs/Risks Index =
Tradeoffs with quality and other positive features
+ Bioengineered products will be too expensive
+ Threat of vertical integration of agribusiness
+ (Loss of genetic biodiversity / 2)
+ (Research should be in other areas / 2)
+ (Will not reduce agrichemical usage / 2).

Environmental Costs/Risks Index =
Unpredictability of long term environmental outcomes
+ Problems of controlling new organisms on release into environment
+ (Loss of genetic biodiversity / 2)
+ (Will not reduce agrichemical usage / 2).

Positive Attitude toward Biotechnology Research Index =
Scientific progress is necessary.

Negative Attitude toward Biotechnology Research Index =
Uncertainty/unknowns about research outcomes
\+ Is unnatural
\+ (Research should be in other areas / 2).

(a) Socioeconomic characteristics and perceived potential benefits of biotechnology

Correlation analyses between socioeconomic characteristics and perceived benefits responses shows that more experienced organic farmers ($r = .5040$, $p = .001$) were most likely to see no benefits to biotechnology. The relationship between rejection of biotechnology with production method type was confirmed through ANOVA multiple comparisons means tests. Both organic farmers (mean = .44) and bio-dynamic farmers (mean = .63) were more likely to respond "no benefits" than either conventional (mean = .07) or organic-conventional (mean = .33) farmers [$F_{(4,108)} = 5.8678$, $p = .0003$]. Level of prior knowledge of biotechnology appears to be related to the "no benefits" response in that respondents with no or little prior knowledge were more likely to see no benefits to be derived from this new technology [$F_{(2,109)} = 11.4070$, $p < .0001$].

In respect to the potential for economic benefits to be realized from biogenetic engineering technology, group differences based on general education level was significantly related to the summary benefits index only in respect to the two conventional farmers with grade school education who responded more than others that environmental benefits would result from biotechnology [$F_{(5,102)} = 2.7431$, $p = .0229$]. All other groups (based on this socioeconomic characteristic) were essentially equal in their identification of environmental benefits and economic benefits of biotechnology. In terms of individual potential benefits, more experienced farmers felt that scientific progress as represented by biotechnology was necessary ($r = .2736$, $p = .002$), less experienced farmers were more skeptical in asserting that only short term benefits would be realized ($r = -.2025$, $p = .018$). Less experienced organic farmers were also more likely to believe in the benefits of this new technology

TABLE 9-6. CORRELATIONS: SOCIOECONOMIC CHARACTERISTICS X PERCEIVED BENEFITS OF BIOTECHNOLOGY
(Total Group, N = 107)

Socioeconomic Characteristics	Means	s.d.	5	6	7	8	9	10	11
1. Age	45.50	10.31	.0657	.1057	-.1153	-.1367	.0390	-.0791	-.0668
2. Total Years Farming	17.50	11.08	.0608	.1016	-.2025*	-.1370	.0111	.0614	.0461
3. Years Organic Farming	7.52	9.37	-.1804*	.5040***	-.0289	-.2935***	-.3319***	-.2049*	-.1216
4. Farm Size (acres) (Note 1)	512.11	1317.01	.4527***	-.0627	-.1106	-.1517	-.0613	-.0764	-.0289

Socioeconomic Characteristics	12	13	14	15	16	17	18
1. Age	.0740	.2224*	-.0993	-.0719	-.1088	-.0749	.1691*
2. Total Years Farming	.1063	-.1014	-.0044	.0178	-.0309	-.0351	.2736**
3. Years Organic Farming	-.0817	-.0159	-.0784	-.1273	-.0784	-.1007	.0302
4. Farm Size (acres) (Note 1)	-.0524	-.0096	-.0236	-.0538	-.0244	-.0574	-.0892

Perceived Benefits	Means	s.d.
5. Don't know	.1215	.3282
6. No Benefits	.2991	.4600
7. Short term benefits only	.1028	.3051
8. Genetic plant resistance to pests	.3084	.4640
9. Increase production yields	.2150	.4127
10. Reduce need for agrichemicals	.1869	.4151
11. Grow plants in different areas	.0467	.2121
12. Uniformity in production	.0187	.1361
13. Enhance nitrogen-fixating	.0093	.0967
14. Reduce labour costs	.0093	.0967
15. Is more environmentally sound	.0374	.1906
16. Enhances food safety	.0093	.0967
17. Enhances food quality	.0935	.2924
18. Scientific progress is necessary	.0935	.2924

* $p < .05$ ** $p < .01$ *** $p < .001$

Note 1. Farm Size: Correlations for this item was based on 105 subjects. Two outlier subjects with farm sizes of 12,000 and 48,702 acres were excluded from the analysis.

in agriculture (economic benefits, $r = -.3917$, $p < .001$; environmental benefits, $r = -.3186$, $p < .001$). Less experienced organic farmers were generally more optimistic regarding the potential benefits of increased plant resistance ($r = -.2935$, $p = .001$), increased production yields ($r = -.3319$, $p < .000$), and reduction of agrichemical usage ($r = -.2049$, $p = .017$).

Intergroup comparisons based on production method showed that organic (mean = .76, s.d. = 1.05) and bio-dynamic (mean = .75, s.d. = 1.04) farmers see fewer total benefits to be derived from biogenetic engineering technology in agriculture than either conventional (mean = 1.72, s.d. = 1.28) or organic-conventional (mean = 1.00, s.d. = .89) farmers [$F_{(4,112)} = 5.2902$, $p = .0006$]. Intergroup comparisons of perceived economic and environmental benefits indices revealed that organic farmers perceived significantly fewer economic benefits than did conventional farmers [$F_{(3,108)} = 6.2594$, $p = .0006$). On the other hand, organic farmers perceived significantly greater potential environmental benefits from biotechnology than did conventional farmers [$F_{(3,108)} = 5.2950$, $p = .0019$]. However the major differences between groups did not concern either environmental type benefits or positive attitudes towards biotechnology research. Of the potential economic benefits, there were only significant differences in means on the three items of increased production yield [bio-dynamic (mean = .00) < organic (.11) < organic-conventional (.17) < conventional (.42); $F_{(3,108)} = 5.4730$, $p = .0005$]; plant resistance to pests and diseases [organic (.16) < organic-conventional (.33) < bio-dynamic (.38) < conventional (.47); $F_{(3,108)} = 2.9435$, $p = .0236$]; and nitrogen-fixating in plants [organic (.00) = conventional (.00) = organic-conventional (.00) < bio-dynamic (.13); $F_{(3,108)} = 3.5841$].

To determine whether differences in perceptions of potential benefits varied according to the type of food produced, additional multiple comparisons were conducted. There remained no differences between production method groups in regards to perceived potential environmental benefits or the belief in scientific progress. Organic and bio-dynamic farmers involved in livestock, vegetable and mixed production were more likely than those conventional farmers to see no benefits to biogenetic engineering in agriculture. The major differences primarily concerned increased plant resistance (for livestock, vegetable and mixed producers); increased production yields (for mixed producers); reduced need for agrichemicals (for fruit and berries, and vegetable producers, and food quality and ability to grow in different areas or climates (for specialty producers only). Only mixed producers differed in the number of total perceived benefits. Generally, conventional farmers within each product category were more positive about biotechnology than either organic or bio-dynamic farmers. Reflecting their boundary status, there was much more variability in the position of organic-conventional farmers on potential benefits.

Discussion. While there were a number of farmers who totally rejected biogenetic engineering technology in agriculture out of hand on the basis of little or no knowledge, this was more prevalent amongst the organic farmers in the study. An interesting finding in this analysis is that the newer organic farmers are more likely to identify the benefits of this technology than their more experienced counterparts. In other words, recent converts to organic farming appear to be more willing to give biotechnology the benefit of the doubt and see it in a relatively more positive light than earlier adopters of organic farming.

The group comparisons analysis suggests that while organic farmers focus on potential environmental benefits, the primary focus of the conventional farmers is on the economic benefits that are to be derived from their adoption. This finding is consistent with earlier results regarding the different production method groups' motivations, perceptions and attitudes in Chapter 5. That is, the primary motivation and concern of organic farmers is on the environmental impact of agricultural methods while conventional farmers are more likely to focus on economic factors in their evaluations of technologies.

b. Socioeconomic characteristics and perceived potential costs/risks of biotechnology

Farmers identified a large number of perceived costs and risks associated with this new technology. A correlation analysis between socioeconomic variables and perceptions of costs/risks yielded several significant findings [see Table 9-7]. First, there are relatively few (11) farmers who see no potential costs/risks associated with biogenetic engineering technology in agriculture. Congruent with the earlier finding that more experienced organic farmers see no potential benefits, they also are less likely to see no risks or costs attached to biotechnology ($r = -.1695$, $p = .04$). There were only four organic farmers and seven conventional farmers who were unconditionally positive (9.7% of the 113 who answered this question). More experienced farmers were also more likely to state that they did not know of any costs or risks ($r = .2118$, $p = .012$). A respondent's education level appears to be related to this response in that for the total group, the two respondents with only grade school education were more likely than others to say they "don't know any costs/risks" [$F_{(5,102)} = 4.7954$, $p = .0006$]. Additional analysis based on production method revealed that education level is an explanatory variable for only the conventional farmers where respondents with grade school education (2) and ones with post-graduate education (2) were both more likely to indicate this response than other conventional farmers [$F_{(5,36)} = 3.2297$, $p = .0165$].

In regards to individual costs/risks, farmers working with larger acreages were more concerned with the possible tradeoffs or sacrifices in product quality that might result from bioengineering research ($r = .2052$, $p = .017$). They also felt that these products would be relatively more expensive than current input products ($r = .2959$, $p = .001$).

TABLE 9-7. CORRELATIONS: SOCIOECONOMIC CHARACTERISTICS X PERCEIVED COSTS/RISKS OF BIOTECHNOLOGY
(Total Group, N = 107)

	Means	s.d.	PERCEIVED COSTS/RISKS OF BIOTECHNOLOGY					
			5	6	7	8	9	10
Socioeconomic Characteristics								
1. Age	45.50	10.31	.1407	-.0249	.0689	.0678	.1252	.0259
2. Total Years Farming	17.50	11.08	.2182*	.0144	-.0279	-.0384	.0521	-.0415
3. Years Organic Farming	7.52	9.37	-.1370	-.1695*	.1326	.0902	.1968*	.3664***
4. Farm Size (acres) (Note 1)	512.11	1317.01	.0980	-.0858	.0698	-.1034	.1144	-.1317

	11	12	13	14	15	16
Socioeconomic Characteristics						
1. Age	.1753*	-.1065	-.0294	-.0784	.0074	-.0129
2. Total Years Farming	.0581	-.0108	-.1194	-.1008	-.0241	-.0510
3. Years Organic Farming	.1714*	-.2156	.0695	-.1595*	.1326	.2678**
4. Farm Size (acres) (Note 1)	.0591	.0094	-.0478	-.1093	-.0316	-.0843

Perceived Costs/Risks	Means	s.d.
5. Don't know	.0280	.1659
6. No costs/risks	.0935	.2924
7. Loss of genetic biodiversity	.2710	.4466
8. Vertical integration of agribusiness	.2150	.4127
9. Tradeoffs with positive features	.1963	.3990
10. Research should be in other areas	.1869	.3917
11. Will not reduce agrichemical usage	.0935	.2924
12. Will be too expensive	.0841	.2789
13. Unpredictability of envir. outcomes	.2710	.4466
14. Problems of controlling new organisms	.2523	.4364
15. Unknowns about research outcomes	.2710	.4466
16. Is unnatural	.2243	.4191

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* $p < .05$
** $p < .01$
*** $p < .001$

Note 1. Farm Size: Correlations for this item was based on 105 subjects. Two outlier subjects with farm sizes of 12,000 and 48,702 acres were excluded from the analysis.

Length of organic farming experience was significantly correlated with both the summary indices of economic costs ($r = .2215$, $p = .011$) and with five individual cost/risk variables. Compared to newer organic farmers, the more experienced organic farmers believed that biogenetic engineering would not reduce the use of agrichemicals ($r = .1714$, $p = .039$), that such research is not needed and that researchers should focus on other research problems ($r = .3664$, $p < .001$). They more often questioned the ethics of what they viewed to be an "unnatural" endeavour ($r = .2678$, $p = .003$) and felt that tradeoffs with positive genetic qualities of current products would result ($r = .1968$, $p = .021$). In contrast, the less experienced organic farmers were relatively more concerned with problems of controlling new organisms once released into the natural environment ($r = -.1595$, $p = .05$). A comparison based on general education levels, taking into account production method type, revealed no additional statistically significant difference.

In terms of production method type, organic (mean = 2.49) and bio-dynamic (mean = 3.25) farmers perceived there to be, on average, a significantly greater number of costs/risks associated with biogenetic engineering than either conventional (mean = 1.30) or organic-conventional (mean = 1.83) farmers [$F_{(3, 108)} = 5.6121$, $p = .0004$]. Costs/risks index comparisons revealed no significant intergroup differences in terms of overall economic costs/risks. In contrast, organic farmers perceived significantly greater environmental costs/risks with biotechnology than did conventional farmers [$F_{(3,108)} = 2.2632$, $p = .0852$, difference significant at the $p = .05$ level]. Compared to conventional and organic-conventional farmers, organic and bio-dynamic farmers were also more critical of scientific research involving biotechnology [$F_{(3,108)} = 8.1956$, $p = .0001$].

While for the majority of individual cost/risk variables there were no significant intergroup differences observed, there were four notable ones which were highly correlated. The two variables of the lack of reduction of agrichemical usage and the threat of loss of genetic biodiversity have both economic and environmental implications. Organic (mean = .33) and bio-dynamic (mean = .50) farmers were more likely than either conventional (mean = .0698) or organic-conventional farmers (mean = .17) farms to assert that biogenetic engineering technology will not reduce the use of agrichemicals [$F_{(3,108)}$ = 2.6976, p = .0345]. More than conventional farmers (mean = .12), organic farmers (mean = .36) also contend that the loss of genetic biodiversity is a potential risk ($F_{(3, 108)}$ = 2.5324, p = .0465].

Both organic (mean = .33) and bio-dynamic (mean = .50) farmers were more likely than conventional (mean = .07) farmers to view biogenetic engineering as being unnatural or raising ethical issues [$F_{(3,108)}$ = 3.4784, p = .0103]. They (organic mean = .24; bio-dynamic mean = .63) were also more likely than conventional farmers (mean = .05) to assert that biogenetic research efforts should be redirected to other production problems [$F_{(3,108)}$ = 2.6976, p = .0345]. Both of these results indicate that organic farmers are somewhat more skeptical about the claims for the need for this line of research.

There were few differences between production method groups depending on the type of food produced. For those involved in fruit production (n = 42), only bio-dynamic farmers (n = 3; mean = .67) were significantly different than conventional (n = 18; mean = .06) or organic (n = 17; mean = .00) farmers in asserting that research should be in other directions [$F_{(3,108)}$ = 3.1556, p = .0357]. Furthermore, conventional fruit farmers (mean = .89) identified significantly fewer total costs/risks than organic (mean = 1.77), bio-dynamic (mean = 2.67) or organic-conventional (mean = 2.75) fruit farmers [$F_{(3,108)}$ = 4.5752, p = .00079].

For those involved in commercial vegetable production (n = 48), organic (n = 24, mean = .29) farmers were more likely than conventional farmers (n = 20, mean = .00) to state this line of research was not needed [$F_{(3,108)}$ = 5.05332, p = .0043]. Not surprisingly, organic vegetable farmers (mean = .3333) were more likely than conventional vegetable farmers (mean = .00) to state that biogenetic engineering was unnatural [$F_{(3,108)}$ = 4.6852, p = .0063]. And finally, these organic farmers (mean = 2.79) identified significantly more costs/risks than their conventional counterparts (mean = 1.10) [$F_{(3,108)}$ = 4.2599, p = .01].

Discussion. Not surprisingly, organic farmers proved to be the most negative and skeptical about biotechnology in agriculture whilst there were very few conventional farmers who were unconditionally positive about this set of innovations. Compared to conventional farmers, organic farmers were more likely to assert that biotechnology will not reduce the use of agrichemicals and will hasten the loss of genetic biodiversity. Further, the ethical and moral questions surrounding genetic manipulation were a key issue for organic farmers. It should be noted that these are perhaps three of the most often cited issues identified by environmentalist critics of biotechnology in agriculture (Doyle, 1985; Suzuki & Knudtson, 1988; and others).

c. The relationship between information sources and perceptions about biotechnology

To explore the influence of different information sources on the formation of perceptions regarding biotechnology, correlations were calculated between stated sources of information and perceived benefits [see Table 9-8] and perceived costs/risks [see Table 9-9] of biotechnology. While these correlations do not prove causal relationships, they do indicate to some degree what farmers have learned from these information sources. Obviously, the relationship is mediated by which sources of information the individual has sought out, source availability, resources and/or personal preferences for different information sources.

Given the number of observed differences between organic/bio-dynamic and conventional farmers in their perceptions of benefits and costs/risks of biotechnology separate analyses for these subgroups were also conducted.

(i) Other farmers as source of information. First focusing on the whole sample of farmers, one sees that if other farmers are an information source regarding biotechnology, the individual is less likely to identify genetic pest resistance as a benefit ($r = -.1831$, $p = .027$). He/she is also more likely to state that they did not know of any costs/risks ($r = .2242$, $p < .009$) and is less likely to express concern about the problems of controlling organisms released into the natural environment ($r = -.1601$, $p = .046$).

Organic farmers who rely on information from other farmers are more likely to view biogenetic engineering technology as unnatural ($r = .2189$, $p = .042$). Conventional farmers relying on this information source were more likely to state that they did not know of any benefits ($r = .3382$, $p = .013$) nor did they know of any costs/risks with biotechnology ($r = .6417$, $p < .001$). Conventional farmers more often identified that biogenetic engineering technology offered environmental benefits ($r = .2833$, $p = .033$) but were less likely to identify plant resistance to pests and diseases as a benefit ($r = -.2554$, $p = .049$).

(ii) Farm organizations as an information source. Farmers who identified their farm organizations as an information source more often identified the benefits of food safety ($r = .2741$, $p = .002$) but were less likely to mention the benefits of production yields ($r = -.1884$, $p = .023$) or plant resistance to pests and diseases ($r = -.2261$, $p = .008$). For the total group, there was also a strong association between farm organizations as an information source and the mention that there were no benefits to be derived from biotechnology ($r = .2749$, $p = .002$).

A slightly different picture emerges when responses based on different production methods are compared. Organic farmers utilizing this information resource were more likely to state that there were no benefits to biotechnology ($r = .2089$, $p = .05$); and that it could result in more uniformity/consistency in production ($r = .2924$, $p = .01$). However organic farmers less often mentioned plant resistance to pests and diseases as a benefit ($r = -.2107$, $p = .049$).

In contrast, conventional farmers were learning from their farm organizations that biogenetic engineering enhances food safety ($r = 1.000$, $p < .001$) and is environmentally sound ($r = .5634$, $p < .001$). These conventional farmers were also more likely to state that there were no costs/risks associated with biotechnology ($r = .3499$, $p = .011$). Organic farmers on the other hand, more often cited the threat of vertical integration of agribusiness ($r = .2252$,

TABLE 9-8. INFORMATION SOURCES AND PERCEIVED BENEFITS OF BIOTECHNOLOGY
(Total Group, N = 112)

	Means	s.d.	INFORMATION SOURCES 1	2	3	4	5	6	7	8	9
Perceived Benefits											
1. Don't know	.1161	.3218	.2242**	-.0354	-.0539	.0566	.0798	.0910	-.0819	-.0707	.0677
2. No Benefits	.3036	.4619	.1185	.2736**	-.0473	-.0487	-.1169	-.1031	-.0088	-.1319	-.0874
3. Short term benefits only	.1071	.3107	-.0961	-.0267	-.0248	.0649	-.0661	.1886	-.0783	.0124	.0797
4. Genetic plant resistance to pests	.3036	.4619	-.1831*	-.2287**	-.0083	.0453	.0995	-.0476	.0615	.1402	.0431
5. Increase production yields	.2232	.4183	-.0654	-.1857*	-.0169	-.1159	.0123	-.0350	.0339	.1264	.0392
6. Reduce need for agrichemicals	.1786	.4075	-.0366	-.1525	-.0757	.0114	.1818	.0719	-.0992	.0598	-.1453
7. Grow plants in different areas	.0446	.2074	-.0600	-.0749	.0279	-.0467	.1495	-.0883	-.0489	.1375	-.0713
8. Uniformity in production	.0179	.1330	-.0374	.1713*	.1255	-.0291	-.0570	-.0550	-.0305	-.1301	-.0445
9. Enhance nitrogen-fixating	.0089	.0945	-.0263	-.0329	-.1020	-.0205	-.0402	-.0387	-.0215	.0984	-.0313
10. Reduce labour costs	.0089	.0945	-.0263	-.0329	.0884	-.0205	.2244**	.2325**	-.0215	.0984	-.0313
11. Is more environmentally sound	.0357	.1864	.1334	.0889	-.0138	-.0416	.1868	.0589	.1305	-.0894	-.0635
12. Enhances food safety	.0089	.0945	-.0263	.2740**	.0884	-.0205	-.0402	.2325**	.3218***	-.0916	-.0313
13. Enhances food quality	.0982	.2989	-.0915	-.1143	.1268	-.0713	-.0560	-.0490	.0339	.0418	-.1089
14. Scientific progress is necessary	.0982	.2989	.0250	-.1143	.0064	-.0713	.0276	-.0490	.0339	-.0783	-.0081
Information Sources											
1. Other Farmers	.0714	.2587									
2. Farm Organizations	.1071	.3107									
3. Agricultural Publications	.5357	.5010									
4. Industrial Suppliers	.0446	.2074									
5. Education	.1518	.3604									
6. Scientific Researchers	.1429	.3515									
7. Government	.0625	.2777									
8. Television-- General	.4821	.5019									
9. Television--"Nature of Things"	.0982	.2989									

* p < .05
** p < .01
*** p < .001

TABLE 9-9. INFORMATION SOURCES AND PERCEIVED COSTS/RISKS OF BIOTECHNOLOGY
(Total Group, N = 112)

	Means	s.d.	INFORMATION SOURCES 1	2	3	4	5	6	7	8	9
Perceived Costs/Risks											
1. Don't know	.0280	.1622	.3834***	-.0575	-.1782*	.2319**	-.0702	.0903	-.0375	-.1601*	.1311
2. No costs/risks	.0982	.2989	-.0915	.0797	.0064	.2192**	-.0560	.0367	.3594***	-.1383	-.1089
3. Loss of genetic biodiversity	.2679	.4448	-.0895	-.0140	.2397**	-.0331	.0813	.0412	-.1367	-.0591	.0036
4. Vertical integration of agribusiness	.2143	.4122	.0241	.1709*	.0499	-.0075	.0823	.1599*	-.0393	.1058	.1932*
5. Tradeoffs with positive features	.1964	.3991	-.1371	-.1713*	.2350**	-.1069	.0414	.0550	-.0305	.0177	-.1632*
6. Research should be in other areas	.1786	.3847	.0517	.1400	.0134	-.1008	-.1972*	-.0571	-.0211	.2033*	.0811
7. Will not reduce agrichemical usage	.0982	.2989	.0250	.0797	.1268	.0739	.0276	.1225	-.0746	.1619*	-.0081
8. Will be too expensive	.0804	.2731	.0455	-.1024	-.1200	-.0639	.2411**	.2548**	.0520	-.1538	.0128
9. Unpredictability of envir. outcomes	.2768	.4494	-.0941	.1728*	.2158*	-.0371	.0164	-.0244	-.1398	.0421	.0641
10. Problems of controlling new organisms	.2500	.4350	-.1601*	-.0667	.0827	-.0250	.0431	-.1768*	-.0559	.1032	.0866
11. Unknowns about research outcomes	.2589	.4400	-.0057	.1247	.0598	-.0291	.0908	-.1248	-.1336	.1231	-.0581
12. Is unnatural	.2221	.4241	.0938	.1514	.0454	-.0165	-.0558	-.0432	-.0478	.1466	.1028
Information Sources											
1. Other Farmers	.0714	.2587									
2. Farm Organizations	.1071	.3107									
3. Agricultural Publications	.5357	.5010									
4. Industrial Suppliers	.0446	.2074									
5. Education	.1518	.3604									
6. Scientific Researchers	.1429	.3515									
7. Government	.0625	.2777									
8. Television-- General	.4821	.5019									
9. Television--"Nature of Things"	.0982	.2989									

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* p < .05
** p < .01
*** p < .001

p = .038) but were less likely to mention the potential genetic tradeoffs with food quality and other positive features ($r = -.2215$, $p = .041$). Earlier analyses of general agricultural information sources used by respondents [see Chapter 5] revealed that organic and conventional farmers belong to different types of farm organizations. Based on this analysis, the information being conveyed by conventional farm organizations to their members appears to be significantly more positive about biotechnology than that being communicated by organic farming organizations to their members.

(iii) Government sources of information. In general, information obtained from government sources (extension agents and publications) appears to highlight only food safety as a benefit of biogenetic engineering technology ($r = .3218$, $p < .001$) while minimizing perceptions of costs or risks ["no costs/risks" ($r = .3594$, $p < .001$)]. These results hold for conventional farmers who, compared to organic farmers, more often mentioned government extension agents and publications as information sources for biotechnology knowledge. Unlike their conventional counterparts, organic farmers who cited government information sources did not have any significant correlations with perceived benefits or costs/risks of biotechnology.

(iv) Industrial suppliers. For farmers, primarily those using conventional production methods, who cite industrial suppliers as information sources, there are only significant correlations with general indicators of costs/risks perceptions. The impact of this information source appears to be primarily that of a lack of knowledge of costs/risks ($r = .2322$, $p = .007$), the conclusion that there are no costs/risks associated with biotechnology ($r = .2197$, $p = .01$) thus resulting, for conventional farmers, in a lesser number of identified total costs/risks ($r = -.3273$, $p = .016$).

(v) Education and research information sources. As mentioned by a number of respondents, the topic of biotechnology innovations in agriculture has recently been addressed in education courses and conferences, especially those attended by conventional farmers. Education courses and conferences are the second most often cited category of information sources and appear to offer information concerning both the benefits and costs/risks of biotechnology. A number of respondents also stated that they had had personal contact (primarily as a result of participation in agricultural research projects and federal government committees) with scientists either conducting or familiar with biogenetic engineering research.

For farmers, the message being received at education courses and conferences appears to be that biotechnology has significant environmental benefits ($r = .2663$, $p = .002$) and will reduce the use of agrichemicals in production ($r = .1832$, $p = .026$). While farmers who have attended these events acknowledge that bioengineered products will be expensive ($r = .2419$, $p = .005$), they appear to be convinced that it is an appropriate research endeavour ($r = -.1951$, $p = .019$, for item "research needs to be in other areas").

Farmers who have had more contact with scientific researchers more often stated that biotechnology research will enhance food safety ($r = .2327$, $p = .007$) and will reduce agricultural labour costs ($r = .2327$, $p = .007$). They also more often indicated that these products will be expensive ($r = .2555$, $p = .003$), possibly due to the threat of vertical integration of agribusiness ($r = .1615$, $p = .044$). They are less concerned about the potential threat of loss of control over organisms released into the natural environment ($r = -.1743$, $p = .032$) yet more readily acknowledge that any benefits may only be for the short term ($r = .1896$, $p = .022$).

A comparison of farmer responses based on production methods yielded quite different sets of correlations. Organic farmers who have attended education courses and conferences were more likely to identify increased production yields ($r = .3635$, $p = .002$), the ability to grow plants in different areas/climates ($r = .2241$, $p = .039$) as well as the general environmental benefits ($r = .3592$, p

= .002) of this technology. In contrast, conventional farmers were less optimistic regarding promises of increased production yields (r = -.3742, p = .007, with scientific researchers) but felt that enhanced genetic resistance to pest and diseases (r = .2592, p = .047, with education sources), agricultural labour savings (r = .2803, p = .034, with education sources) and enhanced food safety (r = .3499, p = .011, with researchers) would result.

In terms of potential costs/risks, both organic and conventional farmers who cited these information sources also stated the perception that bioengineered products would be expensive (organic, r = .3330, p = .004, with researchers; conventional, r = .3175, p = .019, with researchers, and r = .3537, p = .010, with education), one contributing factor being the threat of vertical integration of agribusiness (organic, r = .3052, p = .008, with researchers; conventional, r = .2549, p = .049, with education). Organic farmers more often noted that biotechnology may result in the loss of genetic biodiversity (r = .2708, p = .016, with education). On the other hand, conventional farmers in contact with scientific researchers appear to be less concerned with potential organism control problems associated with bioengineered products' release into the natural environment (r = -.2744, p = .038). And finally, conventional farmers appeared to be more informed regarding the total costs/risks associated with biotechnology (r = .3019, p = .025) as a result of attending education courses and conferences which have included this topic on their programmes.

(vi) Agricultural media. The agricultural media (primarily newspapers, journals and newsletters) was identified as a primary source of information regarding biotechnology. It is very interesting to note that there were no statistically significant correlations with perceived potential benefits variables for either organic or conventional farmers. Instead, the net effect of this information source seems to have been to make their readers more aware of the potential costs/risks associated with biotechnology. Specifically, farmers (especially organics) were more likely to identify a greater number of risks (total group, r = .2530, p = .003; organics, r = .3046, p = .008). They also stated that there were more risks in terms of loss of genetic biodiversity (total group, r = .2334, p = .006; organic, r = .3201, p = .005); the unpredictability of long term environmental effects (r = .2095, p = .013) as well as potential tradeoffs with current positive product qualities (total group, r = .2298, p = .007; conventionals, r = .3048, p = .023).

(vii) Mass media (television) information sources. Television, and in particular the CBC programme "The Nature of Things with David Suzuki", was the most often cited information source regarding biotechnology (television was cited by 54 farmers, "The Nature of Things" by 11). What has been the role of the electronic media in influencing perceptions of benefits and costs/risks of biotechnology?

As a total group, there were no significant correlations with identified benefits. Subgroup analyses yielded significant correlations for only three benefits. For organic farmers, the potential for increased genetic resistance to pests and diseases in plants (r = .2712, p = .016) and for conventional farmers, the promise of increased production yields (r = .3311, p = .015) and the ability to grow plants in different areas or climates (r = .2603, p = .046).

An examination of costs/risks correlations revealed that television may have contributed to the perception of a greater number of costs/risks (r = .1880, p = .023), especially amongst conventional farmers (r = .3702, p = .007) The impact of television appears to be related to the perception that biotechnology will not lower the use of agrichemicals (r = .1640, p = .041). Amongst conventional farmers, television programs also appear to have highlighted the issues of controlling bioengineered organisms in the natural environment (r = .4179, p = .003) and to have made them more aware of the unknowns or uncertainties of such research (r = .3920, p = .005). They are also more likely to identify biotechnology as unnatural (r = .3227, p = .017). For organic farmers, the influence of television appears to have been to convince them of the lack of need for this line of research (r = .2121, p = .048, for item "research needs to be in other areas").

An acknowledged critic of biotechnology, David Suzuki (Suzuki & Knudtson, 1988) host of the CBC program "The Nature of Things" was identified specifically by 11 farmers. What has been the received message of the programmes which have been broadcast on the subject of biotechnology? One effect may have been the increased perception of the potential for vertical integration within agribusiness (total group, $r = .1944$, $p = .020$; organics, $r = .2402$, $p = .029$). For conventional farmers who had identified Suzuki as an information source, they were more likely to perceive biotechnology as unnatural ($r = .2833$, $p = .033$) or to say that they didn't know of any risks ($r = .2833$, $p = .033$). Perhaps the most interesting correlation is the one concerning the perception that research resources should be redirected to other areas ($r = .3730$, $p = .007$). While a cost/risk often identified by organic farmers, this was the only time a positive correlation was observed for the conventional farmer subjects on this item.

Discussion. While assertions of causality are limited, the correlations between identified information sources and farmers' perceptions of the benefits and costs/risks associated with biotechnology offer several interesting observations concerning the influence of various information sources on farmers' attitudes towards bioengineered products (Research Question 4). Organic farmers attending to information from their farm organizations were more likely to hold a negative perspective on biotechnology in agriculture whereas conventional farmers who attended to information from their farm organizations held a more positive perspective. In regards to the nature of information offered at education courses and conferences and by scientific researchers, it appears that a balanced perspective of both the positive and negative features of biogenetic engineering technology is being provided. It also appears that information provided by mass media sources has been somewhat biased towards identifying the costs and risks associated with biotechnology rather than its potential benefits. What is interesting is that this result was also found in connection with the agricultural media which one might presume would offer a more positive viewpoint given their reliance on advertising revenue from agribusiness suppliers.

PART D. FARMERS' WILLINGNESS TO TRY BIOGENETICALLY ENGINEERING PRODUCTS

Given that few biogenetically engineered products have yet to reach the marketplace, farmers were asked which of a list of 15 biogenetically engineered products they would be willing to use and/or experiment with. They were also asked if there were specific conditions under which they would use these products and if they would not use them, the reasons why. The 15 items on the product list were derived from the literature on current research on biogenetic engineering in agriculture (e.g., Botterman & Leemans, 1988; Hedin, Menn & Hollingworth, 1988). The products were grouped into three categories:

(1) Crop seeds and plants -- disease resistant, herbicide resistant, nitrogen-fixating, pest resistant, stress resistant, higher quality, higher yields, growth regulators.

(2) Microbial organisms -- bioherbicides, biofungicides, microbial inoculants, protection against frost damage, decomposers of farm wastes.

(3) Biological Controls -- parasites and predators, for weed control.

The analysis of intention to use biogenetically engineered products focused on the research questions concerning the relationship between farmers' intentions to try out biogenetically engineered agricultural products and their socioeconomic characteristics and agricultural production experience; their assessment of biotechnology's projected benefits, costs and risks; prior knowledge and accessed information sources; and finally, their prior assessments of the benefits and costs/risks of biogenetic engineering technology and attitudes towards biotechnology research. For each question, correlation analysis and/or analysis of variance tests were conducted at three levels of specificity regarding bioengineered products: (1) total number of bioengineered products; (2) by product category; (3) by individual product.

Intentions to Use Bioengineered Products: Socioeconomic and Farming Experience Characteristics

In his summary of the socioeconomic characteristics of early adopters of innovations, Everett Rogers (1983, pp. 251-252) concluded that early adopters tend to have more years of education and to have larger-sized operating units (number of acres) than late adopters. While the evidence is inconsistent, he concluded that early adopters are not different from late adopters in age.

Correlation analysis of farmers' socioeconomic characteristics and intentions to use bioengineered products (in terms of total number of products and product category) revealed no statistically significant relationships (at $p = .01$ level) for farmers' age or total years of farming experience. There were also no differences based on education level once production method type was controlled for. However there were significant differences in use intentions based on gender, farm size (total acres), and years of organic farming experience. Female farmers would use a fewer total number of bioengineered products [$F_{(1,111)} = 8.3204$, $p = .0047$]. Correlations between bioengineered product use intentions and farm size proved to be statistically significant for both total number of products ($r = .2253$, $p = .009$) and crop seeds ($r = .3027$, $p = .001$). Thus farmers with larger acreages appear to be more willing to utilize bioengineered products. [Note that these correlations were based on a reduced sample of 109 farmers after the exclusion of two outlier corporate farms which were extremely large.]

Given that there is a positive correlation between total years of farming experience and years of organic farming experience ($r = .2362$, $p < .01$), it is interesting to find the strong negative correlations between years of organic farming experiences and intention to use these products. Based on this sample of farmers, it appears that the more experienced organic farmers are significantly less likely to use biogenetically engineered products than newer organic farmers ($r = -.5277$, $p <.000$).

Intentions to Use Bioengineered Products: The Influence of Production Method and Type of Production

A farmer's production method appears to have a significant influence on whether or not one intends to try out a new bioengineered product [see Table 9-10]. At the two levels of aggregation (total number and by product category), the pattern of acceptance was conventional farmers would try out the most products, organic-conventional the next most, then organic farmers and finally, bio-dynamic farmers the least number of products [$F_{(3,108)} = 19.9856$, $p < .0001$; conventional > organic and bio-dynamic farmers at $p < .01$ level; organic-conventional > bio-dynamic at $p < .05$ level]. The most significant intergroup differences were between conventional farmers and organic/bio-dynamic farmers. Reflective of their boundary spanning status, farmers practising both organic and conventional methods were in the middle (i.e., means were almost half-way between organic and conventional farmers' means).

In regards to different types of bioengineered products, conventional and organic-conventional farmers were more likely than organic or bio-dynamic farmers to indicate a willingness to use bioengineered crop seeds ($F(3,108) = 21.455$, $p < .0001$, difference significant at $p < .01$ level). Conventional farmers were more willing to use bioengineered microbial organisms and biological controls than were organic or bio-dynamic farmers (respectively, $F(3,108) = 12.012$, p M .0001; $F(3,108) = 11.288$, $p < .0001$; all group differences significant at $p < .01$ level). Conventional farmers were also more likely than organic-conventional farmers to indicate a willingness to use bioengineered biological controls (at $p < .01$ level).

A detailed analysis of variance revealed there to be two exceptions to this pattern. For nitrogen-fixing crop seeds, the positions of organic-conventional and conventional farmers were reversed with organic-conventionals being more willing to try this product. For biological controls for weed control, the order of acceptance was conventionals > organics > organic-conventionals > bio-dynamics.

TABLE 9-10. BIOENGINEERED PRODUCT USE INTENTIONS

	TOTAL GROUP (N = 112)	ORGANIC FARMERS (N = 55)	CONVENTIONAL FARMERS (N = 43)
	Means (s.d.)	Means (s.d.)	Means (s.d.)
Bioengineered Products			
Total Number (15)	7.3214 (5.9095)	4.6909 (5.4019)	11.6279 (3.5925)
Crop Seeds (8)	4.0357 (3.3475)	2.4727 (2.9367)	6.6279 (2.0121)
Microbial Organisms (5)	2.1429 (2.1429)	1.3455 (1.9927)	3.5581 (1.6374)
Biological Controls (2)	.4643 (.5010)	.2909 (.4584)	.7907 (.4116)

	ORG.-CONV. FARMERS (N=6)	BIODYNAMIC FARMERS (N=8)
	Means (s.d.)	Means (s.d.)
Bioengineered Products		
Total Number (15)	7.3333 (6.0882)	2.2500 (5.2030)
Crop Seeds (8)	4.8333 (3.5449)	.2500 (.7071)
Microbial Organisms (5)	2.0000 (2.3664)	.1250 (.3536)
Biological Controls (2)	.3333 (.5164)	.0000 (.0000)

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Recognizing that the type of food produced could influence farmers' perceptions regarding these products' utility, intergroup comparisons within food production categories were conducted. In regards to the total number of bioengineered products farmers would be willing to use, only fruit/berry and vegetable producer groups were different based on production method (at p = .01 level). For both, the order of means was conventional > organic-conventional> organic > bio-dynamic with the only statistically significant intergroup differences being between conventional and organic farmers. When intergroup comparisons were conducted on the basis of bioengineered product categories, there were observed differences (at p = .01) for fruits/berries (n = 42), vegetable (n = 48) and mixed (n = 18) producers. Again, there were no differences in use intentions based on production method for livestock (n = 21), grain (n = 13), specialty (n = 13), poultry (n = 5) or greenhouse (n = 3) producers. The lack of differences within these groups is most probably due to the low number of growers in each category. The lack of intergroup differences for livestock and poultry farmers if probably explained by the nature of products under consideration (even though many of these individuals are also producing other types of food, notably livestock producers often grow grain and hay for feed and commercial sale).

For fruit and berry producers, there was generally more acceptance of bioengineered crop seeds, microbial organisms, and biological controls [respectively, $F_{(3,38)} = 19.905$; $F_{(3,38)} = 10.216$; $F_{(3,38)} = 11.135$; all $p < .001$]. In as far as individual products were concerned, the only products for which there were no intergroup differences were for the less popular microbial inoculants, microbial decomposers of farm wastes, and biological controls for weed control.

Intergroup comparisons for vegetable growers yielded similar findings as for fruit and berry producers. Significant differences were observed between conventional and organic-bio-dynamic grower groups (conventional > organic-conventional > organic > bio-dynamic) for bioengineered crop seeds, microbial organisms, and biological controls [respectively, $F_{(3,44)} = 16.288$, $p = .0001$; $F_{(3,44)} = 6,840$, $p = .001$; $F_{(3,44)} = 10.553$, $p = .0001$]. With no exceptions, conventional vegetable growers were willing to use each product more than organic growers (at $p = .01$ level).

Differences in use intentions emerged for farmers engaged in mixed production. Again, bio-dynamic and organic mixed farmers were significantly less likely than conventional farmers to indicate a willingness to use bioengineered crop seeds, microbial organisms or biological controls [respectively, $F_{(3,14)} = 10.054$, $p = .001$; $F_{(3,14)} = 3.545$, $p = .043$; $F_{(3,14)} = 5.503$, $p = .01$]. In regards to individual bioengineered products, the groups differed (at $p = .01$ level) on all but bioengineered nitrogen-fixing, pest resistant, stress resistant crop seeds and all bioengineered microbial organisms except decomposers of farm wastes.

The Role of Knowledge and Information Sources on Intentions to Use Bioengineered Products

To what degree is there an association between an individual's knowledge about biotechnology and their stated interest in utilizing the products of this technology? To answer this question, correlation analyses were conducted. For the total group ($n = 113$), there is a positive relationship between the total number of bioengineered products a farmer would try and his/her prior knowledge concerning new crop seeds ($r = .2103$, $p = .013$), genetic resistance to pests and diseases ($r = .2351$, $p = .006$) and bioengineered organisms ($r = .1798$, $p = .029$). This would suggest that the more informed a subject is about biotechnology, the more likely he/she will want to try it out. Given that production method has been shown to be a significant differentiating variable, separate analysis of variance multiple comparisons tests were conducted for organic, bio-dynamic, organic-conventional and conventional subsamples. It appears that these correlations for the total sample tend to hold only for the organic, bio-dynamic and organic-conventional farmers. There was no significant correlation between prior knowledge of biotechnology and intention to use these products for the conventional farmer subsample. In fact, for conventional farmers, there was a negative relationship between overall knowledge level and intentions to use bioengineered crop seeds and plants. Recalling that 49% of conventional farmers consider themselves to be well informed about biotechnology, this observed lack of correlation might suggest that conventional farmers hold a generally positive attitude towards trying these new products irrespective of their knowledge concerning biotechnology. In contrast, organic and bio-dynamic farmers who are more willing to try these products may be doing so from a more informed knowledge base and those who are rejecting this technology are doing so because of a cautious attitude towards a technology they do not know much about.

The next question to be addressed is the relationship between intention to use decisions and information sources. For the total group of farmers, it would appear that television has a dampening effect on the willingness to try bioengineered products ($r = -.1742$, $p = .033$). So too with those individuals who cite farm organizations as a source of information about biotechnology ($r = -.1710$, $p = .036$). In contrast, industrial suppliers of agricultural products appear to encourage an individual's intention to use these products ($r = .2234$, $p = .009$). Examining subgroup differences based on production methods we see that for conventional farmers, there were no significant correlations between types of information source and total number of products would try out. However there was a negative correlation between television as an information source and the willingness to try new crop seeds and plants ($r = -.2679$, $p = .041$). This could be explained by the large number of crop seeds in the suggested list of bioengineered products under consideration. It would appear that television plays a discouraging role in the conventional farmers' decision to use these products.

Reading the agricultural literature appears to encourage only the organic-conventional farmers in their intentions to try bioengineered products ($r = .8397$, $p = .018$). For bio-dynamic farmers, there are positive correlations between the total number of bioengineered products they were willing to use and farm organizations ($r = .6228$, $p = .05$) and industrial suppliers ($r = .9902$, $p = .001$) as information sources.

The relationship between type of information source and use intentions is more complex for the organic farmers interviewed. Those who indicated that government extension agents were an information source were more likely to indicate a willingness to try more bioengineered products ($r = .2621$, $p = .027$). However in regards to crops seeds and plants, there was less willingness to try these products if they relied on other farmers ($r = -.2380$, $p = .04$), farm organizations ($r = -.2443$, $p = .036$) and the CBC programme "Nature of Things with David Suzuki" ($r = -.2573$, $p = .029$) as information resources. This would suggest that other farmers, farm organizations (primarily organic) and "The Nature of Things" are conveying a negative story about the utility or advantages of bioengineered crop seeds and plants.

Perceptions of Biotechnology Benefits and Costs/Risks and Intentions to Use Bioengineered Products

The results of a correlation analysis between bioengineered product use intentions and perceived benefits and costs/risks of biotechnology (summary indices) is provided in Table 9-11. Specifically, there were positive relationships between the total number of bioengineered products which farmers would try out and perceived economic benefits ($r = .3152$, $p < .001$) and environmental benefits ($r = .3062$, $p < .001$). There were negative relationships between the total number of bioengineered products and perceived economic costs ($r = -.2131$, $p < .05$) and environmental risks ($r = -.222$, $p < .01$). The perception of no benefits was negatively related to the total number of bioengineered products farmers would try out ($r = -.4388$, $p < .001$) while the perception of no costs/risks was positively correlated with intention to use bioengineered products ($r = .2675$, $p < .01$).

TABLE 9-11. CORRELATIONS: BIOENGINEERED PRODUCT USE INTENTIONS X PERCEIVED BENEFITS AND COSTS/RISKS OF BIOTECHNOLOGY (TOTAL SAMPLE)

		BIOENGINEERED PRODUCT USE INTENTIONS TOTAL SAMPLE (N=112)			
	Means (s.d.)	TOTAL # PRODUCTS (15)	CROP SEEDS (8)	MICROBIAL ORGANISMS (5)	BIOLOGICAL CONTROLS (2)
PERCEIVED BENEFITS					
Economic	.0798 (.1025)	.3152***	.3888***	.2476**	.3437***
Environmental	.0580 (.0887)	.3062***	.3754***	.2262**	.3614***
Total Benefits	1.1429 (1.2070)	.3522***	.4224***	.2846***	.4257***
PERCEIVED COSTS/RISKS					
Economic	.1272 (.1365)	-.2131*	-.1924*	-.2167*	-.2897***
Environmental	.1775 (.1828)	-.2222**	-.1761*	-.2378**	-.2438**
Total Costs/Risks	2.0536 (1.5759)	-.3762***	-.3761***	-.3838***	-.4654***
ATTITUDE TOWARDS BIOTECHNOLOGY RESEARCH					
Positive	.0982 (.2989)	.2166*	.2305**	.1889*	.2342*
Negative	.1935 (.2309)	-.3694***	-.4422***	-.3658***	-.4589***
NO PERCEIVED BENEFITS	.3036 (.4619)	-.4388***	-.4907***	-.4447***	-.4589***
NO PERCEIVED COSTS/RISKS	.0982 (.1622)	.2675**	.2485**	.2732**	.3545***

* p < .05 ** p < .01 *** p < .001

Farmers who held positive evaluations regarding biotechnology research were more likely to indicate they would try more bioengineered products ($r = .2166$, $p < .05$) while those who were more negative or skeptical about the merits of this line of research indicated they would use fewer bioengineered products ($r = -.3694$, $p < .001$). All of these relationships between perceptions and product use intentions flow logically from the reasoning that if one perceives an innovation to be beneficial and necessary, one would be more likely to adopt it. Obversely, negative perceptions would discourage innovation adoption.

While the total group correlations are all statistically significant at the $p < .05$ level, subgroup correlations based on production method reveals that the source of the majority of these correlations can be traced to the organic and bio-dynamic farmers. Given the previously observed similarities between organic and bio-dynamic farmers in respect to perceptions about biotechnology, the two groups were combined for this analysis [see Table 9-12a.]. Organic and bio-dynamic farmers are more likely to indicate that they would use the identified bioengineered crop seeds if they feel there were economic ($r = .3650$, $p < .01$) and environmental ($r = .3060$, $p < .01$) benefits or no costs/risks ($r = .3278$, $p < .01$) associated with biotechnology. Alternatively, they would use these products less if they perceived a greater number of economic ($r = -.2237$, $p < .05$) and environmental ($4 = -.2286$, $p < .05$) costs/risks or no benefits ($r = -.2441$, $p < .05$).

Negative relationships were found between perceptions of total costs/risks and intentions to use bioengineered microbial organisms ($r = -.3213$, $p < .01$) and bioengineered biological controls ($r = -.3917$, $p < .001$). For total and individual categories of bioengineered products there were negative relationships observed between the perception of no benefits and intention to use these products (total number of products: $r = -.2441$, $p < .05$). Obversely, there was a positive relationship between bioengineered product use intentions (total and by category) and the perception that there were no costs/risks attached to bioengineered products (total number of products: $r = .3846$, $p < .001$).

TABLE 9-12. CORRELATIONS: BIOENGINEERED PRODUCT USE INTENTIONS X PERCEIVED BENEFITS AND COSTS/RISKS OF BIOTECHNOLOGY (ORGANIC/BIODYNAMIC AND CONVENTIONAL FARMER GROUPS)

TABLE 9-12a. ORGANIC AND BIODYNAMIC FARMERS (N=63)

		BIOENGINEERED PRODUCT USE INTENTIONS			
	Means (s.d.)	TOTAL # PRODUCTS (15)	CROP SEEDS (8)	MICROBIAL ORGANISMS (5)	BIOLOGICAL CONTROLS (2)
PERCEIVED BENEFITS					
Economic	.0476 (.0783)	.1471	.3650**	-.0077	.0824
Environmental	.0349 (.0699)	.1522	.3060**	.0219	.1794
Total Benefits	.7619 (1.0273)	.1708	.3352**	.0893	.1721
PERCEIVED COSTS/RISKS					
Economic	.1495 (.1445)	-.2000	-.2237*	-.1781	-.1844
Environmental	.2163 (.1921)	-.1021	-.2286*	-.1307	-.1838
Total Costs/Risks	2.5873 (1.6327)	-.2728*	-.2844*	-.3213**	-.3917***
ATTITUDE TOWARDS BIOTECHNOLOGY RESEARCH					
Positive	.0635 (.2458)	.2489*	.2127	.3865**	.1472
Negative	.2751 (.2416)	-.2671*	-.3427**	-.3721***	-.4669***
NO PERCEIVED BENEFITS	.4603 (.5024)	-.2441*	-.3325**	-.3117**	-.3194**
NO PERCEIVED COSTS/RISKS	.0635 (.2458)	.3826***	.3278**	.4553***	.4463***

TABLE 9-12b. CONVENTIONAL FARMERS (N=43)

		BIOENGINEERED PRODUCT USE INTENTIONS			
	Means (s.d.)	TOTAL # PRODUCTS (15)	CROP SEEDS (8)	MICROBIAL ORGANISMS (5)	BIOLOGICAL CONTROLS (2)
PERCEIVED BENEFITS					
Economic	.1294 (.1160)	.0147	-.0566	.0339	.3622**
Environmental	.0953 (.1045)	.1411	.1500	.0990	.3088*
Total Benefits	1.7209 (1.2785)	.1168	.0605	.0762	.4745***
PERCEIVED COSTS/RISKS					
Economic	.0911 (.1147)	-.1276	.0386	-.2348	-.3849**
Environmental	.1250 (.1614)	-.2464	-.1833	-.2253	-.1344
Total Costs/Risks	1.3023 (1.1027)	-.2775*	-.1949	-.2803*	-.3294*
ATTITUDE TOWARDS BIOTECHNOLOGY RESEARCH					
Positive	.1395 (.3506)	.1556	.2441	-.0559	.2072
Negative	.0853 (.1516)	-.1298	-.2708*	-.0045	-.0251
NO PERCEIVED BENEFITS	.0698 .2578	-.1513	-.0865	-.1509	-.3079*
NO PERCEIVED COSTS/RISKS	.1628 .3735	.0462	.0825	.0036	.2269

* $p < .05$ ** $p < .01$ *** $p < .001$

The correlation analysis for the conventional farmers offered a different picture [see Table 9-12b]. The only consistently significant correlations were observed in respect to the two identified biological control products. Conventional farmers were more likely to indicate an intention to use these products if they felt there were a greater number of overall economic ($r = .3622$, $p < .01$) and environmental ($r = .3088$, $p < .05$) benefits and fewer economic costs/risks ($r = -.3849$, $p < .01$) associated with bioengineered products.

Closer examination by product category shows that the major part of these correlations can be traced to evaluations regarding bioengineered biological controls. If conventional farmers perceived there to be no benefits to biotechnology, they were less likely to indicate that they would try out bioengineered biological controls ($r = -.3079$, $p < .05$).

Perhaps one of the most interesting findings yielded by this analysis concerns the role of respondents' attitudes or beliefs regarding the merits of scientific research utilizing biotechnology. For the organic and bio-dynamic farmer group, this appears to be the relatively most significant factor in their intention to use decision. Not surprisingly, those organic and bio-dynamic farmers who are the most skeptical or distrustful of biotechnology research indicated that they were less likely to use bioengineered products of all kinds (total number of products: $r = -.2671$, $p < .05$). Those organic and bio-dynamic farmers who held a more positive evaluation of bioengineering research were likely to use its products ($r = .2489$, $p < .05$) but this could primarily be attributed to the high correlation with bioengineered microbial organisms ($r = .3865$, $p > .01$). In contrast, only one statistically significant correlation was observed for the conventional farmers and that was a negative correlation between a negative attitude towards biotechnology research and the intention to use bioengineered crop seeds ($r = -.2708$, $p < .05$).

Conditions of Use for Bioengineered Products

As an indicator of farmers' rationale for accepting or rejecting a bioengineered product, individuals were asked why they would not use certain products or alternatively, under what conditions they would consider using them. Nine different categories of responses were identified:

(1) No conditions on use

(2) Will be too expensive

(3) Are unnatural

(4) Potential for environmental problems

(5) No value added/satisfied with current products or methods

(6) Trade-offs/sacrifices with current positive product features

(7) Need to be self-regenerating

(8) Need to be approved by organic certification association

(9) Lack of knowledge for informed opinion.

A summary of responses by individual bioengineered product is provided in Table 9-13.

A total of 17 farmers (3 organic, 13 conventional and 1 bio-dynamic) would place no conditions on using any of the identified bioengineered products. By far the three most common reasons why a bioengineered product would not be used were that: there would be no value added over current products or methods; the bioengineered product would create environmental problems; and the product would be unnatural. There was a core group of organic farmers (5 to 8 depending on the product) who felt that a bioengineered product would need to be approved by their organic certifying association before they would consider using it. The organic and bio-dynamic farmers' negative attitude towards bioengineered products was borne out by their assessment that bioengineered crop seeds were unnatural and would create more environmental problems. Satisfaction with current products or practices emerged as a significant reason for not trying a particular bioengineered crop seed with herbicide resistance, growth regulation and nitrogen-fixing being singled out (by organic, bio-dynamics, organic-conventional and conventional farmers) as being the least necessary qualities to be enhanced through biotechnology research.

TABLE 9-13. BIOENGINEERED AGRICULTURAL PRODUCTS -- CONDITIONS OF USE

	CROP SEEDS								MICROBIAL ORGANISMS					BIOLOGICAL CONTROLS	
CONDITIONS OF USE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. No Conditions	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
2. No Value Added	24	52	34	31	30	26	29	43	30	33	34	30	39	29	35
3. Environmental Problems	16*	17*	15*	16*	16*	16*	16*	16*	20	20	19	28	24	24	24
4. Is Unnatural	16*	18*	16*	16*	15*	15*	15*	18*	6*	6*	6*	6*	6*	7*	7*
5. Trade-offs	5*	7	7	7	7	6*	6	7	4	4	5	5	5	5	4
6. Need Organic Certifying Agency Approval	5*	5*	5*	5*	5*	5*	5*	6*	7*	6*	7*	7*	7*	8*	8*
7. Too Expensive	3*	3*	3*	3*	3*	3*	3*	3*	3*	4	4	5	4	4	4
8. Needs to be Self-Regenerating	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*
9. No opinion/Lack knowledge	2*	2*	2*	2*	2*	2*	2*	2*	4	3	2*	2*	3*	2	2*

CROP SEEDS: 1 = disease resistant; 2 = herbicide resistant; 3 = nitrogen-fixating; 4 = pest resistant; 5 = stress resistant; 6 = higher quality; 7 = higher yields; 8 = growth regulators.

MICROBIAL ORGANISMS: 9 = bioherbicides; 10 = biofungicides; 11 = microbial inoculants; 12 = protection against frost damage; 13 = decomposers of farm wastes.

BIOLOGICAL CONTROLS: 14 = parasites and predators; 15 = weed control.

* Only cited by organic and/or biodynamic farmers

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In regards to bioengineered microbial organisms, no value added and potential environmental problems were the most often cited reasons for not wanting to try a bioengineered product. While organic and bio-dynamic farmers were fairly consistent in their rejection of these products, the three products which conventional farmers singled out most were microbial decomposers of farm wastes (13 responses) and microbial inoculants and biological weed controls (10 responses for each).

The greatest potential for environmental problems in the view of both organic and conventional farmers are first, for microbial organisms to protect against frost damage, and secondly, for decomposers of farm wastes and the two biological control products.

PART E. GOVERNMENT'S REGULATORY ROLE REGARDING AGRICULTURAL PRODUCTION INPUTS

As earlier discussed in Chapter 2, the Canadian federal government has responsibility for the protection of plant breeders' rights through the extension of patent legislation. Agriculture Canada is currently developing a regulatory framework for the approval of new products developed through biotechnology. While the Canadian pesticide regulatory system is currently being revised, the federal government's primary role is the evaluation and registration of chemical pesticides. The provincial governments' role concerns the sale and use of certain types of pesticides. In B.C., this involves authorizing permits and licenses to certain types of pesticide users (e.g., the Pesticide Applicators Certificate program) and enforcement of safety regulations as well as the control of transportation, storage, disposal and spills of pesticides.

To ascertain farmers' attitudes towards bioengineered products, interviewees were asked whether they felt that the government regulation of bioengineered products should be the same, less strict or more strict/different than what is currently in place to regulate synthetic chemical pesticides [see Table 9-14]. Of the total number (112) who answered this question, only 9% felt that there should be an easier or less rigorous regulatory system for bioengineered products, 57% felt that it should be the same, and 34% felt that a more strict and/or different regulatory system should be implemented. Organic farmers felt that a stricter (51%) set of regulations be developed while conventional farmers felt that the current (30%) or an easier (21%) level of regulation would be sufficient. In total, organic and bio-dynamic farmers advocated stricter regulations for bioengineered products than did conventional farmers [$F_{(3,108)} = 15.2053$, $p < .0001$, group differences significant at $p = .01$ level].

Correlation analysis with selected socioeconomic characteristics revealed that more experienced farmers ($r = -.2359$, $p = .01$) felt that the regulatory system for bioengineered products needs to be less strict than that for synthetic chemicals. Only the conventional farmers felt to any degree that government regulation of bioengineered products should be the same or less strict than that for synthetic chemicals. However these differences between groups were not statistically significant. For conventional farmers only, a respondent's education level also appeared to be related to one's conclusion regarding the nature of regulation of bioengineered products. Specifically, conventional farmers with only partial high school education were more likely than others to indicate that the regulation of bioengineered products should be easier than that in place for synthetic chemical pesticides [$F_{(5,36)} = 2.4228$, $p = .0542$].

TABLE 9-14. REGULATION OF BIOENGINEERED AGRICULTURAL PRODUCTS

	TOTAL GROUP (N=112) Means (s.d.)	ORGANIC FARMERS (N=63) Means (s.d.)	CONVENTIONAL FARMERS (N=43) Means (s.d.)	ORG.-CONV. FARMERS (N=6) Means (s.d.)	BIODYNAMIC FARMERS (N=8) Means (s.d.)
1. Regulation of bioengineered products (Note 1)	2.4308 (.75)	2.9000 (.4026)	1.9310 (.7527)	2.0000 (.0000)	3.0000(.0000)
Reasons					
2. Are more harmful to environment/humans	.0982 (.30)	.0727 (.26)	.0698 (.26)	.3333 (.52)	.2500 (.46)
3. Are less harmful to environment/humans	.0268 (.16)	.0000 (.00)	.0698 (.26)	.0000 (.00)	.0000 (.00)
4. Are fundamentally different products	.2679 (.44)	.3273 (.47)	.1628 (.37)	.3333 (.52)	.3750 (.52)
5. System needs larger group of stakeholders	.1071 (.31)	.1636 (.37)	.0233 (.15)	.1667 (.41)	.1250 (.35)

* p < .05 ** p < .01 *** p .001

Note 1. Regulation of bioengineered products compared to current regulatory system for synthetic chemical pesticides.
Coding: 1=less strict/easier; 2= the same; 3=stricter/different.

When asked the reasons for their assessments regarding government regulation, farmers offered a number of different thoughts regarding not only the regulation of bioengineered products but also regarding the current pesticide regulatory system [see Table 9-14]. The most frequently cited rationale that a stricter and/or different regulatory system would be required is that they feel that bioengineered products are fundamentally different from synthetic chemical pesticides ($r = .2302$, $p < .01$) and hold more potential for environmental problems ($r = .2416$, $p < .05$). Therefore a different and stricter regulatory system that involves a larger group of stakeholders (e.g., farmers and their organizations, the general public, social scientists, and/or philosophers) than what is currently perceived to be a government and industry dominated process should be implemented ($r = .3830$, $p < .001$). Interview quotes which illustrate this point of view are from both organic and conventional farmers.

> "I would say that it should be different, considerably different. Way more stringent. I think it should be inputted by people who are outside of the field of genetics and land engineering. I think there should be everyday people involved and small producers, philosophers, religious people, just a cross-section of people who have input into final decisions. Not just business, agribusiness people and government officials. And by the way, I feel that the pesticide system has been totally out of control and has been completely influenced by business." (Organic garlic/vegetable farmer)

> "I think it has to be more stringent. It needs to have more testing in a controllable atmosphere and that includes its initial release. We have to utilize our more isolated sites, our more hostile environments. It would be very easy for something to go astray. When you think of the things that we've done in the past and organisms have moved from one continent to another, when start adding whole new life forms it scares me. I don't feel they should be tried right in the middle of major growing centres, which is what is happening now. The first release of the ice bacteria on potatoes was done in a major potato growing area, that doesn't make sense to me. Even though it had really good laboratory testing." (Organic vegetable farmer)

> "Much more stricter and severe. I don't know much about it, the public doesn't know much about it. Maybe they are creating something new that is not natural. They approved PCBs, that's synthetic and it's one of the worst chemical contaminants in the world, ever. It took man to build it. They have to do a much better job. DDT was once the up and going pesticide and look what it did. It's scary so we have to really watch it. We'll never know until 50 years after what it's done or will do. Even longer term, 100 years or 200 years." (Conventional livestock farmer)

An alternative stance was that because the nature of the product was different, regulations should be less strict for bioengineered products.

> "I think there's obviously a need for caution in a sense that we don't want to unleash something that will create another problem. But my feelings on this avenue is that it shouldn't have the same stringent regulations to it because you're not producing toxins that are dangerous to the welfare of human life, fish, animals. For example, if you develop a plant that is resistant to fireblight, I have difficulty comprehending why it should have to go through years and years of testing to prove itself. I think it's something that should be moved in, trialled on a larger scale." (Conventional vegetable/tree fruit farmer)

Still others drew a distinction depending on what type of bioengineered product was being considered.

> "Probably has to be different because if you're altering and if you're introducing new bugs then there's that problem. Are they innocuous to the rest of the ecosystem? I think it's easier to check pesticides. There's an established system that has been worked out over a long period of time whereas some of these new things, not as much is know about them. Just different criteria or additional criteria. I'm just not sure that the criteria that is used right now would be completely sufficient for this new way. If you're developing a new seed, I don't see any problem with that or a new wheat or a new apple but it you're going to these bioherbicides or biofungicides, who knows? I think you have to be more careful because you're introducing something living." (Conventional tree fruit farmer)

A subgroup correlation analysis based on production method showed that organic and bio-dynamic farmers held this view the most strongly. However analysis of variance intergroup comparisons revealed no significant differences between groups on these individual variables.

To what extent are these conclusions based on prior knowledge, information sources and perceptions regarding the benefits and costs/risks associated with biotechnology? Those farmers who are more knowledgeable about biotechnology, rely more on mass media information sources ($r = .2710$, $p < .01$) and rely less on other farmers and farm organizations ($r = -.2399$, $p < .01$) as information sources tend to conclude that a stricter and/or different regulatory system is required for bioengineered products [see Table 9-15].

In regards to reasons for these conclusions, we find that those who feel that bioengineered products are less potentially harmful to the natural environment rely more often on government sources of information ($r = .3265$, $p < .001$). Those farmers who feel that bioengineered products are fundamentally different than agrichemicals are generally found to be those with a lower overall knowledge level about biotechnology ($r = -.3869$, $p < .001$) but rely more often on education courses and conferences ($r = .1969$, $p < .05$) as sources of

TABLE 9-15. REGULATION OF BIOENGINEERED PRODUCTS X BIOTECHNOLOGY INFORMATION SOURCES; BIOTECHNOLOGY KNOWLEDGE LEVEL (Total Group, N = 112)

			INFORMATION SOURCES (SUMMARY INDICES)					
	Means	s.d.	6	7	8	9	10	11
1. Level of Regulation for Bioengineered Products (Note 1)	2.2768	1.0416	-.2399**	-.0915	.2710**	.0304	.1355	-.3452***
Reasons								
2. Are more harmful	.0982	.2989	-.0596	-.0746	-.0181	-.0715	.1169	-.0655
3. Are less harmful	.0268	.1622	-.0610	.3625***	-.0645	-.0925	.0343	-.0413
4. Need larger group of stakeholders	.1071	.3107	-.0085	-.0783	.1378	-.0293	.0820	-.0863
5. Are fundamentally different	.2679	.4448	-.1393	.0091	.0821	.1969*	.0649	-.3869***
Information Sources (Summary Indices)								
6. Farmers/Farm Organizations	.1786	.4880						
7. Government	.0625	.2777						
8. Mass Media	.5804	.6387						
9. Education and Research	.2946	.5308						
10. Agricultural Media	.5446	.5179						
11. Biotechnology Knowledge Level (Note 2)	.4821	.6000						

* $p < .05$ ** $p < .01$ *** $p < .001$

Note 1. Level of Regulation: 1 = Less strict than for chemical pesticides; 2= the same; 3 = Stricter/Different than for chemical pesticides

Note 2. Prior Knowledge Level: 0 = None; 1 = A little knowledge; 2= Well informed.

information regarding biotechnology. It appears that those who view bioengineered products as less harmful to the natural environment also tend to stress the economic benefits to be derived ($r = .2768$, $p < .01$). There is a positive correlation between stricter/different regulations and a negative or critical attitude towards scientific research involving biotechnology ($r = .2311$, $p < .01$) [see Table 9-16]. A farmer's negative attitude toward scientific research utilizing biotechnology and his/her perception of environmental risks appears to be related to concerns that these products are fundamentally different from agrichemicals ($r = .2567$, $p < .01$) and pose greater potential for environmental problems ($r = .1790$, $p < .05$).(See Table 9-16)

Thus it would appear that the rationale for suggesting that a stricter and/or different regulatory system be instituted for biotechnology is derived from environmental concerns and distrust of scientific research using biotechnology. These relationships generally hold irrespective of which type of production method group the respondent belonged to.

The question regarding regulation of bioengineered products often prompted comments regarding the pesticide regulatory system currently in place [See Table 9-17]. This was a particularly important issue for conventional farmers who use these products. Typical comments reflecting this viewpoint are as follows,

> "The current process for synthetic chemicals is far too slow. Their response is glacial. It means that if a new pesticide or fungicide is available, it is more than likely to be available to all our competitors for years and years before we can use it. So consequently, imported fruit can be on the market in Canada which has been treated with these substances and yet we can't use it here. And that just doesn't seem to be fair. It doesn't make sense. If you can't use the product in Canada then no product on which it has been used should be allowed to be imported. Their response to synthetic chemicals and these new things should be much more rapid because otherwise I think we will be left behind." (Conventional tree fruit farmer)

> "I think it should be quite different. For example, Nova came onto the market here this year. It's been sprayed everywhere in the world for seven years, so all the apples in the stores that aren't coming from B.C. have got it on it anyhow. Why did we have to wait seven years to get it? I think what's licensed in the States should be licensed here. We have such a small market here that a lot of the companies are not going to go through all the bullshit and all the money that's involved to get it licensed up here. So anything that's licensed in the States, we should rubberstamp them up here." (Conventional tree fruit farmer)

TABLE 9-16. REGULATION OF BIOENGINEERED PRODUCTS X PERCEIVED BENEFITS AND COSTS/RISKS OF BIOTECHNOLOGY; BIOTECHNOLOGY KNOWLEDGE LEVEL (Total Group, N = 112)

			PERCEIVED BENEFITS/COSTS and ATTITUDES TOWARDS RESEARCH					
	Means	s.d.	6	7	8	9	10	11
1. Level of Regulation for Bioengineered Products (Note 1)	2.2768	1.0416	.0655	.0001	.1038	.1419	-.0881	.2311**
Reasons								
2. Are more harmful	.0982	.2989	-.0743	-.1490	.0774	.1728*	-.0081	.1790*
3. Are less harmful	.0268	.1622	.2768**	.1415	-.0536	-.0478	.1311	-.1396
4. Need larger group of stakeholders	.1071	.3107	-.1118	-.1296	.0474	.0985	.0797	.1061
5. Are fundamentally different	.2679	.4448	.0333	.1277	.1755*	.1719*	-.1319	.2567**
Perceived Benefits of Biotechnology								
6. Economic Benefits	.0798	.1025						
7. Environmental Benefits	.0580	.0887						
Perceived Costs/Risks of Biotechnology								
8. Economic Costs/Risks	.1272	.1365						
9. Environmental Costs/Risks	.1775	.1828						
Attitude towards Biotechnology Research								
10. Positive/Supportive	.0982	.2989						
11. Negative/Critical	.1935	.2309						

* $p < .05$ ** $p < .01$ *** $p < .001$

Note 1. Level of Regulation: 1 = Less strict than for chemical pesticides; 2= the same; 3 = Stricter/Different than for chemical pesticides

TABLE 9-17. PERCEPTIONS REGARDING CURRENT PESTICIDE REGULATORY SYSTEM

	TOTAL GROUP (N=112) Means (s.d.)	ORGANIC/ BIODYNAMIC FARMERS (N=63) Means (s.d.)	CONVENTIONAL FARMERS (N=43) Means (s.d.)	ORG.-CONV. FARMERS (N=6) Means (s.d.)
Current pesticide Regulatory System needs to be made:				
1. More efficient/easier to register	.0893 (.2864)	.0159 (.1260)	.2093 (.4116)	.0000 (.0000)
2. Is effective--no change	.1518 (.3604)	.0159 (.1260)	.3023 (.4647)	.5000 (.5477)
3. Stricter--need more barriers to registration	.3393 (.4756)	.4921 (.5040)	.1628 (.3735)	.0000 (.0000)
Need international harmonization of pesticide regulations	.1071 (.3107)	.0159 (.1260)	.2558 (.4415)	.0000 (.0000)

As a group, conventional and organic-conventional farmers expressed greater satisfaction with the current pesticide regulatory system than did organic and bio-dynamic farmers ($F_{(3,108)} = 9.1769$, $p = .0002$). A number of conventional farmers (especially those in fruit and berry production) also proposed that registration of pesticides be made more efficient or easier such that a greater variety of these products would be available in the marketplace ($t = -3.50$, $p = .0005$).

Given that the majority of synthetic chemical pesticides used by Canadian farmers are developed (and often manufactured) in the United States, the issue of international harmonization of pesticide regulatory systems was often mentioned as one way to accelerate the pesticide registration process thereby increasing the number of available products ($r = .6002$, $p < .001$). In contrast to conventional farmers who generally supported this policy initiative, organic and bio-dynamic farmers were less convinced of its merits ($F_{(3,108)} = 6.8813$, $p = .0001$). In fact, several organic and bio-dynamic farmers felt that international harmonization and increased availability of synthetic chemical pesticides were not desirable goals and should be avoided. Citing their distrust of the validity and reliability of the U.S. pesticide regulatory system, several also stated that the Canadian regulatory system should be made stricter and additional barriers to importing synthetic chemical pesticides be implemented.

> "I know there's a lot of pressure from the farmers to bring in pesticides from the States without retesting them. And they want to bring these in they say so they can compete with the American producers. In the first place, they shouldn't have to compete with the cheapest possible product from anywhere else in the world cause all it means is that everybody has to work for the lowest wages that a desperate Mexican will which is not going to keep anybody alive in this country. I don't want to have anything that's tested in some lab in Texas that turns out to have falsified their results like that last one that tested Roundup and it turned out that they faked the results. There's too much of that that goes on. So when they talk about harmonizing, it's absolute lunacy." (Organic vegetable farmer)

In general though, there was considerable variability amongst conventional farmers regarding whether the current pesticide registration system should be more or less strict. A number of conventional farmers were skeptical of a review system which relied heavily on research data provided by pesticide manufacturers as the following comment illustrates.

> "I sometimes wonder whether they do such a good job on chemicals. I think they should keep close check on these things. Actually, some of these spray materials they developed, I understand that the onus is on them to do the research. And I think some of it was not accurate. It doesn't seem like a good idea to have the onus on them. If they've spent millions on a product, they're going to try to prove it's safe, aren't they?" (Conventional tree fruit farmer)

One farmer who was a former Agriculture Canada extension agent questioned the ability (or willingness) of his former employer to make unbiased judgments.

> "As long as it's with Health and Welfare Canada, it's fine. As long as it's outside the area of political control. Ag Canada you can manipulate, Health and Welfare Canada, those boys in there, you can't. They're assigned a job and they carry it out. But Ag Canada has got a little too political and too easy to control. I think they have an attitude that they are trying to be helpful whereas on these things here you have to answer the questions." (Conventional tree fruit/vegetable farmer)

And finally, the following statement made in half-jest by a large scale vegetable/tree fruit farmer illustrates the mixed feelings he has about the issue.

> "As a farmer, take those regulations that regulate chemicals and throw them in the garbage can. They're a joke, they're a waste of time and they cost me a helluva pile of money every year. And I don't have chemicals as a result of them too. So I'm not on an even playing field with my competition in the U.S. let alone New Zealand or Chile or any of these countries that are still using chemicals that were banned here 15 years

ago. So if we're going to have pesticide controls, let's have them for everybody. And let's have an even playing field.

Now as a citizen, I say they're great. They're the best in the world. Because I know what it takes to get a pesticide certified in Canada. It's a helluva lot harder than it is in the U.S. and I think as far as a track record is concerned, as far as controlling pesticides, Canada has a pretty good track record." (Conventional vegetable/specialty farmer)

The Issue of Plant Breeders' Rights

An issue related to bioengineering technology is the extension of patent protection to include life forms. In agriculture, the introduction of Plant Breeders' Right legislation (Bill C-15) provides a measure of security that biotechnology researchers will recoup their economic investment. As earlier discussed in Chapter 5, while agricultural researchers and agribusiness support the concept and have successfully lobbied governments to enact such legislation, environmentalists oppose plant breeders' rights for a number of reasons.

In interviews with farm organization leaders, the topic of the recent introduction of plant breeders' rights legislation in Canada was addressed. One common concern expressed was the negative economic impact on farmers caused by potentially higher seed prices due to corporate concentration in the seed industry. Another concern was a potential requirement that bioengineered seeds be used with specific agrichemicals to achieve their production potential. As elaborated by one farmer,

"To obtain the seeds is going to cost and it is not going to be any cheaper for individual farmers. Certainly, the chemical companies now getting into plant breeding, they will tailor make seeds and plants that will be tolerant to a specific chemical for in the field use. So that is a concern. There's fewer plant breeders now than ever, it has been concentrated and that can spell higher prices, so I guess to develop these new plants there is a cost attached that they're also going to control the rights to those plants...I guess the benefits will be plants that perform better and produce more, are more tolerant of more diseases, are stronger and more specific...The benefits would be an improved plant with which to work and if it is offset by a lot of costs, to have the access to that plant then there are none." (Conventional grain farmer)

A related issue which was expressed most often by organic farmers was the additional potential threat of patent legislation to the availability of heritage seeds and the protection of genetic diversity.

"We came out strongly opposed to it. Plant breeders' rights is basically a license for multinational corporations, mostly petroleum corporations,

> to corner the market and to eliminate the heritage varieties and to restrict trade in seed. Our major fear is that through genetic engineering and biotechnical engineering that they're going to breed seeds that can only survive using the petrochemicals that they develop and that they'll impregnate the seeds with whatever, and maybe to the extent that they'll have herbicides and pesticides already in the seed. So you'll plant the seed and then it's already a package with everything and all the chemicals that are needed already in there. And it has nothing to do with anything that we stand for in terms of preserving the land, in terms of regenerating the land, in terms of soil improvements, in terms of diversity. It's a step towards the direction that the whole country is going into ownership by multinational corporate hands." (Organic specialty farmer)

One organic farmer objected to plant breeders' rights on moral grounds, likening the ownership of plants to slavery.

> "It is another step away from the farmer's stewardship of the soil and towards a more industrial model of agriculture. Slavery was outlawed in the last century, but now we are coming back to the idea that we can in fact own life forms. There is something unnatural and unsettling about being able to own something, own and have total control over something that is alive. We do it with our animals in our exploitation of them for meat and so on, but it is not quite the same as taking a life form and patenting it so that everybody who uses it has to pay you to use it. I don't like it." (Organic tree fruit farmer)

Following discussion with their members, several of the organic certifying associations sent letters of protest to the federal government (both individually and collectively). The association located in the Lower Mainland/Fraser Valley region (B.C. Association for Regenerative Agriculture) was perhaps the most active and organized in their opposition to Bill C-15. They sent letters and telegrams to the federal cabinet, key politicians and Agriculture Canada. When asked what kind of response they got back, the person who was the president at the time related,

> "Typical bureaucratic response. 'Thank you for your inquiry. You're terribly mistaken'. That 'Oh no, this isn't doing what you think it's going to do. It's very benign and wonderful...' Or some of the responses would be 'Thank you for your interest', period. This was a while back but I can't recall whether it was a three or four, could have been a longer page letter of gobbely-gook that was basically a rationale for doing it. But it had huge holes in it. And the same thing is going on with virtually every other policy area in the federal government. Well, it's 'The Americans did it, so we have to. Cause we won't be able to compete with them if we don't do what they do'." (Organic specialty farmer)

In summary, support for plant breeders' rights amongst farmer groups was rare while opposition on economic and ethical grounds was much more prevalent amongst the persons interviewed. However, the condemnation of plant breeders' rights was not unanimous. For supporters of the legislation, the potential for increased research initiatives and improved seeds were identified.

> "Yes we're [the B.C. Grain Growers Assoc.] in favour of it, we think it will stimulate research that has stagnated because of the reduced federal budget. Twenty years ago we were leading the research in agriculture and plant breeding in the world and we've just slowly eroded that by cutbacks. Now we're in the position where we're losing research stations, they're going to close them down. And if we can't upgrade them, then we have to go outside and look at other countries and see what they have and bring them in. The only problem that there could be is in the grasses, that a company can buy the rights to this product, and it's theirs and only theirs, and they must get money from that product so they can capture the market on possibly a very good product, that's a downside. There's a fear that it will hold the farmers ransom, they'll get a real good product and hold it and don't want to sell it for $10 a bushel. If they can sell it for $10 a bushel and the farmer knows that he can produce more with it and get a better price, then we'll pay it. If the price is too high and the product hasn't been tested enough, it will die. It's still supply and demand." (Conventional grain farmer)

> "We're in favour of it because it protects what is done in Summerland [AgCanada Research Station]. The Fruit Growers Association, they're the ones that do all the lobbying. It does have an effect on us because Summerland is one of the top plant breeders of tree fruits in the world. A lot of interest in new varieties, so the plant breeders' rights is important." (Conventional tree fruit farmer)

As far as the sampled farm organizations which supported plant breeders' rights legislation, it was learned that the B.C. Federation of Agriculture (through the Canadian Federation of Agriculture), the B.C. Fruit Growers Association, the B.C. Grain Producers Association, and the B.C. Vegetable Marketing Commission (through the Canadian Horticulture Council) supported and/or lobbied for the enactment of Bill C-15. Adamantly opposed to Bill C-15 were the National Farmers Union and all of the B.C. organic certifying associations (with the exception of the Peace River Organic Producers Assoc.). As one of the grain farmers in the Peace River region related, the Alberta Wheat Pool's support for plant breeders' rights was subject to nine conditions, among them

> "The Alberta Wheat Pool, I was quite a vocal opponent in plant breeders' rights policy with the Alberta Wheat Pool so they've ended up with the conditionals in the plant breeders' rights. Conditional on the fact that the multinationals not be allowed to control seed stocks, that public money still go into research and development of new varieties, and that it not be turned completely over to the private." (Conventional grain farmer)

In summary, from the perspective of the purchasers of patented plant material, plant breeders' rights, the increased costs of this production input may or may not be offset by the projected benefits to be derived from improved plant materials. Plant breeders' rights are also perceived to be another impetus for increased corporate concentration and control in the agribusiness industry which may result in a loss of decision making discretion at the farm level. The argument that Canadian plant breeders' rights legislation be made congruent with that of other industrialized countries is a persuasive one. As identified in Chapter 5, there are significant international pressures for harmonization of plant patent legislation. However, the suspicion remains amongst many farmers that it is primarily agribusiness interests which will benefit from this legislation. That is, instead of increasing the variety of seeds available, plant breeders' rights creates the incentive for plant breeders to only market those seeds which they have patent rights for.

PART F. SUMMARY CONCLUSIONS

In regards to Research Question 13a which proposed that both conventional and organic farmers will hold positive beliefs about the relative economic advantages of biogenetic engineering innovations, there appears to be support only for the conventional farmer group. Only 7% of conventional farmers did not feel there were any benefits to be realized from biotechnology. Of particular interest to the conventional farmers were the potential benefits of increased production yields, genetic plant resistance to pests and reduced need for agrichemicals. A large percentage (46%) of organic and bio-dynamic farmers stated that they did not see any benefits to biogenetic engineering technology in agriculture -- economic or otherwise. However there were a few organic and bio-dynamic farmers (19%) who did at least one benefit to biotechnology in production (that of increased genetic plant resistance to pests).

What cannot be discounted is the large number of costs and risks both organic and conventional farmers associated with biotechnology. The majority of farmers interviewed perceive that biogenetic engineering entails significant costs and risks of both economic and environmental natures. Balancing these against each other, the decision for conventional farmers (as indicated by the intention to use data) appears to be in favour of the potential benefits to be derived from the adoption of bioengineered innovations. In contrast, organic and bio-dynamic farmers come to the opposition conclusion -- that biotechnology's potential costs and risks far outweigh the benefits and therefore should not be adopted. In fact, organic and bio-dynamic farmers viewed biogenetic engineering to be of such high risk that they (more than conventional farmers) felt that government regulation of these products should be stricter and different than what are currently required for pesticides. In total then, Research Question 13a can only be supported in regards to conventional farmers and not for the majority of organic or bio-dynamic farmers in this study.

The relationship between prior assessments of benefits and costs/risks of biotechnology and subsequent behavioral intentions appears to be tenuous at best for conventional farmers. It appears that in the face of judging the acceptability of individual bioengineered products, conventional farmers were willing to disregard or ignore their negative beliefs and attitudes regarding the merits of the technology in general. Not so for the organic and bio-dynamic farmers who tend to remain more true to their primarily negative initial judgments about biotechnology and resist acceptance of the individual products.

Thus, there is mixed support for Research Question 13b which proposed that both conventional and organic farmers would view biogenetic engineering innovations as being compatible with their existing agricultural practices. Based on these data, Research Question 13b can only be supported for the conventional farmer group in that while they may have their misgivings concerning bioengineered products' potential economic costs and environmental risks, they are generally willing to utilize them as part of their production practices. On the other hand, as a group, organic and bio-dynamic farmers do not view bioengineered products to be either practically or ethically compatible with their mode of production.

Research Question 13c proposed that both conventional and organic farmers would attribute low complexity to the incorporation of biogenetic engineering innovations with their existing agricultural practices. In addition, Research

Question 13d proposed that biogenetic engineering innovations would be perceived by both conventional and organic farmers as requiring incremental changes to existing agricultural practices. Again, conventional farmers' indication that they would try out the majority of the identified bioengineered products would suggest that they perceive the adoption of bioengineered products to be of relatively low complexity and requiring incremental adjustments to their farming practices. This is especially true for the crop seeds which were generally perceived to be substitutes for existing ones. Conventional farmers' relatively higher acceptance (in terms of intentions to use) of microbial organisms and biological controls was also largely premised on perceptions of their ease of substitutability for existing synthetic pesticides.

The picture is less clear for organic and bio-dynamic farmers who were more strongly opposed philosophically to biotechnology research in general. Organic and bio-dynamic farmers were more likely to identify problems such as controlling bioengineered organisms and unpredictable environmental outcomes thus suggesting that they view the introduction of these products as more complex and requiring greater control mechanisms (at the government approval stage and in use) to prevent negative outcomes. In general, they were less likely to see the use of bioengineered products as simply a substitution of one input with another but one that requires caution and more complex management systems. In regards to the incremental-radical dimension of bioengineered products, while many of the identified bioengineered products are not acceptable under existing organic certification standards, at the surface level, the substitution of certain crop seeds for others is regarded as representing incremental changes to existing practices (with the exception of herbicide resistant crop seeds) and the use of biological controls for pests would appear to be consistent with organic methods of production. While at the practical level bioengineered products might be viewed as representing incremental change, it is at the philosophical level that it represents a radical shift from utilizing "natural" inputs and methods of production to ones which are (like agrichemicals) produced through scientific technology. Therefore, the radicalness of bioengineered products is associated less with work practices and more with a readjustment of one's philosophy of agriculture and one's relationships with agribusiness suppliers which are closely associated with synthetic agrichemicals.

In summary, it appears that Research Question 13c regarding bioengineered products' complexity in use at the farm level is more supportable for conventional farmers rather than organic farmers. While at the practical level Research Question 13d regarding incremental and radical changes to existing agricultural practices would appear to be supportable for both conventional and organic farmers, at the philosophical (and political) level bioengineered products are perceived by organic farmers to represent a radical shift in their approach to agriculture.

Substantial support was found for Research Question 5a which proposed that the primary sources of information about biogenetic engineering for both organic and conventional farmers was through mass media communication channels. The agricultural print media and television programs were by far the most often mentioned by all farmers. To a much lesser extent farmers were obtaining information at education courses and conferences or through their farm organizations. It appears that the information received through the print media and television has been more of a negative nature in that farmers who attended to these sources of information were more likely to identify the costs or risks associated with biotechnology. On the other hand, those who attended to other sources of information were more likely to identify the positive benefits to be derived from biotechnology.

Who then are perceived to be the champions of biogenetic engineering innovations? As illustrated by the comments made by farmers, the general perception is that the manufacturers of bioengineered products as being the ones who are promoting biotechnology in agriculture. Noting that several of the corporations involved in biotechnology research are also those who manufacture synthetic pesticides and are acquiring seed companies, the prospect of increased vertical integration and corporate concentration in the agribusiness sector is not viewed as a positive development by farmers, the eventual purchasers of these products. What is interesting is that both organic and conventional farmers expressed this concern.

As evidenced by data on farmers' sources for information on biotechnology, the debate concerning its benefits and costs/risks is taking place primarily at the societal (television) and sectoral (agricultural media) levels. In opposition to the agribusiness champions of biotechnology are critics such as David Suzuki who are opposed to biotechnology on ethical and moral grounds. Critics apparently are given voice in the agricultural media which provide information on both the positive and negative features of biotechnology.

Government is also seen as being in alignment with agribusiness manufacturers in both their research and regulatory roles. It appears that government researchers who present at education courses and conferences tend to highlight the positive aspects of biotechnology research in agriculture. Conventional farmers who attend these sessions are generally supportive of government's initiatives to promote biotechnology research and through plant breeders' rights legislation, to offer patent protection for the products of this research. Leaders of conventional farm organizations reported that lobbying of government for plant breeders' rights legislation was done primarily by their umbrella national organizations rather than by individuals or provincial farm organizations. On the other hand, organic and bio-dynamic farmers are more likely to regard the collaboration between government and agribusiness in a much more negative light. As related by organic farm organization leaders, the concerns of those outside of conventional agriculture and agribusiness have been ignored during the development of plant breeders' rights legislation.

While the data gathered in this research study as to the championship of biogenetic engineering technology is limited to the perceptions of farmers, from their perspective it would appear that the championship of these innovations follows those identified in Research Questions 16c and 16d. To reiterate, Research Question 16c proposed that the championship role for biogenetic engineering innovations will tend to be diffused among organizations and/or societal interest groups while Research Question 16d proposed that champions of biogenetic engineering innovations are centrally situated in societal level sociometric and communication networks. For the farmers interviewed, the championship of biotechnology is generally associated with the agribusiness sector and government agencies rather than with individuals. The only individual commonly identified in the biotechnology debate was David Suzuki who is acting as a strong opponent of the technology through his national television programme. The organic and bio-dynamic farmers who were especially critical of biotechnology perceive there to be almost a conspiracy of these interest groups to promote biotechnology over the objections of its critics. They were also more likely to draw analogies between the promotion of biotechnology innovations and developments which led to and continues to sustain the widespread adoption of synthetic chemical innovations. Thus at this early stage in its development, the contest between proponents and opponents of biotechnology is primarily being conducted in mass media channels and in the corridors of government amongst those located in societal level sociometric and communication levels.

In conclusion, there appear to be significant commonalities between biogenetic engineering technology and synthetic agrichemicals in terms of societal and institutional support mechanisms. Based on the results of these individual level data, innovations arising out of biogenetic engineering technology will not bring about the unification of organic and conventional agriculture. Instead, each sector of this organizational field will continue in parallel in respect to these latest technological innovations. As observed throughout the analysis concerning organic farming and synthetic agrichemicals, those who practise organic farming are primarily motivated by their ideological and environmentalist beliefs and values. In contrast, those who practise conventional agriculture are primarily motivated by their economic interests.

Organic farmers' rejection of biotechnology is as much informed by their distrust of the sectional interests which are promoting biotechnology as by their ethical and environmentalist concerns. Organic farmers identify biogenetic engineering technology as one more means by which industrial elites can continue their domination over agriculture. Now that synthetic agrichemicals have fallen in disrepute (as evidenced by the rising public concern about pesticides and the imposition of government restrictions on their licensing and use), biotechnology is becoming the future focal point for resistance.

Despite their concerns about biotechnology's potential risks and costs, conventional farmers will apparently welcome these new technological innovations as a means of enhancing agricultural production. While expressing some distrust of sectional interests in industrial agriculture, conventional farmers advocate only incremental adjustments to the system within which they operate. Adopting a critical perspective, Lukes (1974, p. 23) would argue that this response was evidence of the existence of hegemonic power wherein "the supreme exercise of power [is] to get another or others to have the desires you want them to have -- that is, to secure their compliance by controlling their thoughts and desires". Needless to say, many conventional farmers would protest this attribution that they are only pawns of industrial interests. The alternative argument would be that the introduction of biotechnology does indeed serve the interests of those who support capitalist free market principles. As posited by the biotechnology industry and by government, bioengineered products will raise current productivity levels, reduce the use of environmentally harmful synthetic agrichemicals, and enhance the profitability of farm operations. These benefits may indeed be realized, but one must also consider that the acceptance of biotechnology also represents a continuation of the current social and power relations within the agricultural sector.

However, there are contradictions in the conventional farmers' response when one considers the social and political bases of the current economic crisis in conventional agriculture. Despite their stated desire to be independent, conventional farmers support (some grudgingly) government assistance in the forms of regulated marketing, financial subsidies and trade protection (in defense of a "level playing field" with competitors). As yet, such programmes have not been provided to organic farmers who operate outside of mainstream agriculture. While both organic and conventional farmers share a common goal of economic independence, the paradox is that organic farmers are the ones who are more fully enacting this free market principle by rejecting many of the products of the industrial agribusiness.

SECTION V. CONCLUSIONS

What has been learned about the innovation process and organizational politics as a result of this field analysis of B.C. farmers and farm organizations? As a multi-faceted research project which included analysis at individual, organizational and societal levels, there were numerous insights into a wide variety of topics and issues. This section provides first, a brief summary of major research findings. A discussion of theoretical contributions and suggestions for future research directions is followed by brief final comments.

PART A. A SUMMARY OF FINDINGS

In the course of this field analysis a number of research questions concerning the innovation process and organizational politics were explored. The following is a summary discussion of the evidence obtained on each of these questions. The first set of questions to be addressed concern the socio-economic and personal background characteristics of farmers. These are followed by a discussion of questions concerning information sources and communication behaviour and then, individual perceptions, beliefs and evaluations. The discussion will then relate findings regarding farm organizations followed by a discussion of the incidence and political dynamics of innovation championship observed in this research project. Part A will conclude with a brief outline of the interorganizational networks in B.C. agriculture and then focus more specifically on the interorganizational networks which exist within the organic farming industry. The results of the detailed analysis of the organizational politics which surrounded the introduction of provincial organic agricultural productions regulations concludes this part of the chapter on research findings.

Socio-economic and Personal Background Characteristics

The following questions relate to the historical and current personal contexts within which organic and conventional farmers are operating. This includes their personal backgrounds, production operations and the degree to which they have been innovative in the past (Chapter 4).

Are organic farmers different from conventional farmers?

Comparisons between organic and conventional farmers in the sample interviewed showed that there are a number of differences between the two groups in terms of their socio-economic characteristics. There were no statistically significant differences in terms of the average ages of organic and conventional farmers, although the bio-dynamic farmers were relatively older than the rest. There were more organic farm women who identified themselves as either the primary or equal partner in farm production.

On average, organic farmers had a higher education level than conventional farmers but the nature of their education was more likely to be in nonagricultural disciplines. This helped explain organic farmers' greater diversity in occupational backgrounds and their higher levels of career and geographic mobility. In contrast, the conventional farmers in this study were more likely to be technical specialists in agriculture. That is, their education and training was more often in agriculture related disciplines and they were also more likely to have continuous careers as farmers (many starting in childhood). In terms of current off-farm employment, organic farmers and their spouses/partners were the most likely to have dual careers.

Thus, the organic and conventional farmers who were studied in this research project were different primarily in terms of the level and nature of their formal education and career histories (past and current) rather than other demographic characteristics.

Are organic farms different from conventional farms?

This question focuses on the differences in farm operations and marketing based on the type of production system used on the farm. While the process by which conventional farmers were selected restricts generalizations to the larger farm population in conventional agriculture (i.e., not a cross-sectional sample), this matching of organic and conventional farmers on the basis of product type and geographic location controls to some extent variability in terms of the production requirements for different types of farm products and growing conditions. In contrast, the organic farmers participating in this study were a higher proportion (25% of the estimated number in 1990) of the total B.C. organic farming population and a cross-sectional sample.

It was found that, on average, organic farms were smaller (in terms of farm acres in total and in production) than conventional farms producing the same types of products in the same geographic region. Both organic and conventional farmers were equally diversified in terms of the type of farm products, while the bio-dynamic farmers were the most diversified. There was also a trend over the past five years towards increased product diversification.

While comparisons of amounts of farm operating expenses was not possible (such data was not collected), a comparison of the level of each type of operating expense as a percentage of total operating expenses was conducted. Generally, organic farmers spend proportionately more on labour expenses while conventional farmers spend proportionately more on crop production inputs. For larger farm operations, conventional farmers hired more agricultural labour than did organic farmers. In contrast, organic farmers were more likely to be able to fulfil farm labour requirements from within the farm family or partnership unit. This was especially common on those organic farms which were operated by members of intentional communities or non-family partnerships (such nontraditional operating arrangements were limited to the organic farming sample).

There were a number of differences in terms of the methods by which the farmers marketed their products. On average, organic farmers were more likely to be engaged in direct sales, either at the farm gate or community farmers markets. Conventional farmers were more likely to be selling through established wholesalers, distributers and marketing co-operatives. Part of this difference can be attributed to the fewer number of established marketing channels for organic food given the smaller number of organic producers and their relative newness in the industry.

Therefore, the answer to the question of whether organic and conventional farms are different would be in the affirmative. Organic farms tend to be smaller and are less reliant on hired agricultural labour than conventional farms. Organic farms are also more autonomous in terms of the marketing of farm products in that they are much more likely to be involved in direct sales marketing.

Are organic farmers more innovative than conventional farmers?

As found in Chapter 4, organic and conventional farmers were equally innovative in terms of trying new products and practices in their farm operations. The large majority (90%) reported that they had made at least one substantive change (on average, 2.6 innovations/changes) in their operations during the past five years.

When asked the source of ideas for these innovations and changes, organic farmers were more likely to state that they had thought of it themselves or had learned of it from reading publications, talking to other farmers or through their farm organizations. In contrast, conventional farmers were more likely to identify the sources of innovative ideas as being suppliers and consultants, government or publications.

While the simple counting of changes in farm operations does not reveal the full impact of an innovation on farm operations, these findings suggest that organic farmers are not more innovative than conventional farmers but rather are only different in terms of the types of innovations which they adopt. Even so, there appears to be a degree of transfer between organic and conventional agricultural production systems. Most notable is conventional farmers' adaptation of sustainable agriculture practices for soil conservation and enhancement. Both organic and conventional farmers are also adopting similar methods of biological and cultural pest control to address common production problems.

Information Sources and Communication Behaviour

The following research questions attend to the knowledge stage of the innovation decision making process in regards to the influence of information sources and individual communication behaviour (Chapter 5). Of interest is whether there are differences between organic and conventional farmers in terms of the type of information sources they access to learn about agriculture in general, organic farming and biogenetic engineering technology. Also of interest are farmers' evaluations of different information sources on the criteria of relevance, understandability and trustworthiness. In this way, the degree to which the communication behaviours of selective exposure and selective perception are operating within each farmer group can be ascertained.

Are organic and conventional farmers different in terms of their communication behaviour?

This question concerning communication behaviour relates to the type of information sources being attended to by organic and conventional farmers. Research Questions 4a and 4b posit that farmers will attend to those information sources which are identified as being congruent with their chosen method of farm production (selective exposure). In effect, these research questions suggest that rather than seek out alternative points of views, farmers seek out those sources which offer information which confirms their pre-existing biases and philosophies. There was substantial support for both Research Questions 4a and 4b. Organic farmers tended to cite sustainable agriculture information sources to a significantly greater extent than they did information sources associated with mainstream or conventional agriculture. Conventional farmers only cited information sources associated with mainstream or conventional agriculture, very few had accessed information sources associated with organic or sustainable agriculture.

What communication channels do farmers access for information concerning organic farming innovations and biogenetic engineering innovations?

Information from various sources plays an important role in the innovation adoption and diffusion process (as discussed in Chapters 1 and 2). As a relatively new innovation, it was proposed that the major source of information about biogenetic engineering innovations would be through mass media communication channels (Research Question 5a). For both organic and conventional farmers interviewed, there was substantial support found for this research question (Chapter 7). The primary sources of information regarding biotechnology were the agricultural media (31% of farmers) and television (28%). Other sources of information such as other farmers, farm organizations and agribusiness suppliers were significantly less often cited.

In regards to information about organic farming innovations, it was proposed that as a relatively more established and less researched method of agricultural production, the primary sources of information about organic farming innovations would be interpersonal communication channels (Research Question 5b). Given the prominence of print media as the source of information regarding organic farming for the organic farmers in this study, this proposition could not be supported (Chapter 5).

Given that the primary sources of information concerning both organic farming and biogenetic engineering technology are mass media communication channels, this would suggest (according to the innovation diffusion literature) that both sets of innovations are in the early stage of development and adoption.

Are there differences between organic and conventional farmers in terms of how they rank different information sources in terms of relevance, understandability and trustworthiness?

Judgments as to the relevance, clarity and trust which farmers place in the information provided by different information sources were obtained through a comparative ranking exercise. Research Question 6a posited that organic farmers will rank information sources identified as subscribing to an organic farming philosophy higher (in terms of relevance, clarity and trust) than sources identified as promoting conventional agricultural practices (selective perception). For organic farmers, sources identified as promoting organic agriculture included other organic farmers, organic farm associations and sustainable agriculture media. Organic farmers identified that they associated government, agribusiness, industrial suppliers/contractors with conventional agriculture. Ranking comparisons confirmed that they ranked sources associated with organic farming significantly higher on all three criteria than those they perceive as associated with conventional agriculture (with agribusiness often ranked the lowest).

Given conventional farmers' lack of contact with organic farming information sources, their referent groups in terms of individuals, farm organizations and the print media were those in conventional mainstream agriculture. Thus a direct test of Research Question 6b which stated that conventional farmers would rank information sources identified as promoting conventional agricultural practices higher (in terms of relevance, clarity and trust) than sources identified as subscribing to an organic farming philosophy was not possible. However Research Question 6b is supported to the extent that a very small minority of conventional farmers had accessed information sources associated with organic agriculture. Their choice in not accessing these information sources suggests that they would hold such information as low in at least relevance and possibly, trust. One interesting finding was that conventional farmers also had a low degree of trust in information from agribusiness sources.

Perceptions, Beliefs and Evaluations Concerning Agricultural Innovations and the Natural Environment

These research questions focus on the role of individual perceptions and beliefs about different agricultural innovations within the persuasion stage of the innovation decision making. To understand more fully why organic farmers have chosen to work outside of conventional agriculture, it is first instructive to ascertain their motivations and reasons for doing so. Then comparisons between organic and conventional farmers' perceptions of organic farming, agrichemicals and biotechnology innovations as well as their environmental beliefs are conducted.(Chapters 6 and 7)

What are organic farmers' motivations for choosing organic farming as a method of agricultural production?

As found in other surveys of organic farmers, one of the primary motivations for an individual to choose to practice organic farming was a concern for environmentally sustainable agriculture. Coupled with this concern was many organic farmers' belief that conventional agriculture practices which utilized synthetic chemical pesticides were more dangerous to their personal health. Less important to the organic farmers who were interviewed were any economic motivations to practise alternative agriculture.

Are there differences between organic and conventional farmers in how they perceive and evaluate organic farming?

In respect to farmers' evaluations of organic farming attributes, it was proposed that conventional farmers would have more negative evaluations that organic farmers would. Specifically, it was proposed that compared to organic farmers, conventional farmers perceive organic farming as being less economically advantageous (Research Question 8a); as having higher complexity (Research Question 8b); and requiring radical changes to existing work practices (Research Question 8c). It was also proposed that organic farming innovations will be perceived by organic farmers to require incremental changes to their existing work practices (Research Question 8d). Based on a qualitative analysis of farmers' definitions of organic farming and their responses to questions assessing organic farming attributes, it was found that conventional farmers did hold more negative judgements regarding the economic and production benefits of organic farming than did organic farmers (thus supporting Research Question 8a). There was limited support for Research Question 8b regarding complexity in that conventional farmers perceived organic farming to be less easy to understand but easier to practise than did organic farmers. There was no significant difference between organic and conventional farmers in regards to their perception as to the trialability of organic farming.

Research Question 8c regarding conventional farmers' perception of the degree to which conversion to organic farming practices would require radical changes was supported to the extent that conventional farmers perceived organic farming as being less compatible with the way that they like to work. Substantial support for Research Question 8d was found in that organic farmers saw organic farming as being highly compatible with the way that they liked to work and by their very low risk assessments of organic farming (both initially and currently).

Are there differences between organic and conventional farmers in how they perceive and evaluate synthetic agrichemicals?

In regards to farmers' perceptions of agrichemicals, as expected, organic farmers were significantly more negative than conventional farmers were about the economic (Research Question 9a), environmental (Research Question 9b) and safety (Research Question 9c) implications of these production inputs. It was also found that conventional farmers held the strongest beliefs about the relative merits of organic farming (negative) and synthetic agrichemicals (positive). One finding of interest was that organic farmers tended to recognize that there were some economic benefits associated with the use of agrichemicals.

Are there differences between organic and conventional farmers in terms of their values and beliefs regarding the natural environment?

An assessment of the degree to which organic and conventional farmers subscribe to either New Environment Paradigm (NEP) values or Dominant Social Paradigm (DSP) values was conducted. Unlike in other studies concerning the NEP, there was no relationship found between farmers' age or education level and their environmental values. It was found that organic farmers were more committed to

NEP values than were conventional farmers. However, conventional farmers proved to be generally neutral in regards to which paradigm values they subscribed to (that is, at the midpoint between the NEP and the DSP). While previous studies of conventional farmers have found that they most closely subscribe to Dominant Social Paradigm values, the findings of this study suggest that conventional farmers have changed and are moving towards environmentalist values (although not to the same extent as organic farmers).

What are the relationships between organic and conventional farmers' attitudes between organic farming, synthetic agrichemicals and the natural environment?

The relationships between NEP scale scores and evaluations of organic farming attributes were also explored. There was found to be positive relationships between pro-environmental values (high NEP scores) and positive evaluations of organic farming. This observation held for both organic and conventional farmers although was more often statistically significant for organic farmers. In regards to the relationships between NEP scale scores and evaluations of agrichemicals, there were strong negative relationships found for organic farmers but positive relationships found for conventional farmers. This would suggest that organic farmers view the use of agrichemicals as being incompatible with their strongly held pro-environmental values. On the other hand, conventional farmers were less likely to see an inconsistency between the use of agrichemicals and support of environmentalist values as measured by this survey instrument.

Are there differences between organic and conventional farmers in how they perceive biogenetic engineering technology in agriculture? Are there differences between organic and conventional farmers in their evaluation of the perceived attributes of biogenetically engineered agricultural products?

The innovation adoption and diffusion decision is often premised on the degree to which an individual views an innovation's attributes either positively or negatively (Chapter 1). Specifically, an agricultural innovation's potential for successful adoption and diffusion is enhanced if it is perceived to offer economic advantages, can be incorporated easily into existing agricultural practices (low complexity, incremental change), and/or is compatible with existing agricultural practices. As a new innovation promoted by its advocates (agribusiness and government) as a positive development in agriculture, it was proposed that biogenetic engineering innovations would be perceived by both conventional and organic farmers as possessing all of these positive attributes.

Based on the responses of the farmers interviewed regarding their perception of the benefits and costs/risks associated with biogenetic engineering technology and their willingness to try out bioengineered products, it was primarily conventional farmers who were the most positive about the potential benefits and utility of this set of innovations (Chapter 7). There was a small minority of both conventional (9%) and organic (7%) farmers who saw no costs or risks associated with biogenetic engineering technology. However as a group, organic farmers were significantly more negative about biotechnology and a large percentage (44%) stated that there were no benefits to be derived from its application to agriculture. Compared to conventional farmers, organic farmers perceived there to be significantly fewer benefits (economic, environmental) and significantly greater costs/risks (environmental, economic, ethical) to be associated with biogenetic engineering technology. Thus in terms of attributions of economic and other benefits, Research Question 13a can only be supported for the conventional farmer sample.

In terms of compatibility with existing agricultural practices (Research Question 13b) and complexity in adoption (Research Question 13c), conventional farmers were more likely than organic farmers to give positive evaluations of these two innovation attributes. Despite expressed concerns regarding the ethics of biotechnology, potentially higher costs for bioengineered products and environmental risks, conventional farmers indicated a greater willingness to try different bioengineered agricultural products and identified very few barriers to their adoption. They were more likely to identify that bioengineered products would enable them to enhance their current efforts to improve productivity (eg., better quality crop seeds, more effective means of pest control) and reduce production costs (eg.,reduce agrichemicals in production).

In contrast, organic farmers were more likely to state that they would not be willing try any bioengineered products in their operations. Their rejection of these products was premised primarily on ethical and philosophical objections to bioengineering technology itself. It was viewed as not compatible with organic farming practices in that they perceived bioengineered products as being more compatible with conventional agricultural methods (e.g., the linking of bioengineered crop seeds with selected herbicides). Many organic farmers viewed the introduction of bioengineered products as requiring more complex management systems to prevent unforeseen negative consequences upon release into the natural environment (particularly in regards to bioengineered biological controls). Thus in respect to both Research Questions 13b and 13c, support could only be found for conventional farmers with the opposite being true for organic farmers.

A similar conclusion can be reached in regards to the degree to which biogenetic engineering technology is viewed as representing a radical or incremental change to a farmer's existing agricultural practices (Research Question 13d). In general, while conventional farmers viewed biogenetic engineering technology as a new and different type of agricultural research, it was often seen as a natural extension of scientific progress requiring few modifications to existing practices. For organic farmers, the opposite was more often true. Organic farmers were more likely to view biogenetic engineering technology as a radically new "unnatural" technology which challenges their environmental and ethical beliefs. As such they were more likely to state that government regulation and approval of bioengineered products should be stricter and different than what is currently in place for synthetic pesticides. In general, they advocate that this radically new technology requires radically different methods of evaluation and control. Thus Research Question 13d can be supported only for those who practise conventional agriculture methods and not for those who practise organic farming methods.

What is the influence of various information sources on farmers' attitudes towards and stated intentions to use bioengineered products?

As earlier identified, the primary sources of information regarding biotechnology were the agricultural media and television. What is interesting is the type of information being communicated through mass media channels. Farmers who cited these information sources as contributing to their knowledge of this new technology were much more aware of the costs and risks associated with biotechnology in agriculture (and in general) and much less aware and supportive of the benefits to be derived from it. Reliance on information from the electronic mass media also appeared to have a negative relationship with the number of bioengineered agricultural products farmers (especially organic farmers) would be willing to use in their operations. It is conceivable that the negative picture of biotechnology being communicated through mass media channels may serve to slow down or restrict the adoption of bioengineered products in agriculture.

To what extent is a farmer's willingness to try out biogenetically engineered agricultural innovations related to his/her socio-economic characteristics, agricultural production experience, and assessment of biotechnology's projected benefits, costs and risks?

On the whole, whether a farmer practised organic or conventional agricultural methods proved to be the most significant explanatory variable in explaining differences in his/her willingness to try out biogenetically engineered agricultural innovations. There was no relationship found between intention to use bioengineered products and socio-economic characteristics such as age, years of farming experience or education level for either group. While the finding regarding education level runs counter to other innovation diffusion studies which suggest that there is a positive relationship between education level and early adoption of an innovation (Rogers, 1983), there was support found for other innovation studies' conclusions that those with larger farm operations were more likely to early adopters.

In regards to the relationship between farmers' intentions to use data and identification of the benefits and costs/risks of biotechnology, it was only for the organic farmer group that significant relationships were consistently found. If an organic farmer was more positive about the potential benefits to be derived from biotechnology, there was a positive relationship with the number of bioengineered agricultural products he/she would use. On the other hand, a negative evaluation of the environmental and economic costs/risks identified with biotechnology was negatively correlated with the number of bioengineered products he/she would use. In contrast, with only one exception, assessments of potential benefits, costs or risks were not correlated with the number of bioengineered agricultural products that a conventional farmer said he/she would try out. Overall, conventional farmers were willing to try out many if not all of the bioengineered agricultural products which had been identified.

Farm Organizations and Interorganizational Networks in B.C. Agriculture

The next level of analysis in this research project was the organizational context within which farmers operate. Of interest is the degree to which organic and conventional farmers join farm organizations and their reasons for doing so. Another interest is the degree to which there are substantive differences in the structure, processes and leadership in different types of farm organizations. (Chapter 8)

Are organic and conventional farmers different in terms of the number and types of farm organizations they belong to? and organizations outside of agriculture?

The majority of farmers (93%) interviewed in this organizational field analysis study belonged to at least one farm organization. While conventional farmers belonged to relatively more farm organizations than did their organic counterparts, this could be primarily attributed to the greater number of organizations within the conventional agricultural sector (primarily commodity groups and marketing co-operatives). Organic farmers tended to belong to more nonagricultural organizations than did conventional farmers thus indicating a wider range of interests outside the agricultural sector.

In terms of the types of organizations which these farmers belonged to, the division between organic and conventional farmers continued into their farm organization membership. A few organic farmers belonged to mainstream agriculture organizations while it is very rare for a conventional farmer to belong to an organic farming or sustainable agriculture organization. As earlier discussed in Chapter 8, one implication of this finding is that there are few organizational opportunities for the diffusion of ideas between the two organizational fields (in terms of organic to conventional, and vice versa).

Are organic and conventional farmers different in terms of their motivations for belonging to farm organizations?

Organic farmers belonged to organic farm organizations primarily for the purposes of information/education and obtaining certification of their farm products. Conventional farmers' reasons for organizational membership were first, for information/education and marketing, and secondly for services and lobbying government policy makers. There was variation between different conventional farm organizations depending on whether the purpose of the organization was specialized (eg., marketing co-operative, direct marketing association) or more general (farm product commodity group, farmers institute). However, in general, organic and conventional farmers were very similar in the reasons they gave for belonging to their different farm organizations.

What are the history, mission and objectives, activities, organizational structure and processes of different types of farm organizations? What roles do different types of farm organizations serve for their members?

The detailed case studies of a small sample individual farm organizations described the diversity within the B.C. population of farm organizations (over 100 in total). Brief case study analyses were conducted on a total of 20 mainstream agriculture (4 general farm interest groups, 6 farm product marketing, 9 specialized farm product commodity groups, 1 farmer education) and 13 organic farm organizations.

Within mainstream conventional agriculture, there was observed a close collaboration between the larger, more established farm organizations and government policy makers. This included active lobbying for members' interests (often times for grower support programmes and against government regulation) and participation on government-industry committees. Although they had fewer resources (financial, human) to draw upon, the case studies of several of the newer, smaller and more specialized farm product commodity and farm interest groups organizations also illustrated the effectiveness of their government lobbying efforts.

Several of the case studies provided evidence of the ongoing collaboration between government extension services and mainstream farm organizations in regards to funding and conducting applied research and development projects as well as organizing farmer education programmes. In a few cases of the newer direct farm marketing and specialized product organizations, individual agricultural extension agents proved to be instrumental in the actual formation of the farm organization. While there is significant evidence that the relationship between government and conventional agriculture is a collaborative one, this does not preclude the occurrence of competitive influence tactics when deemed to be necessary (especially during periods of economic distress). These case studies offered examples of both successes and failures when adversarial strategies were adopted by farm organizations.

In terms of organizational structures and processes within these primarily voluntary organizations, there was a pattern of development which is similar to that identified by organizational life cycle theorists (Greiner, 1972; Quinn & Cameron, 1983; Tushman & Romanelli, 1985). With the exception of organizations which were created by legislative mandate (eg., regulated food marketing associations), usually an organization was founded by a small group of farmers around a single issue. Over time, as the organization membership grew, the original agenda was expanded, programmes were added, and administrative staff were hired. Whereas the younger and smaller organizations are operated almost entirely on a voluntary basis by their members, executive members of the larger and older farm organizations often receive monetary compensation for their efforts (usually on a per diem basis). While growth and longevity offer several benefits in terms of legitimacy and additional resources, it also creates problems in terms of satisfying the needs of a more diverse membership. In three of the organizations studied (B.C. Federation of Agriculture, B.C. Cattlemen's Association, B.C. Fruit Growers Association), this has led to threats by some segments of their membership to leave and form a new organization which had a more specialized mandate. However, the formation of the B.C. Cattle Feeders Association illustrates how powerless a voluntary farm organization such as the B.C. Cattlemen's is to prevent such an occurrence. Another response to this organizational crisis is for organizations to develop a decentralized organizational structure. This appears to have been the case for the B.C. Federation of Agriculture earlier in its organizational history. Now the challenge for the BCFA is to achieve greater coordination amongst their diverse member organizations. In the case of the B.C. Fruit Growers Association, both responses to the crisis of autonomy have occurred. While the BCFGA had established a number of specialized subsidiary companies, the removal of their legislated monopoly on industry sales of tree fruits in 1973 resulted in a number of their members leaving to form competing organizations. Continuation of the functional specialization process within the tree fruit industry is evidenced by the legal separation of the BCFGA from its former subsidiary companies and the establishment of the Okanagan Valley Tree Fruit Authority. As a result of economic distress and government intervention, the B.C. tree fruit industry has been transformed from a unitary field dominated by one organization to one that is fragmented and populated by a diversity of specialized organizations.

To what degree are farm organizations involved in organic agriculture similar to or different from those in the mainstream? As learned in the case studies of the 13 organic farming associations in B.C., the mandate of these organizations combines that of a specialized food commodity group, an educational association and a farmer interest group. One arena that organic farm associations avoid is marketing so as to prevent any conflict of interest with their certification programmes.

The pattern of organizational development observed within conventional agriculture also appears to be occurring within organic agriculture. In those organizations which experienced substantial growth in membership, administrative processes were formalized and staff were hired. There was an increase in specialized organizational committees and organizational programmes (eg., education, grower promotions) which is not evident in the very small organic certifying associations. In regards to decision making processes, some of the organic farm associations operate on a full consensus basis while others have adopted the majority vote rule common to mainstream farm organizations. It is noteworthy that it tends to be the more informal and smaller organic farm associations which practise full consensus as a symbol of their commitment to environmentalist egalitarian and participative principles. The associations which utilize the majority vote process tend to be larger and have more formal specialized organizational structures. This raises the question of whether full consensus decision making is only viable in small informal organizations or whether it is possible in other organizational contexts.

In regards to relations with government agencies, as illustrated in Chapter 9 on the development of organic agricultural products regulations there are substantial philosophical differences between organic farming associations as to the role of government in organic agriculture. On the one hand there are those who seek to avoid any involvement with government while there are others who seek a similar relationship as that which exists with farm organizations in mainstream agriculture. The implementation of the government regulations under Bill 85 and the commitment of the BCMAFF to offering agricultural extension services and financial assistance for industry research and development would suggest that the latter alternative may be the eventual outcome. As found by Tolbert and Zucker (1983), the legitimation of an organizational policy or programme by law facilitates the process of institutionalization. Thus, another outcome of the acceptance of government regulation and legitimation may be the institutionalization of the organizational field of organic agriculture. While the stated motivation was to attain homogeneity in organic food production standards and enforcement mechanisms, a probable subsidiary development is a reduction of diversity in organizational philosophies, structures and processes within the organizational field.

What roles do leaders play in different types of farm organizations?

As learned in Part C of Chapter 8, leaders in farm organizations play a wide variety of leadership roles, with very few operating as role specialists. In younger farm organizations, leaders were more likely to be called on to play a facilitator role. The relationship between organizational size and leadership roles was such that leaders in very small organizations performed less of a monitor role than those in very large organizations. Leaders operating in medium size farm organizations were more often called on to perform a coordinator role than those in either small or large farm organizations.

There were very few differences in leadership roles performed in conventional as compared to organic farm organizations. Organic farm organization leaders were more often acting as facilitators than leaders in conventional farm organizations who in turn, more often engaged in a brokering role as part of their government lobbying efforts.

What is the incidence and nature of social innovations within different types of farm organizations?

Compared to other organizations in B.C. agriculture, the use of the consensus decision making process in a few organic associations and ABCOPA could be considered to be a social innovation. For many of the founding members in these organizations, consensus decision making was symbolic of their commitment to environmental and egalitarian values. As such, it was one way in which they differentiated themselves from other farm organizations where a majority vote decision process is the modus operandi. However, as learned in Chapters 8 and 9, achieving consensus amongst members who hold strong opposing views can be lengthy, difficult and divisive. Through trial and error, they are still learning how to make the consensus process work (for example, the necessity for an independent facilitator). Other social innovations in the B.C. organic farming community were first, organizing on a strong bioregional basis (unique in Canadian organic agriculture) and second, interorganizational collaboration to develop provincial organic certification regulations. While efforts to develop a completely autonomous self-regulatory system of provincial accreditation and certification proved to be unsuccessful, the alternative government sanctioned system administered by the industry was eventually implemented (again, both are unique in Canada). For the government, the use of enabling legislation to provide for the certification of agricultural practices or processes was itself an innovation in government regulation.

Alternatively, have there been social innovations developed within farm organizations serving the interests and needs of conventional farmers? For the most part, there were fewer radically new social innovations being implemented in these farm organizations. While there were a number of new organizations in the B.C. farm community, most were essentially adaptations of pre-existing organizational forms and processes. For example, while new to their regions, the newly formed direct marketing associations benefitted from the existence of similar organizations elsewhere in Canada and the United States. Similarly, while new to the individuals who initiated different tactics in lobbying (eg., farmer demonstrations), these were adaptations of lobbying tactics which have been used in the past. What is challenging to the farm organizations in Canadian agriculture is governments' redefinition of the relationship between government and agriculture. Resisted by some organizations more than others, farm organizations are being forced to adapt and change to governments' agenda of deregulation and privatization of services. In the B.C. tree fruit industry, perhaps the greatest changes have involved the introduction of a new player (the Okanagan Tree Fruit Authority) in the industry and the introduction of organizational procedures to engender a more competitive and efficient industry (e.g., autonomy of local packinghouses, the privatization of Sun-Rype Products).

One social innovation which was advocated by the B.C. Fruit Growers Association, a national apple marketing agency failed when put to a national vote of orchardists. While this again was a replication of controlled marketing agencies which exist for other food commodities, its application in a tree fruit industry would have been a new venture.

Innovation Championship

Are there differences in the innovation championship of organic farming innovations and biogenetic engineering technology innovations?

Given that there is relatively less support for organic farming from industry and government bodies, it was expected that the championship role for organic farming innovations would tend to be assumed by individuals and would more closely resemble that of the product innovation champion (Research Question 16a). In addition, it was expected that champions of organic farming innovations would be centrally situated in interpersonal sociometric and communication networks (Research Question 16b). There was inconclusive support for either proposition in this study.

Based on findings regarding the source of information for organic farming and organic farming innovations, it would appear that a major championship role is played by the organic/sustainable agriculture print media. Organizational champions of organic agriculture (representing the management champion role) which were often identified included Rodale Institute, Ecological Agriculture Projects at McGill University's MacDonald College, IFOAM, OFPANA, etc. For bio-dynamic farmers, the International Bio-dynamic Society was often identified. However, there were individual champions within the organic agriculture movement who were often identified by organic farmers. These individuals included the authors of books which organic farmers found to be important sources of information. For organic farmers, the most frequently mentioned individual authors were Robert Rodale (founder of the Rodale Institute) and Masanobu Fukuoka of Japan. For bio-dynamic farmers, the most frequently mentioned bio-dynamic authors were Rudolph Steiner (founder of bio-dynamic agriculture), Herbert Koepf, and E.E. Pfeiffer. There were also individual champions who had met with organic farmers in B.C. Foremost was Dr. Stuart Hill, Director of Ecological Agriculture Projects at McGill University's MacDonald College who had been invited to speak at organic forums or conferences held in three bioregions (Similkameen-Okanagan, Peace River, Lower Mainland) and who had personally met with individual organic farmers. There were also individual B.C. organic farmers who were identified as strong champions in the formation and promotion of the different bioregional organic associations and as a technical resource regarding organic farming. Two individuals (one in the Lower Mainland and the other in the Similkameen-Okanagan) were often identified by members in their own bioregion and organic farmers in other regions as strong and effective advocates of organic agriculture in the province. While acting in different ways, both were seen as centrally located within interpersonal and communication networks.

Thus it would appear that the championship of organic farming is operating at individual, industry and societal levels. Therefore Research Questions 16a and 16b can be supported to the extent that there are a number of individuals operating as product innovation champions who are centrally situated in interpersonal sociometric and communication networks. However, Research Questions 16a and 16b cannot be supported in regards to the championship role being limited to that of individual product champions. In addition to individual championship, there are organizations and institutions that function as important management innovation champions which are centrally situated in societal level sociometric and communication networks.

As a relatively new innovation, it was proposed that the championship role for biogenetic engineering innovations will tend to be diffused among organizations and/or societal interest groups and will more closely resemble that of the management innovation champion (Research Question 16c). Similarly, it was proposed that champions of biogenetic engineering innovations are centrally situated in societal level sociometric and communication networks (Research Question 16d). There was significant support for both propositions found in farmers' perceptions as to which parties were championing biogenetic engineering technology. Given the perceived linkage between the bioengineering of crop seeds and the patent protection of new crop seeds through the federal government's Bill C-15, the Plant Breeders Rights Act, support for both research questions was also found. Most often identified as the champions of biogenetic engineering innovations and plant breeders rights were first, agribusiness and secondly, government and conventional farm organizations. From the farmers' perspective, it is these societal interest groups and organizations which are regarded as the major players in championing both initiatives. It is also farmers' perception that agribusiness, government and conventional agriculture are collaborating closely at senior levels with much of the championing activity taking place in Ottawa and Central Canada. Thus the championship of biogenetic engineering and plant breeders rights is perceived to be occurring through centrally situated societal level sociometric and communication networks. In contrast, opposition to biogenetic engineering and plant breeders rights is identified as being led by individuals rather than institutional parties. Individuals most often identified by B.C. organic farmers were Vic Althouse (MP-NDP), Sharon Rempel (past-president, Sustainable Agriculture Association), and Pat Mooney (author). Thus while pro-championship is at institutional levels, anti-championship is more often identified as an individual phenomenon.

To what degree does the championship of organic farming and biogenetic engineering technology involve social innovations?

Another aspect of innovation championship investigated was the incidence of social innovations. Specifically, it was proposed that individual and organizational champions of organic farming will exhibit a greater propensity than champions of biogenetic engineering to develop new social innovations in the way they interact and influence others to engender public and governmental support for their proposed changes (Research Question 18a). Given that bioengineering technology and plant breeders rights are identified as being championed by those at societal (government) and industrial (agribusiness and conventional agriculture) levels, it was proposed that their championship would be operating through established channels of influence. Thus there would be a lesser need to develop new types of relationships or ways of interaction (social innovations). It appears that such social innovations have yet to be developed. In regards to plant breeders rights legislation, the debate has followed the traditional legislative model of informal lobbying and the presentation of briefs at public hearings. In regards to biotechnology itself, there is little evidence of new organizational structures or processes to champion this set of innovations. It has been identified by some researchers that there is a need for more interorganizational collaboration within the biotechnology industry in communicating with the general public, this observation is based on secondary data sources and relates to biotechnology in general (eg., Peridis & Newell, 1992). In as far as data collected as a part of this particular study, there is little direct evidence in support of a conclusion that champions of biogenetic engineering technology have not yet developed social innovations in their activities.

As earlier identified, the primary social innovations within the organic farming community involve the formation of interorganizational linkages amongst organic certifying associations. The focal point of both the provincial COABC and federal COAB (the result of the Canadian Organic Unity Project) has been the development of government organic agriculture regulatory systems. This represents a departure from the traditional government regulatory role in that the industry is largely self-regulating. However, the organizational mandates of both the COABC and COAB are not limited to that of regulation but also include the development and coordination of marketing and development programmes as well as grower and public information and education. In this way, the championship of organic farming has involved developing new organizational forms (functionally autonomous yet connected to government agencies) at provincial and federal levels. For a small group of organic farming associations, the championship of organic farming has also involved the modelling of organizational processes on environmentalist principles. This was most evident in ABCOPA and a few of the organic certifying associations which practise full consensus decision making.

In general then, there is some evidence to support the contention that there is an interrelationship between technological innovations and social innovations. Specifically, technological innovation success requires a combination of both technological and social innovation (Research Question 18b). While this assertion can be supported to a larger extent for those involved in organic farming, there is also support for those involved in mainstream agriculture and biogenetic engineering technology innovations.

To what degree does the championship of organic farming and biogenetic engineering technology involve collaborative and/or competitive organizational politics?

It was proposed that the championship of organic farming innovations would be limited to collaborative political strategies because of the lesser availability of financial and social (influence networks) resources needed to engage in competitive political tactics (Research Question 17a). In regards to the championship of organic farming through education and information activities involving farmers (organic and conventional) and the general public, there is evidence of collaborative strategies of influence. In terms of the formation of organic certifying associations, collaboration was more often the preferred mode of political influence. This was especially true of those organizations which were highly committed to the consensus decision making process. But as learned in the individual and interorganizational political contests which have taken place within the B.C. organic farming community, the desire to only work in collaborative ways has not prevented the occurrence of competitive political tactics. This was most clearly illustrated in the political contest which surrounded the introduction and development of provincial certification standards under Bill 85 (Chapter 9). Those organic farming associations and individuals who championed a government sanctioned regulatory system proved to be the most willing and able to engage in competitive political games. While those who were opposed to this initiative continuously strained to limit actions to collaborative strategies, they also engaged in competitive strategies. In the end, the incidence of competitive politics outweighed and out-maneuvered collaborative political action. Another insight to be derived from this case study of politics was that the most competitive players were also those which had the relatively greater amount of both financial (organizational and government funds) and social (influence networks with government) resources to access during the political contest which evolved. Therefore, Research Question 17a cannot be supported in that there is evidence that organizational politics surrounding organic farming involves both collaborative and competitive political strategies.

As societal and industry level actors, the champions of biogenetic engineering innovations were seen as being able to access a larger amount of financial and social resources to promote their innovation. Thus, it was proposed that the championship of biogenetic engineering innovations will encompass both competitive and collaborative political strategies (Research Question 17b). Support for this proposition can be found in farmers' perception that there has been a significant level of collaboration amongst farm organizations (eg., cooperation of umbrella farm organizations within and between the Canadian Federation of Agriculture, the Canadian Horticulture Council, and so forth) in advocating both biotechnology and the associated plant breeders rights. There was also perceived to be close collaboration between agribusiness interests, government and conventional farm organizations in their advocacy and support of both developments. There was also perceived to be competitive tactics employed against opponents of plant breeders rights in terms of excluding them from the legislative development process (they were not invited to the table) and denying their positions when opposing submissions were made (one example being the response received to BCARA members' letters opposing plant breeders rights). In as far as lobbying government agencies is a competitive political influence tactic, lobbying by farm organizations and agribusiness was also utilized in addition to collaborative strategies.

What has been the incidence, purpose and nature of interorganizational networks in agriculture?

As found in Chapter 8, there were a number of interorganizational networks of farm organizations operating in B.C. Within mainstream agriculture, the oldest and largest interorganizational network studied was the B.C. Federation of Agriculture. The mandate of the BCFA is wide in scope and encompasses representing the interests of its member organizations (59 commodity associations and 7 regional farmers institutes) to government, administering research and development projects, education and publishing. The BCFA itself is part of an even larger national network, the Canadian Federation of Agriculture. The size and diversity of its membership is both a source of strength and problems for the BCFA. On the one hand, size and diversity enhances their ability to influence government policy. On the other hand, there are times when the interests of different member organizations are in opposition (most recently, international free trade). As a result, the BCFA is often placed in the unenviable position of having to abdicate their advocacy role in order that they not promote one member's interests at the expense of another.

This is not the case for the Creston Agricultural Society which also represents different commodity groups but is much smaller in geographic scope. The four commodity groups in the Creston Valley recently organized around the issue of promoting conventional agriculture in defense against attacks from the local environmentalist group. Conflicting member interests is not an issue for the B.C. Vegetable Marketing Commission which as mandated by government legislation, coordinates the marketing activities of seven sales agencies and five crop grower groups. Their mission is clear, that is, to regulate the production of regulated vegetables, provide information services for members, and lobby government policy makers.

There was also evidence of a number of informal ad hoc alliances amongst conventional farm organizations. Most noteworthy was the 1992 joint demonstration by the Cloverdale Lettuce and Vegetable Co-operative, the Surrey Farmers Institute, the Island Vegetable Co-operation, and the B.C. Marketing

Commission to lobby the provincial government to impose a tariff on cheap U.S. vegetable imports. As also identified in the introductory chapter, many of these ad hoc alliances have been motivated by economic distress attributed to government free trade policies (both domestic and international) which do not recognize the structural inequities in agricultural production between different countries. Other joint lobbying efforts have focused on government policies which are considered to unfairly restrict the operation of market forces (e.g., Agricultural Land Reserve, cheap food policies). As such the primary focus of ad hoc alliances within conventional agriculture is on economic issues.

Within the organic agriculture sector, the two interorganizational networks which were studied included the Alliance of B.C. Organic Producers Association (ABCOPA) and the Certified Organic Associations of B.C. (COABC, formerly the B.C. Certified Organic Farmers). As detailed in Chapter 9, ABCOPA was formed initially to serve an information sharing and educational role for the bioregional organic certifying associations in the province. The original intent of ABCOPA was that it would be an exemplar of an organization based on egalitarian and environmentalist principles. As became evident, the commitment of the original ABCOPA members to full consensus decision making and independence from government was not shared by all of its members. The introduction of Bill 85 and the government's offer to assist in the development of a provincial accreditation and certification system proved false the earlier assumption of unity of interests and agreement over means of promoting organic agriculture. One result has been the creation of COABC as one more interorganizational network within the organic farming industry to administer the organic agricultural products regulations and to conduct industry and market development work -- an organizational mission similar to that of interorganizational networks in mainstream agriculture. While a few of the organic certifying associations have memberships in both, the majority now belong to COABC. Five organic associations remain with ABCOPA which remains separate from government involvement and focused on its original philosophy and mandate.

One observation regarding the operation of interorganizational networks to be derived from the ones studied in this research project is how tenuous these voluntary alliances can be. Even in those interorganizational networks where there is a presumed unity of interests, there is an ongoing requirement for negotiation and mediation amongst members.

What has been the incidence and nature of organizational politics operating within interorganizational networks in agriculture?

The contest between those in support of and in opposition to a government sanctioned organic accreditation and certification system provided a unique opportunity to conduct a longitudinal in-depth study of organizational politics within and between interorganizational networks in organic agriculture. In this case, the central issue was the proposed government organic agricultural products regulatory system which was an innovation in government policy in that the system would be largely administered by the industry with government only retaining oversight authority. For the organic farming industry, the introduction of a government sanctioned system represented a significant change in their organizational operations (less autonomy, different administrative procedures) and relationships with government and each other. At its core, the political contest which surrounded the Bill 85 initiative was a contest over the nature (type and degree) and process by which the organizational field should be institutionalized.

The first part of the analysis of the individual political tactics initiated during the three years from announcement to implementation focused on answering several research questions about the incidence and nature of political action. First, it was found that following an initial gestation period of very low political activity, there were two periods of intense political action. The first period was initiated by an external event which represented a substantive change in strategic course of action by the government. Occurring one year later, the second period was due to external events and to internal action by one of the chief opponents to the initiative. In this second period, political action both preceded and led to substantive changes in courses of action concerning the innovation. Therefore, in this case of organizational politics around a social innovation, there were examples of organizational political tactics being both in response to and leading to changes in the innovation's development.

What is the incidence and nature of social innovation championship and nonchampionship in interorganizational networks?

The analysis of this case study of social innovation in organic agriculture also included an exploration of the number, types and pattern of political tactics initiated by champions and opponents (nonchampionship) throughout the course of the innovation's development. As suggested in the literature on innovation championship, it was found that these champions also initiated the greatest number of political tactics. They used more collaborative tactics (such as networking and reasoning) than their opponents. They also initiated slightly more competitive tactics, in particular budgeting, insurgency, impression management and labelling. Opponents to the initiative were more likely to have initiated defensive tactics such as the use of strategic candidates, gatekeeping, blocking, and appeals to higher authority for support.

Perhaps most telling in this analysis was the pattern of political tactics initiated throughout the development of the innovation. It was found that the champions of the initiative employed political tactics earlier than their opponents who only became politically active quite late in the process. In respect to the nature of the tactics employed over time, these innovation champions initiated almost an equal number of competitive and collaborative tactics during the first part of the process and shifted to a more collaborative mode as time went on. In contrast, there was no discernible pattern for opponents of the initiative in regards to the proportion of collaborative to competitive tactics.

One observation to be derived from the political contest over which type of regulatory system should be pursued is that the evaluation of whether an innovation is good or bad depends largely on the perspective of the evaluator.

For those who worked on the Bill 85 initiative, their evaluation was that this innovation would be beneficial not only for themselves but also for the wider organic farming community. In contrast, for those who opposed the Bill 85 initiative, their negative evaluations were informed by a distrust of the motives of the proposer of the innovation (the government). In addition to focusing on the potential negative economic impact of the initiative on organic farmers and their certifying associations, they saw such a regulatory system as a threat to their vision of an organic farming community operating independently of government and mainstream agriculture.

While generalizations from one case study are obviously limited, the operation of organizational politics which occurred in this instance confirmed that of a few other studies of the innovation development process (in particular, Garud & Van de Ven, 1992; Van de Ven & Pooley, 1992). One unique feature of this case study analysis was the longitudinal analysis of the interplay and results of different political tactics as events in the development of an innovation. In addition to offering a number of findings regarding organizational politics in an interorganizational arena, this case study analysis serves as an illustration of the potential of this methodological approach for understanding the innovation process.

PART B. THEORETICAL CONTRIBUTIONS AND FUTURE RESEARCH DIRECTIONS

As set out in the introductory chapter, this research project sought to extend knowledge in regards to theories of the innovation process, organizational power and politics, and organizations. This objective was realized in several respects.(see Table V-1)

Innovation Decision-Making Process and Innovation Championship

In regards to theories of the innovation process, new empirical data was obtained concerning the individual decision making process involving organic farming and biogenetic engineering technology innovations. While organic and conventional farmers do not differ significantly in terms of the socio-economic characteristics of age and marital status, there were observed significant differences in terms of education and career experiences. These findings confirm that of others who have also found organic farmers to be the same age (Lockeretz & Wernick, 1980) but to have higher education levels (Lockeretz et al, 1984; U.S. Department of Agriculture, 1980) than conventional farmers. This study extended the literature concerning the differences between organic and conventional farmers by examining first, the type and level of education, and second, career experience as a form of occupational learning. It was found that organic farmers had more diverse educational and occupational backgrounds while conventional farmers tended to be specialized within agriculture. While several organic farmers were found to be similar to conventional farmers in these respects, in general, their propensity to challenge the status quo of conventional agriculture (specifically, the use of agrichemicals) appears to have been enhanced by their nonagricultural backgrounds.

Additional evidence of this difference in occupational motivations was provided by questionnaire data on attitudes and beliefs regarding the natural environment and the use of agrichemicals. The key differences between organic and conventional farmers appear to be ideologically rather than economically based. For organic farmers, strong environmentalist beliefs are the primary

TABLE V-1. CONTRIBUTIONS OF THE RESEARCH PROJECT

° INNOVATION DECISION MAKING PROCESS

- Similarities and differences between organic and conventional farmers in respect to their socioeconomic characteristics, motivations, actions, and environmentalist beliefs.
- Innovation decision making process involving organic farming, synthetic agrichemicals and biogenetic engineering technology
- Role of ideological beliefs in the innovation decision making process.
- Trade-offs between competing innovations.
- Existence and influence of selective exposure and selective perception in communication behaviours.

° INNOVATION CHAMPIONSHIP

- Innovation championship of organic farming and biogenetic engineering technology.

° ORGANIZATIONAL POWER AND POLITICS

- Innovation championship involves the use of a combination of competitive and collaborative political tactics.
- Importance of "first mover advantage" in innovation championship.
- Organizational politics of institutionalization processes in an organizational field.

° ORGANIZATION THEORY

- Organizational fields can be defined not only in terms of products, services and geographic location but also in terms of ideological belief systems.
- Isomorphic processes in organizational fields.
- Heterogeneity and homogeneity of organizational fields in agriculture.

° INTERORGANIZATIONAL NETWORKS

- Formation and operation of interorganizational networks (underorganized and overorganized)

° METHODOLOGICAL

- Longitudinal analysis of organizational politics involving the adaptation of a methodology designed to analyze critical events in innovation development.

basis for their choices as to which innovations to adopt and which to reject. On the other hand, economic considerations are the dominant variable for conventional farmers (as also found by Lawson, 1982; Mumford, 1983; Tait, 1982; and others). This dynamic was found to operate for both organic farming innovations and for biogenetic engineering technology innovations thus indicating the importance of obtaining beliefs and values data in studies of innovation adoption and diffusion. Another implication for empirical research on the linkage between beliefs, attitudes and subsequent behaviour (Fishbein & Ajzen, 1975; Van Liere & Dunlap, 1980; and others) is that data regarding different sets of beliefs and attitudes need to be obtained. As found in this research project, individuals often engage in trading off one set of beliefs against another. In the case of the conventional farmers, beliefs regarding environmental and ethical issues proved to be less dominant than those concerning economic benefits. In the case of organic farmers, the reverse was more true. This finding suggests that researchers of innovation adoption and environmental beliefs should obtain data on the interaction between competing and complementary beliefs and attitudes to enable more accurate predictions regarding subsequent behaviours and actions.

This research project also extends the empirical literature on the measurement of environmental beliefs and values. There was strong evidence found that previous conceptualizations of environmentalist worldviews as a dichotomy between the New Environmental Paradigm and the Dominant Social Paradigm are no longer appropriate (Dunlap & Van Liere, 1978; Van Liere & Dunlap, 1980, 1981; Arcury, Johnson & Scollay, 1986; Kuhn & Jackson, 1989; and others). Instead, as proposed by Colby (1990), there has been an evolution of environmentalist beliefs resulting in a number of middle-range paradigms. In this research study, evidence of the existence of middle-range paradigms is provided by the mid-range scores of conventional farmers on the Ecological Opinion Survey. These findings suggest that further research is required to empirically delineate and measure the specific components of these middle-range environmentalist paradigms.

In regards to understanding the role of communication behaviour in the innovation decision making process, this study provided significant evidence of the existence and influence of selective exposure and selective perception behaviours (Rogers, 1983). It was found that in general, organic and conventional farmers access different types of information sources. Further, it was found that organic and conventional farmers evaluate information from the same sources in significantly different ways. One implication for empirical research on the influence of communication channels on the innovation decision making process is that data needs to be obtained not only on the number and types of information being accessed but also on the individual's general perceptions of its source in order to ascertain the effect of communication behaviours such as selective exposure and selective perception.

Unlike many previous research studies on innovation decision making and championship which focus on one innovation in isolation of others (Howell & Higgens, 1990; Rogers, 1983; and others), this research project gathered data on competing innovations within an organizational field. For example, detailed data were gathered regarding the innovation decision making process in respect to three sets of technological innovations (agrichemicals, organic farming and biogenetic engineering technology) and two alternative social innovations (government sanctioned vs. autonomous regulation of organic food production). As demonstrated in this research project, prospective innovations are often evaluated in comparison to others. There is evidence that the process of innovation adoption is one which involves trade-offs between alternative courses of action. There is also evidence that these trade-offs involve objective, subjective and political evaluations of the innovations under consideration.

One implication of these findings for researchers of the innovation process is that the scope of data obtained regarding an innovation should be extended to include whether or not there are competing innovations present in the organizational field. In this way, a more complete understanding of the innovation decision making process is facilitated. Another implication is that data should be gathered concerning the economic, social and political context within which an innovation and/or innovation champion is situated. Therefore, the analysis needs to encompass the individual, organizational and societal levels of the organizational field in order to gain a fuller appreciation of the innovation process.

In this research project, such an analysis was conducted in regards to organic farming innovations and innovation championship. A more incomplete analysis was conducted on biogenetic engineering technology innovations. Therefore, one future research direction would be to extend the investigation of biogenetic engineering technology in both scope and depth.

Organization Theory

Concerning the empirical literature concerning organizations, the analysis of the organizational field of B.C. agriculture revealed that at this point in time, there have been two organizational fields operating in parallel. Longer in existence, the organizational field of conventional or mainstream agriculture exhibited substantial homogeneity in organizational structures and processes. Recent developments within this organizational field provide evidence that there are forces towards increased specialization of function (on the basis of commodity and geographic scope) rather than organizational form. The impetus for many of these changes in conventional agriculture were traced to dissatisfaction with organizational responses to their members' economic needs as well as to changes in government policy. For several of the new commodity and marketing organizations, government assistance proved to be instrumental in their formation.

The organizational field of B.C. organic agriculture was found to be relatively young in comparison. This organizational field has only been in existence since 1986 with majority of organizations only being three years old when studied. There was found to be a common pattern of establishment and development for these organizations leading to increased specialization of function within organizations organized (with one exception) on the basis of geographic location. While there was a fairly high degree of homogeneity among organizations in terms of their certification standards and grower certification procedures, there was more variability observed in terms of organizational decision making processes and structures. The government initiative to develop an organic food regulatory system proved to be the pivotal event in the institutionalization of this organizational field. The introduction of government legislation also changed the mechanism by which institutional isomorphic change was occurring (DiMaggio & Powell, 1983). Prior to 1990, homogeneity within the organic agriculture organizational field was being achieved through imitation of early established organizations (mimetic isomorphism). During and after 1990, the institutionalization process was supplanted and accelerated by coercive isomorphism. The institutional theorists' term of "coercive" isomorphism proves to be especially fitting in this case study. In fact, the perception of whether the formal institutionalization of the organizational field was either coercive or natural and inevitable informed the political contests which occurred between the organic farming organizations. This case study confirms Scott's (1987) observation that organizations are more than production or exchange systems and have symbolic importance. As revealed in the case study analyses of individual organic farming organizations and interorganizational networks, organizational fields can be defined as much by ideology as by product or service. This case study also offers evidence that "which environmental agents are able to define the reigning forms of institutional structures will be determined largely by political contests among competing interests"(Scott, 1987, p. 509). Therefore, one contribution of this research study has been to provide a vivid illustration of the organizational politics of institutionalization processes.

Interorganizational Networks

This research study contributes to our understanding of the formation and operation of interorganizational networks (Brown, 1983; Cummings, 1984; Trist, 1983; Gray, 1989). In the conventional agriculture organizational field, the case study of the B.C. Federation of Agriculture provided one example of an established and overorganized interorganizational network. As proposed by Brown (1983), there was confirmation that one of the critical problems in such networks is the suppression of constructive conflict. Attempts by the BCFA to manage the conflicting interests of member organizations through avoidance and smoothing tactics have not reduced the threats of withdrawal by key organizations or garnered many new members. In the organic agriculture organizational field, the operation of two interorganizational networks were studied. The first interorganizational network which was formed (Alliance of B.C. Organic Producers Association) proved to suffer from many of the problems typical of underorganized networks (Brown, 1983). The critical problems for this network's survival and influence were ones of obtaining resources, developing consensus and channelling members' energy towards intended goals. The crisis created by the introduction of government regulations served to escalate the internal conflict among member organizations such that a group left to form their own competing network (B.C. Certified Organic Farmers/Certified Organic Associations of B.C). This case study demonstrates how tenuous interorganizational collaborations can be and how they are often fraught with both collaborative and competitive politics.

Organizational Power and Politics

In regards to the literature on organizational power and politics, this research study provides several insights. First, there is evidence that innovation championship involves the use of a combination of competitive and collaborative political tactics. Innovation champions' political astuteness and willingness to engage in a wide variety of political tactics were most clearly demonstrated in the case study of the organizational politics surrounding the social innovation of organic food regulation. Second, the importance of "first mover advantage" in innovation championship was demonstrated in the longitudinal analysis of this political contest. Alternatively, resistance by opposing interests is less effective if left until late in the innovation development process. Both of these findings have implications for innovation championship within organizations and interorganizational networks as well as for changes in public policy.

Methodological

Unlike many other studies of political tactics which are based on projective techniques or cross-sectional analyses (Ansari & Kapoor, 1987; Kipnis, Schmidt & Wilkinson, 1980; Roberts, 1986; Shilit & Locke, 1982; Yukl, Falbe & Youn, 1993), this longitudinal case study focused on an extended political contest involving multiple parties. Thus, the influence and outcomes of political tactics (both individually and in combination with others) by different political actors could be examined. This longitudinal case study analysis also extends previous research on critical incidents and events during the innovation development process (Garud & Van de Ven, 1992; Van de Ven & Poole, 1990; Van de Ven & Pooley, 1992). As found in this research study, much can be gained by adapting this methodological approach to examine the politics of the innovation process. Given that this was only one case study, there needs to be additional research studies to test out these findings and to further refine this type of longitudinal research.

Limitations and Future Research Directions

There are recognized limitations in conducting a field analysis to generalizing findings to other contexts. As an in-depth field analysis, this research project provides one module on which others can be based. The agriculture industry in B.C. is seen as being somewhat different than that in other provinces in terms of the predominance of smaller and diversified farm operations, the bioregional variability in food production, and the proportionately smaller role played by agriculture in the provincial economy. On the one hand, B.C. agriculture is a relatively isolated system (geographically, politically and socially) which permits a "cleaner" test of the phenomenon of interest. However, the next logical step would be to conduct similar case studies of farmers and agriculture in other provinces to determine whether these findings are unique to B.C. or are reflective of agriculture in general.

Another future research direction would be to expand the breadth of the study to include a larger number of participants, especially those involved in conventional agriculture. Given the resource limitations (financial and human) of conducting a dissertation research project, the number of research participants was small. One future avenue for research would be to conduct research on a larger scale to include more farmers.

A larger research project would include more individuals in the research project. A research project such as this one is especially vulnerable to the threat of single researcher bias especially when one considers Walter's (1993, p. 372) assertion that: "Organizational behavior has never been a value-free science and it never will be." Several precautions to reduce the undesired influence of individual personal values or bias on reported findings were taken in this research project. For example, questionnaire items developed by other researchers and previously subjected to extensive validity and reliability tests were utilized to measure attitudes, values and beliefs of respondents. Multiple measures of constructs were also utilized. The qualitative coding of answers to unstructured questions was conducted by two persons and intercoder reliability indices were calculated. If one measure of self-confirming bias is a lack of contrary results, there were several research questions which proved to be unsupported by the data. For example, in regards to the environmental values and beliefs of conventional farmers (Research Question 10), it was found that contrary to expectations, conventional farmers were not anti-environmentalist but rather held moderate environmentalist values. Another example is the finding that the predicted higher level of innovativeness of organic farmers was unsupported by the data. Therefore there are several assurances that methodological means to reduce single researcher bias were successful.

And finally, a third future research direction would be to revisit these farmers at some future time to determine the results of current actions and trends. Such longitudinal research would be particularly interesting in regards to the fledgling organic farming industry in B.C. What will be the eventual impact of the provincial government accreditation and certification programme on organic farmers in the province? Will it facilitate the growth and economic viability of the organic farming industry in the industry? What will the COABC look like in five years' time? What problems will they have encountered as they moved from the planning stage to actual implementation? How have these problems and issues been resolved? Will ABCOPA still be operating and if so, what role will this association be playing in the organic farming community? Other questions surround the evolution of the bioregional organic farming associations themselves. As a result of current events, will the individual organic associations retain their autonomy and strong bioregional focus? Or will there be a centralization and standardization of organizational roles and operations on a province-wide basis?

In summary, future research directions could encompass: the replication of the methods and analysis of this organizational field analysis in other contexts; the expansion of breadth in terms of the number of participants within the current context; and longitudinal research to test out the validity of current predictions and the results of current individual and organizational actions.

PART C. FINAL COMMENTS

One theme of this research project has been the importance of taking a holistic approach to understand a dynamic phenomenon. Referring once again to the metaphor of research as a puzzle solving process, a research study which focuses on only one piece or section of the puzzle necessitates simplifying assumptions about the bigger picture which can later prove to be problematic. In this organizational field analysis, the importance of learning about the historical and personal contexts within which individuals and organizations are operating is illustrated. For example, while there was found to be a congruence amongst organic farmers as to their motivations, beliefs and attitudes concerning organic farming and synthetic agrichemicals, the subsequent analysis at the collective level of the organic farming community indicates that there is a significant divergence concerning the socio-political agenda of organic farming as a force for change in agriculture. While unified on a number of dimensions on an individual level, there are substantive disagreements over both means and ends at organizational and interorganizational levels. This is only one example which illustrates the importance of examining innovation adoption and championship at both individual and collective levels.

Another example concerns the influence of communication channels on individual perceptions about different innovations (and subsequent potential for adoption). In regards to biogenetic engineering technology, the preliminary analysis of the type of information provided by different information sources indicated that farmers were more often receiving negative information about this set of innovations. If the analysis had been limited to only this aspect of the innovation decision making process, one would be have been led to conclude that the potential for adoption was less than optimistic. However, as the subsequent analysis of farmers' intentions to use specific bioengineered agricultural products illustrated, this conclusion would have only held for the organic farmers in the study. Contrary to expectations, conventional farmers were more likely to ignore their initial concerns (economic, philosophical, environmental) about biotechnology and state that they would adopt these innovations if made available. This draws into question assumptions that beliefs and attitudes necessarily translate into behavioral intentions and actual practice as proposed by the social psychology literature (Fishbein and Ajzen, 1975). A finding that would have been missed if a more integrative strategy had not been conducted.

In the course of this research project, much has been learned about the social, economic and political reality farmers and organizations in B.C. agriculture. At the conclusion of my interviews with farmers, I asked them to describe what would be their vision of a "perfect world". The dedication and commitment of many to farming is revealed by the answer that despite all the problems that they currently are facing, 39% said that they would still choose to be farming. As one conventional farmer elaborated,

> "The only reason that farming is going today is that for those of us who are in it, it's a way of life. We're not in it for the easy hours. We're not in it for the comfort. We're not in it for the big bucks. We're not in it for the glory. Because none of those are there."

On a more philosophical note, one organic farmer had the following vision of a perfect world.

> "There is many a May day when I am in a perfect world and I'm doing exactly what I want to do. Standing in the middle of my field and listening to the birds in the forest and being the only one around. I would like to see bioregionalism. I want to see each city and town producing as much of its own food locally as it can. And I think there should be a rejuvenation of the growing spirit in and around the cities and not just in the rural areas. The other idealistic ideas that go along with that is the integration of rural and urban minds in terms of sustainability of soil and food production."

For many organic and conventional farmers, features of a perfect world would be one in which there was environmental sustainability, no wars, and enough food to feed everyone. A perfect world would also be one in which rural and urban communities would be integrated and in harmony. Idealistic? Of course. Possible? That remains to be seen.

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APPENDICES

APPENDIX A

SUMMARY LIST OF RESEARCH QUESTIONS

A. SOCIO-ECONOMIC AND PERSONAL BACKGROUND CHARACTERISTICS

QUESTION 1. Are organic farmers different from conventional farmers? Specifically, are organic farmers different from conventional farmers in terms of:

1a. age?
1b. gender?
1c. marital status?
1d. level and type of general education?
1e. level and type of agricultural education and training?
1f. prior career histories?
1g. current off-farm employment of themselves and/or family members/partners?

QUESTION 2. Are organic farms different from conventional farms?

Specifically, are organic farms different from conventional farms in term of:

2a. farm size?
2b. ownership status
2c. types and diversity of farm products?
2d. operating expenses?
2e. agricultural labour requirements (family and hired labour)?
2f. methods of marketing farm products?

QUESTION 3. Are organic farmers more innovative than conventional farmers?

Specifically, are organic farmers different from conventional farmers in respect to:

3a. the number of new practices and/or products which they have adopted in their farm operations and in marketing farm products?

3b. the types of new practices and/or products which they have adopted in their farm operations and in marketing farm products?

3c. sources of ideas for innovations and changes in farm operations and marketing?

B. INFORMATION CHANNELS AND COMMUNICATION BEHAVIOUR

QUESTION 4. Are organic and conventional farmers different in terms of their communication behaviour?

4a. Organic farmers will attend to information from sources (individual farmers, organizations, and publications) which support organic farming concepts and philosophy.

4b. Conventional farmers will attend to information from sources (individual farmers, organizations, and publications) which support conventional approaches to agriculture.

QUESTION 5. What communication channels do farmers' access for information concerning organic farming innovations and biogenetic engineering innovations?

5a. For farmers (conventional and organic), the primary sources of information about biogenetic engineering innovations will be through mass media communication channels.

5b. For farmers (conventional and organic), the primary sources of information about organic farming innovations will be through interpersonal communication channels.

QUESTION 6. Are there differences between organic and conventional farmers in terms of how they rank different information sources in terms of relevance, understandability and trustworthiness?

6a. Organic farmers will rank information sources identified as subscribing to an organic farming philosophy higher (in terms of relevance, clarity and trust) than sources identified as promoting conventional agricultural practices.

6b. Conventional farmers will rank information sources identified as promoting conventional agricultural practices higher (in terms of relevance, clarity and trust) than sources identified as subscribing to an organic farming philosophy.

C. PERCEPTIONS, BELIEFS AND EVALUATIONS CONCERNING AGRICULTURAL INNOVATIONS AND THE NATURAL ENVIRONMENT

QUESTION 7. What are organic farmers' motivations for choosing organic farming as a method of agricultural production?

QUESTION 8. Are there differences between organic and conventional farmers in how they perceive and evaluate organic farming?

8a. Compared to organic farmers, conventional farmers will hold more negative beliefs about the relative economic advantages of organic farming innovations.

8b. Compared to organic farmers, conventional farmers will attribute higher complexity to the incorporation of organic farming innovations into their existing agricultural practices.

8c. Organic farming innovations will be perceived by conventional farmers to require radical changes to their existing work practices.

8d. Organic farming innovations will be perceived by organic farmers to require incremental changes to their existing work practices.

QUESTION 9. Are there differences between organic and conventional farmers in how they perceive and evaluate synthetic agrichemicals?

9a. Compared to conventional farmers, organic farmers will hold more negative beliefs about the relative economic advantages of the use of synthetic agrichemicals.

9b. Compared to conventional farmers, organic farmers will attribute higher complexity to the use of synthetic agrichemicals in agricultural production.

9c. Compared to conventional farmers, organic farmers will attribute greater risks (to the environment and to personal health) to the use of synthetic agrichemicals in agricultural production.

QUESTION 10. Are there differences between organic and conventional farmers in terms of their values and beliefs regarding the natural environment?

QUESTION 11. What are the relationships between organic and conventional farmers' attitudes towards organic farming, synthetic agrichemicals and the natural environment?

Specifically, are organic farmers different from conventional farmers in respect to:

11a. the relationship between their perceptions of agrichemicals and their perceptions of organic farming?

11b. the relationship between their perceptions of organic farming and environmental values and beliefs?

11c. the relationship between their perceptions of agrichemicals and environmental values and beliefs?

QUESTION 12. Are there differences between organic and conventional farmers in how they perceive biogenetic engineering technology in agriculture?

Specifically, are organic farmers different from conventional farmers in respect to:

12a. their perceptions of the potential benefits of biogenetic engineering technology?

12b. their perceptions of the potential costs/risks of biogenetic engineering technology?

QUESTION 13. Are there differences between organic and conventional farmers in their evaluation of the perceived attributes of biogenetically engineered agricultural products?

13a. Both conventional and organic farmers will hold positive beliefs about the relative economic advantages of biogenetic engineering innovations.

13b. Both conventional and organic farmers will view biogenetic engineering innovations as being compatible with their existing agricultural practices.

13c. Both conventional and organic farmers will attribute low complexity to the incorporation of biogenetic engineering innovations with their existing agricultural practices.

13d. Biogenetic engineering innovations in agriculture will be perceived by farmers (conventional and organic) to require incremental changes to their existing agricultural practices.

QUESTION 14. What is the influence of various information sources on farmers' attitudes towards and stated intentions to use bioengineered products?

QUESTION 15. To what extent is a farmer's willingness to try out biogenetically engineered agricultural innovations related to his/her socioeconomic characteristics, agricultural production experience, and assessment of biotechnology's projected benefits, costs and risks?

D. INNOVATION CHAMPIONSHIP

QUESTION 16. Are there differences in the innovation championship of organic farming and biogenetic engineering technology innovations?

16a. The championship role for organic farming innovations will tend to be assumed by individuals and will more closely resemble that of the product innovation champion.

16b. Champions of organic farming innovations are centrally situated in interpersonal sociometric and communication networks.

16c. The championship role for biogenetic engineering innovations will tend to be diffused among organizations and/or societal interest groups and will more closely resemble that of the management innovation champion.

16d. Champions of biogenetic engineering innovations are centrally situated in societal level sociometric and communication networks.

QUESTION 17. To what degree does the championship of organic farming and biogenetic engineering technology involve collaborative and/or competitive organizational politics?

17a. Championship of organic farming innovations will be limited to collaborative political strategies.

17b. Championship of biogenetic engineering innovations will encompass both competitive and collaborative political strategies.

QUESTION 18. To what degree does the championship of organic farming and biogenetic engineering technology involve social innovation?

18a. Individual and organizational champions of organic farming will exhibit a greater propensity than champions of biogenetic engineering to develop new social innovations in the way they interact and influence others to engender public and governmental support for their proposed changes.

18b. Technological innovation success requires a combination of both technological <u>and</u> social innovation.

E. FARM ORGANIZATIONS

QUESTION 19. Are organic and conventional farmers different in terms of the number and types of farm organizations they belong to?

QUESTION 20. Are organic and conventional farmers different in terms of their motivations for belonging to farm organizations?

QUESTION 21. Are organic and conventional farmers different in terms of their memberships in organizations outside of agriculture?

QUESTION 22. What are the history, mission and objectives, activities, organizational structure and processes of different types of farm organizations?

Specifically, are there differences between farm organizations involved in mainstream agriculture as opposed to those involved in organic agriculture in terms of:

22a. organizational goals and processes?

22b. how critical issues are addressed and decisions are made?

22c. the extent to which organizational politics have operated within their organizations and in relation to other organizations?

22d. the nature of organizational politics which have operated within their organizations and in relation to other organizations?

QUESTION 23. What roles do different types of farm organizations serve for their members?

QUESTION 24. What roles do leaders play in different types of farm organizations?

24a. Which leadership roles are most required in organizations which are predominantly voluntary associations?

24b. Are there differences in leadership roles due to the size and age of an organization?

24c. Do leaders play different roles in organic farm associations as compared to farm organizations in mainstream agriculture?

QUESTION 25. What is the incidence and nature of social innovations within different types of farm organizations?

QUESTION 26. What has been the incidence, purpose and nature of interorganizational networks in conventional and organic agriculture?

QUESTION 27. What is the incidence and nature of organizational politics operating within interorganizational networks in conventional and organic agriculture?

Specifically, in regards to organizational politics within interorganizational networks:

27a. Is the level of political action surrounding a social innovation either continuous or episodic?

27b. Are episodes of high levels of political activity more likely to be triggered by events/actions exogenous or endogenous to the environment of those involved in the innovation unit?

27c. Are episodes of high levels of political activity a result of a substantive change, a part of a substantive change, or a precursor to substantive changes in the courses of action concerning a social innovation?

QUESTION 28. What is the incidence and nature of social innovation championship and nonchampionship in interorganizational networks?

28a. Do innovation champions initiate a greater number of political tactics than nonchampions of a social innovation?

28b. Do innovation champions differ from nonchampions in the types of political tactics (collaborative vs. competitive) they initiate?

28c. Does the frequency of political tactics initiated by champions and by nonchampions change or remain relatively constant over the course of a social innovation's development?

28d. Does the nature of political tactics initiated by champions and by nonchampions change over the course of a social innovation's development?

APPENDIX B

SUMMARY OF STUDIES REGARDING SOURCES OF INFORMATION FOR FARMERS' PEST MANAGEMENT DECISIONS

STUDY	SOURCES OF INFORMATION	STUDY RESULTS
Tait (1978) U.K. Fruit & Vegetable Growers	Farming advisors -- non-commercial vs. commercial (pesticide salesmen) advisors	- 62% of farmers favoured commercial advisors - no significant difference in pesticide usage based on reliance of commercial vs. non-commercial advisors
Carr (1987) U.K. farmers & environmentalists	Neighbours Agribusiness reps. ADAS family members conservation orgs.	- most powerful influence were neighbours and agribusiness followed by family members. - ADAS was respected as source of advice - no perceived impact of conservationist organizations - farmers discounted the validity of claims of those outside their rural community
Lane & Tait (1987) U.K. farmers	Agribusiness reps.	- over 50% of farmers surveyed had a commercial pesticide pesticide distributor representative on the farm once a week and making decisions on crop protection needs
Turpin & Maxwell(1976) Indiana Corn Farmers	Pesticide dealers County Agriculture Agents	- farmers who used pesticide dealers as primary information source tended to use more pesticides
Lawson (1982) U.K. farmers	ADAS Other farmers Dealers Chemical companies Contracting cos. Press	- verbal information most frequently received from other farmers, dealers and contracting companies - most frequent information was once a month from ADAS, contracting companies, and the press - weighting of information between self-advised farmers and farmers advised by dealers and contracting cos. a. for clarity of information: similar rankings with ADAS and contractors ranked higher than the press b. for trust: self-advised farmers ranked ADAS higher with dealers and the press ranked lowest; for dealer advised farmers, dealers ranked first, followed closely by ADA with press, chemical companies and other farmers at bottom of rankings c. for relevance: for self-advised farmers, no sig. difference between channels of information; for dealer-advised farmers, dealers were ranked sig. more relevance - no sig. difference between self-advised and dealer-advised farmers in terms of number of pesticide applications

APPENDIX C

STUDY PARTICIPANT CONTACT LETTER AND CONSENT FORMS

INITIAL CONTACT LETTER TO STUDY PARTICIPANTS

(on U.B.C. Faculty of Commerce and Business Administration letterhead)

Dear ____________________,

I am a Ph.D. student in the Faculty of Commerce and Business Administration at the University of British Columbia and would like to request your cooperation in a research study on innovation within B.C. agriculture. The title of the study is "A case study of farming innovations in British Columbia". Through this research we hope to learn more about how various innovations have been accepted into agricultural production.

This project is being sponsored by the Faculty of Commerce and Business Administration at the University of British Columbia.

If you should decide to participate, you will be asked to participate in an interview and to complete a brief survey questionnaire. The interview would take one to two hours of your time while the questionnaire can be completed within 15 minutes. We are particularly interested in your experience with and thoughts about various agricultural innovations such as synthetic chemicals, biotechnology and organic farming. A list of the types of questions we would be asking about these and other topics is enclosed.

If you agree to participate in this research project, there are certain principles that need to be spelt out. I would adhere to these and they provide a framework for the interview. They are as follows:

* You are able to impose conditions on the interview that are acceptable to you. You should feel free to refuse to answer any particular question or to discuss particular topics; you will have the opportunity to withdraw from the interview at any time.

* Your consent to be interviewed must be obtained. The attached consent form needs to be signed by you if you do agree to be interviewed.

* We will respect all guarantees of confidentiality. Any information obtained in connection with this study that can be identified with you will remain confidential and will be disclosed only with your permission. Excerpts of your interview may be made part of the final research report, but under no circumstances will your name or identifying characteristics be included in the research report. You will have the opportunity to see a transcript of the interview and to alter the content.

If you should decide to participate in this research project, please sign the attached form and return it in the enclosed stamped self-addressed envelope. If there is anything further you wish to know about me or the research before you come to your decision, then please do not hesitate to contact me. My telephone number is 266-4866. Thank you.

Yours sincerely,

Carolyn P. Egri
Ph.D. Student

INTERVIEW QUESTIONS

We are interested in your current and past experience as a farmer in B.C. The following list outlines the specific types of questions we will be asking during your interview.

1. How long have you farmed? Why have you chosen to be a farmer? What types of formal and informal experiences and/or training have you undertaken to learn about farming? What type of work experience do you have outside of agriculture?

2. What type of farm operation do you have? Specifically, what is the size of your operation? How many people are involved? What types of crops or food do you produce? What types of fertilizers and methods of weed and pest control do you use? How and where do you market your products?

3. What are your experiences with and thoughts on different types of farming methods? For example, ways of controlling for weeds and pests? the use of various types of fertilizers and other methods of enhancing crop production? the use of organic farming methods?

4. What is your knowledge of and thoughts about new types of crop seeds, biological controls for weed and pest management and other agricultural products which are being developed through biogenetic engineering technology research?

5. What is or has been your involvement in organizations and associations within agriculture? What are your thoughts on the way these organizations operate? What have they been doing? What do you think they should be doing?

6. What do you feel are the most critical issues in agriculture today and in the future? How do you feel these affect your operation? What do you think should be or can be changed?

FARMING ORGANIZATION LEADERS

INTERVIEW QUESTIONS

First of all, we are interested in the farming organization which you are involved in. Specifically, we would like to learn about:

1. The history of your organization. What are the organizational goals and objectives? What are the various activities of your organization--which issues which are important and how do things get done?

2. What has been your personal experience and role in this organization? Who do you work with--both inside and outside the organization? What key organizational accomplishments have you been involved with? How were they achieved?

3. What has been your organization's position and involvement in the development of recent government legislation on agricultural practices? For example, provincial and federal organic certification programs, the federal Plant Breeders' Variety Act.

We are also interested in your current and past experience as a farmer in Ontario. The following list outlines the specific types of questions we will be asking during your interview.

1. How long have you farmed? Why have you chosen to be a farmer? What types of formal and informal experiences and/or training have you undertaken to learn about farming? What type of work experience do you have outside of agriculture?

2. What type of farm operation do you have? Specifically, what is the size of your operation? How many people are involved? What types of crops or food do you produce? What types of fertilizers and methods of weed and pest control do you use? How and where do you market your products?

3. What are your experiences with and thoughts on different types of farming methods? For example, ways of controlling for weeds and pests? the use of various types of fertilizers and other methods of enhancing crop production? the use of organic farming methods?

4. What is your knowledge of and thoughts about new types of crop seeds, biological controls for weed and pest management and other agricultural products which are being developed through biogenetic engineering technology research?

5. What is or has been your involvement in organizations and associations within agriculture? What are your thoughts on the way these organizations operate? What have they been doing? What do you think they should be doing?

6. What do you feel are the most critical issues in agriculture today and in the future? How do you feel these affect your operation? What do you think should be or can be changed?

Carolyn P. Egri
Faculty of Commerce and Business
Administration
University of British Columbia
2053 Main Mall
Vancouver, B.C. V6T 1Y8

Dear Ms. Egri,

I have decided to participate in your research study on innovations within Canadian agriculture. My involvement will include participation in an interview and completion of a survey questionnaire. I understand that my time commitment to this project will be one to two hours for the interview and 15 minutes for completing the survey questionnaire. My signature indicates that I have read the information in the attached letter and have decided to participate. I realize that I may withdraw without prejudice at any time after signing this form should I decide to do so.

__________________________ ________________________

Signature Date

____

(Name -- Please Print)

ADDRESS: ____

____

____

TELEPHONE: __________________________

PARTICIPANT INTERVIEW CONSENT FORM

My name is Carolyn Egri, and I am a researcher on an academic project entitled:

A CASE STUDY OF FARMING INNOVATIONS IN BRITISH COLUMBIA.

This project is being sponsored by the Faculty of Commerce and Business Administration at the University of British Columbia.

I am a Ph.D. Student in the Faculty of Commerce and Business Administration and should you have any questions about the research project, I can be reached at my home office of 266-4866. Professor Peter J. Frost is my advisor on this project and may be contacted at 822-8384.

Thank you for your willingness to participate in this research project. Your participation is very much appreciated. Your contribution to this project will involve this interview plus the completion of a written survey questionnaire. The interview will take approximately one to two hours while the questionnaire can be completed within 15 minutes.

Just before we start the interview, I would like to reassure you that as a participant in this project you have several very definite rights.

First, your participation in this interview is entirely voluntary.
You are free to refuse to answer any question at any time.
You are free to withdraw from the interview at any time.
This interview and your written survey questionnaire will be kept strictly confidential and will be available only to members of the research team.

Excerpts of this interview may be made part of the final research report, but under no circumstances will your name or identifying characteristics be included in this report. You will have the opportunity to see a transcript of the interview and to alter the content.

I would be grateful if you would sign this form to show that I have read you its contents and that you agree to participate as an interviewee under the conditions stated above.

______________________________ (signed)

______________________________ (printed)

______________________________ (dated)

Please send me a report on the results of this research project.(circle one)
YES NO

address for those requesting research report

____

____

____

APPENDIX D

INTERVIEW QUESTIONS

PAGE

INTERVIEW QUESTIONS FOR FARMERS

I. BACKGROUND INFORMATION

NAME: ______________________

LOCATION: ______________________

GENDER: M ___ F ___ AGE: ________

MARITAL STATUS: Married____ Single _____ other ____

II. CAREER HISTORY

a. How many years have you farmed? ____________

FOR ORGANIC FARMERS:

b. How many years have you farmed using organic methods? ____________

c. Have you always farmed for a living? YES NO

d. Did you grow up on a farm? YES NO

e. IF YES, Where? ______________________

On what type of farm?

f. Products ______________________

g. Size of operation (acres) __________

h. IF NO, how or why did you get into farming?

i. What other types of work have you done in the past? (the most recent first)

Job ______________ Where? ________ When? _____

Job ______________ Where? ________ When? _____

Job ______________ Where? ________ When? _____

j. Are you and/or your spouse employed elsewhere right now?

YES (SELF) YES (SPOUSE) NO

IF YES (SELF)

(k) What kind of work are you doing? ______________________

(l) How much of your time is spent in off-farm employment?

Weeks/year ____________
Hours/week ____________

(m) Why do you work off your farm?

IF YES (SPOUSE)

(n) What kind of work is he/she doing? ____________________

(o) How much of his/her time is spent in off-farm employment?

Weeks/year ____________

Hours/week ____________

(p) Why does he/she work off your farm?

q. What's the highest level of formal education that you have completed?

r. What type of training or education have you completed to learn about farming and agriculture?

___ university degree
___ academic courses (university, college)
___ courses sponsored by BCMAF, farming organizations
___ conferences
___ formal apprenticeship
___ other ____________________

s. IF MARRIED, What's the highest level of formal education that your spouse has completed?

t. Has she or he had any training or education to learn about farming and agriculture?

___ university degree
___ academic courses (university, college)
___ courses sponsored by BCMAF, farming organizations
___ conferences
___ formal apprenticeship
___ other ____________________

III. FARM OPERATIONS

a. What is the total size of your farm? ____________ acres

b. Do you own or rent your land? OWN RENT OWN & RENT

(i) Acreage owned ____________

(ii) Acreage rented ____________

c. How much of your land is

(i) in crops? ____________ acres

(ii) is for other uses? ____________ acres
(Please specify)

d. What types of food do you produce? Could you tell me how many acres is used for each type of product, how much you produced and how much you sold (in tons; bushels; litres) for 1990 and the previous two years?

	Year		Type of Crop or Product	Acres	Amounts Produced	Sold
(i)	19__	1.	______	______	______	______
		2.	______	______	______	______
		3.	______	______	______	______
(ii)	19__	1.	______	______	______	______
		2.	______	______	______	______
		3.	______	______	______	______
(iii)	19__	1.	______	______	______	______
		2.	______	______	______	______
		3.	______	______	______	______

e. How does this compare to the types of crops you have produced in previous years on this land?

When you first started farming on this land?

What were the reasons for your decision to change the type of food you produce?

f. Could you tell me what this land was used to produce by the previous owner? Can you be specific?

g. Could you name a farmer in this area who has a similar operation (in terms of products and size of operation) who practices

FOR ORGANIC FARMERS -- nonorganic farming methods?
FOR CONVENTIONAL FARMERS -- organic farming methods?

h. Could you give me an estimate of the percentage of your total operating expenses spent on:

______ Labour

______ Capital equipment (e.g., machinery, buildings)

______ Fertilizers

______ Pest controls (e.g., pesticides, biological control, IPM)

______ Other expenses (what are/is the most notable of these)

IV. MARKETING FARM PRODUCTION

a. Could you tell me what % of your total farm output is:

_______ Consumed by you and your family (or given away)

_______ Sold directly to consumers (farmers market, roadside stands)

_______ Sold to wholesalers

_______ Sold directly to retailers

_______ Sold through farmers cooperatives

_______ Other ______________________________

b. Have you changed your method of selling farm output over the past 5 years?

YES NO

IF YES, how have you changed? Why?

c. Have you had any problems in finding commercial outlets for your crops?

YES NO

Could you please be specific?

V. ON-FARM EMPLOYMENT

a. How many people are involved in farming your land? _______

b. In terms of average number of hours/week:

(i) How many hours do you spend working on your farm? _______

(ii) How many hours does your spouse spend on farm production? _______

(iv) If applicable, how many hours do your children (age 12+) spend on farm production? _______
(no. children _______)

c. Do you employ others to help out in your operations?

YES NO

IF YES,

(i) No. full-time _______ No. weeks/yr. _______

(ii) No. part-time _______ No. weeks/yr. _______

(iii) What do they do for you? _______________

____

____

VI. FARMING PRACTICES

a. How do you define organic farming? What is it all about?

b. How do you see it as different from other ways of farming?

c. In terms of overall farming practices, how would you categorize yourself as a farmer?

ORGANIC CONVENTIONAL BIODYNAMIC

IF ANSWER IS ORGANIC OR BIODYNAMIC:

(i) What do you do differently as an organic (biodynamic) farmer than those who use conventional methods of production?

(ii) What new practices or ideas have you implemented during the past 5 years? What got you to do this/these? Did you develop them yourself or did you learn about them from someone or somewhere else? (please be specific)

(iii) Why did you choose to be an organic producer? What made you decide to farm organically?

IF ANSWER IS CONVENTIONAL

(iv) What do you do differently than an organic farmer?

(v) What new practices or ideas have you implemented during the past 5 years? What got you to do this/these? Did you develop them yourself or did you learn about them from someone or somewhere else? (please be specific)

d. On a scale of 1 to 5, how much do you agree with the following statements about organic farming? (CARD #1)

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Organic farming:

___ is a profitable way to farm
___ saves time and effort
___ is easy to understand
___ improves the quality of food produced
___ has low operating costs
___ is easy to try out
___ increases crop losses due to insect pests
___ gets quick results
___ is hard to do
___ reduces weed problems
___ fits well with the way I like to work

FOR ORGANIC FARMERS ONLY

e. When you made the decision to convert to organic farming in 19____, how risky did you perceive it to be then?

0	1	2	3	4
No risk	Very little risk	Moderately risky	Considerable risk	Very risky

f. What factors contributed to your INITIAL feelings about the risk of going organic"?

_________ Small market
________ Hard to reach customers
________ Problems with pests, weeds, etc.
________ More variable yields
_______ Insufficient capital funds
_______ Lack of scientific knowledge or information
______ No experience in organic farming
______ Other ____

g. Given your experience, how risky do you think it is to be an organic farmer TODAY?

What do you see as the most serious risks NOW?

_________ Small market
________ Hard to reach customers
________ Problems with pests, weeds, etc.
________ More variable yields
_______ Insufficient capital funds
_______ Lack of scientific knowledge or information
______ No experience in organic farming
______ Other ____

h. Have you had any problems in borrowing money for the farm that seem to be due to the fact that you have an organic operation?

YES NO

Can you be specific?

ALL FARMERS

i. Do you use any synthetic chemicals for pest control (for example, pesticides, herbicides, fungicides) in your operations?

YES NO

(i) IF YES, what do you use?

How many acres are sprayed? How often each year? Why?

(ii) If you have used synthetic chemicals in the past but no longer do so, why did you stop using them?

j. What types of fertilizer have you used in the past 3 years? Please be specific.

(i) Organic ______________________________

(ii) Chemical ______________________________

k. What other ways do you control for weeds and pests? Please be specific.

___ Crop Rotations
___ Interplanting
___ Planting Times
___ Mulches
___ Tillage
___ Experiment with different plant seeds
___ Other ______________________________

l. How do you keep up to date on the latest developments in agriculture?

Which sources of information have you used in the past 3 years to learn about new farming products or practices, or to get help in solving problems? (CARD #2)

___ 1. Other farmers
Anyone in particular? ______________________________

___ 2. Government agriculture agents

___ 3. Government publications and newsletters

___ 4. Farming organizations:
Can you be specific? ______________________________

___ 5. Education courses, conferences:
Where and when? ______________________________

___ 6. Industrial suppliers of agricultural products and equipment.
Which ones? ______________________________

___ 7. Contracting companies
Which ones? ______________________________

___ 8. Media (newspapers, magazines, radio, television)

Please specify which ones read, radio programmes listened to or TV programmes watched on a regular basis:

___ 9. Other ______________________________

m. CONDUCT INFORMATION SOURCES RANKING EXERCISE.

SOURCES OF INFORMATION ABOUT FARMING PRACTICES

Procedure: There are three sets of cards for each source of information on farming products, equipment and practices. During the interview, subjects are asked to order these in descending order (1 to 7) on three dimensions:

(1) relevance
(2) understandability/clarity
(3) trust

At the conclusion of the ranking exercise, farmers are asked to specify which mass media sources are read or TV programmes watched.

Relevance	Understandability/ Clarity	Trust	
______	______	______	Other farmers
______	______	______	Government sources
______	______	______	Farming organizations
______	______	______	Education courses, conferences
______	______	______	Agribusiness
______	______	______	Contracting companies
______	______	______	Media

VII. ORGANIZATIONAL MEMBERSHIP

a. Are you currently a member of any farming associations? YES NO

(i) IF YES, which ones?

Why do you belong? What do you see as the benefits of belonging?

What is/has been your involvement in this organization?

(ii) Have you been a member of a farming organization in the past but no longer belong to one?

YES NO

IF YES, What was the name of the organization?

What was your involvement in this organization?

Why did you leave?

IF NO, could you tell me why you haven't joined any farming associations?

(iii) Do you belong to any other types of organizations? Could you tell me which ones?

b. What do you see the role of farming organizations in influencing the practice of agriculture?

In general, how effective do you think they have been so far?

1	2	3	4
Very Ineffective	Ineffective	Effective	Very Effective

Would you like to see things change in the way these organizations operate?

YES NO

IF YES, in what ways?

IF CURRENTLY A MEMBER OF A FARMING ORGANIZATION OR HAD PAST MEMBERSHIP:

c. Could you tell me about the farming organization you belong(ed) to. What do you consider to be the key mission and goals of this organization?

What is the history of this organization? What changes have you seen?

How do people relate to each other?

d. Who do you see as the leader in this organization?

How would you describe this person's leadership style and practices?

Could you tell me one story about ____(leader's name)____ which would be typical of how he/she operates?

e. Do you feel he/she is an effective leader? How does he/she do it?

1	2	3	4
very ineffective	ineffective	effective	very effective

How does he/she get others to do what he/she wants them to do?

Inside the organization:

Outside the organization:

f. Since you have been (while you were) a member of this organization, have there been (were there) any particularly innovative or new ideas, programs or initiatives undertaken?

What were they? Who was involved?

Were there any problems during their development and implementation?

YES NO

IF YES, could you please describe them?

What was the role of the leader of this organization in getting these changes implemented? What was his/her specific strategy?

Do you feel this strategy was effective? Why?

1	2	3	4
Very Ineffective	Ineffective	Effective	Very Effective

g. How would you describe this leader's vision of the organization's future?

Do you agree with it? Why or why not?
YES NO

VIII. <u>BIOGENETIC ENGINEERING TECHNOLOGY</u>

a. What do you know about recent agricultural research which is using biogenetic engineering technology (recombinant DNA techniques; cell fusion; cell and tissue cultures)?

b. How have you learned about this research?

c. Based on your current knowledge, what do you see as the <u>potential benefits</u> of biogenetic engineering technology in agriculture as a whole? to your operation?

d. At this point, do you see any <u>potential costs or risks</u> (e.g., personal, financial, environmental) of biogenetic engineering technology in agriculture as a whole? in your operation?

e. Based on your current knowledge, which of the following potential biogenetic engineering products would you be willing to try out? Are there specific conditions under which you would try them? (CARD #3)

(i) New crop seeds designed to be: Conditions

___ 1. Disease resistant
___ 2. Herbicide resistant
___ 3. Nitrogen-fixing
___ 4. Pest resistant
___ 5. Stress resistant
___ 6. Higher quality (e.g., protein improved)
___ 7. Higher yields
___ 8. Growth regulators

(ii) Microbial organisms which act as:

___ 9. bioherbicides (e.g., BioMal)
___ 10. biofungicides
___ 11. microbial inoculants (e.g., the lentil and pea inoculant N-PROVE)
___ 12. protection against frost damage
___ 13. decomposers of farm wastes

(iii) Genetically engineered biological controls:

___ 14. Parasites and predators to combat pests
___ 15. For weed control

f. Which biogenetically engineered products would you not be willing to use? Why?

g. Do you feel that the government review and regulation of these products should be the same as that for other agricultural inputs such as fertilizers, pesticides or crop seeds? ____same ______ different

Could you tell me why or why not? Please be specific.

IX. GENERAL

a. What do you feel are the greatest challenges and/or problems involved in farming today? (personal, financial, environmental)

b. What do you feel should be the role of government in agriculture?

c. If you could have a "perfect world," what would it look like? What type of picture do you see? Could you please describe it for me? Where do you see yourself in that picture?

d. Is there anything else you would like to discuss that we haven't covered?

SUPPLEMENTAL QUESTIONS FOR LIVESTOCK and DAIRY PRODUCERS

1. LIVESTOCK FARMERS

   a. How many cattle are in your operation?

   b. Do you operate a feedlot operation?

      NO YES

   DAIRY FARMERS

   c. How many cows are in your herd? ______________

   d. Do you have a milk quota? YES NO

      IF YES, how much is it?

2. How do obtain feed for your herd?

   a. ON-FARM SOURCES ONLY

   b. PURCHASED SOURCES ONLY

   c. ON-FARM AND PURCHASED SOURCES (% ON-FARM TO PURCHASED)

3. How do you dispose of animal wastes in your operation?

   USE AS FERTILIZER ON OWN FARM

   SELL TO COMMERCIAL FERTILIZER SUPPLIER

   OTHER

SUPPLEMENTAL QUESTIONS FOR LIVESTOCK and DAIRY PRODUCERS

4. Do you use any of the following chemical products in your operation? Please be specific as to what you use, number of times used, use levels and for what purpose.

a. ____ Pharmaceutical

ANTIBIOTICS

ANTIBACTERIALS

WORMERS

INSECTICIDES

COCCIDIOSTATS

b. ___ Biologicals

VACCINES

BACTERINS

c. ____ Feed additives to enhance feed efficiency (bacitracin zinc; chlortetracycline, erythromycin, melengestrol acetate, monensin, oxytetracycline)

ANTIBACTERIALS

NUTRITIONAL

GROWTH HORMONES AND ANTIOXIDANTS (Bacitracin, bacitracin zinc, chlortetracycline, erythromycin, melengestrol acetate, oxytetracycline)

d. ____ Chemicals for promoting milk production (oxytetracycline, thyroprotein)

SUPPLEMENTAL QUESTIONS FOR POULTRY AND EGG PRODUCERS

1. What type of poultry do you raise? How many each year?

a. CHICKENS

LAYERS ____________

DO YOU HAVE A EGG QUOTA? YES NO

IF YES, HOW MUCH IS IT FOR? ____________

FRYERS ____________

ROASTERS ____________

b. DUCKS ____________

c. TURKEYS ____________

d. CORNISH GAME HENS ____________

e. GEESE ____________

f. OTHER (please specify) ______________________________

2. How do obtain feed for your poultry?

a. ON-FARM SOURCES ONLY

b. PURCHASED SOURCES ONLY

c. ON-FARM AND PURCHASED SOURCES (% ON-FARM TO PURCHASED)

3. How do you dispose of animal wastes in your operation?

USE AS FERTILIZER ON OWN FARM

SELL TO COMMERCIAL FERTILIZER SUPPLIER

OTHER

4. Do you use any of the following chemical products in your operation? Please be specific as to what you use, number of times used, use levels and for what purpose.

a. ____ Pharmaceutical

ANTIBIOTICS

ANTIBACTERIALS

WORMERS

INSECTICIDES

COCCIDIOSTATS

b. ____ Biologicals

VACCINES

BACTERINS

c. ____ Feed additives to enhance feed efficiency (arsanilic acid or sodium arsanilate; bacitracin, bambermycins, chlortetracycline, erythromycin, furozolidone, lincomycin, oleandomycin, oxytetracycline, penicillin, roxarsone, tylosin, virginiamycin)

ANTIBACTERIALS

NUTRITIONAL

GROWTH HORMONES AND ANTIOXIDANTS

d. ____ Chemicals for pigmentation (arsanilic acid, sodium arsalinate, roxarsone)

FARM ORGANIZATION LEADERS

QUESTIONS ON ORGANIZATIONAL MEMBERSHIP AND GOVERNMENT POLICY

VII. ORGANIZATIONAL MEMBERSHIP

a. Organization: ______________________________

b. Position: ______________________________

c. Years in Current Position: __________

d. No. Years in Organization: ______

e. Do you belong to other organizations? What is your involvement with these other organizations?

NAME: ______________ DURATION: ________ POSITION: __________

NAME: ______________ DURATION: ________ POSITION: __________

VIII. ORGANIZATIONAL LEADERSHIP ROLE

a. Can you describe your role in (organization a leader of) for me?

b. How would you describe your organization. What is its history? What do you see to be the key goals of your organization?

How do people relate to each other?

c. What key accomplishments have happened since you took this position? What did you do? Why?

What effect did your actions have?

d. What problems have you encountered in your role as leader in this organization and how did you handle them?

e. How do you motivate and influence others? In other words, how do you get them to do what you want them to do? Can you give me some recent examples?
Inside the organization:

Outside the organization:

f. What new and/or innovative ideas, programs or new ways of doing things have happened in your organization?

g. What was your role and personal involvement in initiating and/or implementing these innovations?

h. Was there any resistance to these changes? What did you or others do to overcome them? Which actions were effective? What was ineffective?

i. What is your vision for your organization? What changes would you like to see?

j. What do you see to be the key challenges facing your organization now and in the future?

IX. GOVERNMENT POLICY -- B.C. FOOD CHOICE AND DISCLOSURE ACT

a. Was your organization involved in the development and/or drafting of the B.C. government's Food Choice and Disclosures Act? What specifically was your organization's involvement? What was your personal involvement?

b. Which persons or organizations did you see as instrumental in the process of getting this legislation enacted? What did they do?

c. Did you have an overall strategy in influencing the nature of the Act? What was it? How does it relate to your organizational goals?

d. Did you work with other groups or organizations? If so, which ones? What was the nature of your association?

What were the key issues and/or problems which arose? How were they resolved?

e. What do you feel were the most critical issues or needs to be addressed by this legislation? Do you feel the legislation meets these requirements? Why or why not?

f. Is there anything you would have liked to see different in the Act? Why?

g. What do you see as the critical challenges facing the implementation of this legislation? What do you see as workable? Are there any gaps which will need to be dealt with later?

h. What do you see as the impact (intended and predicted) of this legislation on agricultural practices in B.C.?

i. Are there any alternatives to government legislation which you feel should be undertaken or promoted? What are they? What do you see as the benefits/costs associated with these?

X. GOVERNMENT POLICY -- PLANT BREEDERS' RIGHTS ACT

a. Another development in agriculture is the federal government's Bill C-15, the Plant Breeders' Rights Act. What is your organization's position on this legislation? Why?

b. Has your organization been involved in the development and drafting of Bill C-15? If so, could you be specific?

c. Who do you see as the key players supporting this legislation? Who do you see as opposing this legislation? What have they done to influence the nature of the legislation?

d. What do you see as the impact of this legislation on the practice of agriculture in Canada? What do you see as potential benefits and costs?

INTERVIEW QUESTIONS FOR BCMAFF GOVERNMENT REPRESENTATIVES REGARDING INNOVATIONS IN AGRICULTURE, THE B.C. FOOD CHOICE AND DISCLOSURE ACT AND FEDERAL PLANT BREEDERS' RIGHTS ACT

Name: ______________________________

Position: ____________________________ How long? __________

Current responsibilities and/or job duties________________

____

Previous positions in BCMAF ______________________________

NEW DEVELOPMENTS IN AGRICULTURE

1. What are the latest developments in agriculture in B.C.?
2. What has been the impact of these developments on farmers and agriculture in B.C.?
3. What has been the Ministry's role in these developments? What do you feel should be the role of governments?
4. What has been your involvement in these developments?
5. What do you feel are the greatest challenges and/or problems facing farmers today? agriculture in B.C. and Canada?

ORGANIC FARMING

1. Have you had any contact or involvement with organic farmers and/or organic farming associations in this area? If yes, could you describe the focus and nature of your involvement?
2. What are your thoughts on organic farming as a method of agricultural production? What do you feel are the benefits and costs associated with organic farming?
3. What is the overall policy of the BCMAF regarding organic farming? What type of support for organic farming is provided by the Ministry?
4. How does the B.C. Food Choice and Disclosure Act support this policy? How does it fit in with federal government actions in regards to organic farming?
5. What or who were the driving forces behind the B.C. Food Choice and Disclosure Act?
6. What are the goals of the Act? Why was it enacted at this point in time?
7. Which groups and individuals were involved in providing input to the Act? How were they involved? What was the nature of their involvement (personal contact, telephone calls; conferences or symposiums; mail; letters; media advertising)?
8. Were there any alliances or coalitions amongst the groups during the process of drafting the Act?

9. Which groups chose not to, or declined, to participate? Did they give any reasons why? Please be specific.

10. How would you assess the relative impact of each group's role and input to the policy making process?

11. What were the key issues which arose during the course of developing the Act? Any problems/ differences of opinion?

12. What do you see as the critical challenges facing the implementation of this legislation? What do you see as workable? Are there any gaps which will need to be dealt with later?

13. What do you see as the impact (intended and predicted) of this legislation on agricultural practices in B.C.?

14. If this could have done this over again, what do you feel could have been done differently?

15. What other legislation or policy changes are currently being studied or in process of being developed which deal with organic agriculture in B.C.? (e.g., the farmers' financial assistance programme for environmentally sound agricultural practices)

PLANT BREEDERS' RIGHTS ACT

1. Another recent development in agriculture is the federal government's Bill C-15, the Plant Breeders' Rights Act. What are your thoughts on this Act?

   What is was the position of the BCMAFF on this legislation? Why?

   Was the BCMAFF involved in the development and drafting of Bill C-15? If so, could you be specific?

2. Who do you see as the key players supporting this legislation? Who do you see as opposing this legislation? What have they done to influence the nature of the legislation?

3. What do you see as the impact of this legislation on the practice of agriculture in Canada? What do you see as potential benefits and costs?

CLOSING

1. Are there any alternatives to government legislation which you feel should be undertaken or promoted? What are they? What do you see as the associated benefits/costs of these alternatives?

2. Is there anything else which you would like to talk about which we haven't covered?

APPENDIX E

SURVEY QUESTIONNAIRES

ENVIRONMENTAL OPINION SURVEY

We would like you to respond to each of the following statements in terms of the degree to which you agree or disagree with the assumption made in each statement.

Please indicate your choice by CIRCLING THE NUMBER ON THE LINE that most accurately reflects your feelings about each statement.

Please read each statement carefully and indicate your choice on each scale.

1. In the long run, there are no limits to the extent to which we can raise our standard of living.

   -3__________-2________-1________0_________+1________+2__________+3
   Strongly Disagree — Neutral — Strongly Agree

2. Science and technology often do as much harm as good.

   -3__________-2________-1________0_________+1________+2__________+3
   Strongly Disagree — Neutral — Strongly Agree

3. When humans interfere with nature it often produces disastrous consequences.

   -3__________-2________-1________0_________+1________+2__________+3
   Strongly Disagree — Neutral — Strongly Agree

4. People pay too much attention to environmental issues these days.

   3__________-2________-1________0_________+1________+2__________+3
   Strongly Disagree — Neutral — Strongly Agree

5. Canadians are going to have to reduce their consumption of material goods over the next few years.

   -3__________-2________-1________0_________+1________+2__________+3
   Strongly Disagree — Neutral — Strongly Agree

6. Humans need not adapt to the environment because they can remake it to suit their needs.

   -3__________-2________-1________0_________+1________+2__________+3
   Strongly Disagree — Neutral — Strongly Agree

7. Government regulations regarding environmental protection are too restrictive.

-3 ______ -2 ______ -1 ______ 0 ______ +1 ______ +2 ______ +3
Strongly Disagree ... Neutral ... Strongly Agree

8. "Resource" means resource only for the needs of humans.

-3 ______ -2 ______ -1 ______ 0 ______ +1 ______ +2 ______ +3
Strongly Disagree ... Neutral ... Strongly Agree

9. We are approaching the limit to the number of people the earth can support.

-3 ______ -2 ______ -1 ______ 0 ______ +1 ______ +2 ______ +3
Strongly Disagree ... Neutral ... Strongly Agree

10. The decrease of environmental pollution has priority over economic growth.

-3 ______ -2 ______ -1 ______ 0 ______ +1 ______ +2 ______ +3
Strongly Disagree ... Neutral ... Strongly Agree

11. We cannot keep counting on science and technology to solve mankind's problems.

-3 ______ -2 ______ -1 ______ 0 ______ +1 ______ +2 ______ +3
Strongly Disagree ... Neutral ... Strongly Agree

12. Economic growth improves the quality of life for all Canadians.

-3 ______ -2 ______ -1 ______ 0 ______ +1 ______ +2 ______ +3
Strongly Disagree ... Neutral ... Strongly Agree

13. Humans have the right to modify the environment to suit their needs.

-3 ______ -2 ______ -1 ______ 0 ______ +1 ______ +2 ______ +3
Strongly Disagree ... Neutral ... Strongly Agree

14. The news media blow environmental issues out of proportion.

-3 ______ -2 ______ -1 ______ 0 ______ +1 ______ +2 ______ +3
Strongly Disagree ... Neutral ... Strongly Agree

15. More emphasis should be placed on teaching children about nature than on teaching them about science and technology.

-3__________-2________-1________0__________+1________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

16. The positive benefits of economic growth far outweigh any negative consequences.

-3__________-2________-1________0__________+1________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

17. Mankind was created to rule over the rest of nature.

-3__________-2________-1________0__________+1________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

18. Environmental issues should be ignored when jobs are at stake.

-3__________-2________-1________0__________+1________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

19. Humans must live in harmony with nature in order to survive.

-3__________-2________-1________0__________+1________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

20. In general, the Canadian people would be better off if the nation's economy stopped growing.

-3__________-2________-1________0__________+1________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

21. The balance of nature is very delicate and easily upset.

-3__________-2________-1________0__________+1________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

22. We can continue to raise our standard of living through the application of science and technology.

-3__________-2________-1________0__________+1________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

23. Mankind is severely abusing the environment.

-3__________-2_________-1_________0__________+1_________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

24. Most problems can be solved by applying more and better technology.

-3__________-2_________-1_________0__________+1_________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

25. The earth is like a spaceship with only limited room and resources.

-3__________-2_________-1_________0__________+1_________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

26. Rapid economic growth often produces more problems than benefits.

-3__________-2_________-1_________0__________+1_________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

27. The government should bear the responsibility for environmental protection.

-3__________-2_________-1_________0__________+1_________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

28. There are limits to growth beyond which our industrialized society cannot expand.

-3__________-2_________-1_________0__________+1_________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

29. Plants and animals exist primarily to be used by humans.

-3__________-2_________-1_________0__________+1_________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

30. To maintain a healthy economy we have to develop a "steady state" economy where industrial growth is controlled.

-3__________-2_________-1_________0__________+1_________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

THANK YOU FOR YOUR TIME AND COOPERATION IN COMPLETING THIS SURVEY.

THE USE OF AGRICHEMICALS IN FARMING

Using the scale below, please indicate the degree to which you agree or disagree with the following statements about the use of agrichemicals (chemical pesticides, herbicides, fungicides and synthetic fertilizers)in agricultural production. Please indicate your choice by placing an (X) against the point on the line that most accurately reflects your feelings about each statement.

THE USE OF AGRICHEMICALS IN FARMING.......

1. Is now restricted to carefully tested chemicals.

   -3__________-2_________-1_________0__________+1_________+2__________+3
   Strongly Disagree — Neutral — Strongly Agree

2. Could lead to a build-up of pest resistance.

   -3__________-2_________-1_________0__________+1_________+2__________+3
   Strongly Disagree — Neutral — Strongly Agree

3. Is very effective in reducing crop losses in the short term.

   -3__________-2_________-1_________0__________+1_________+2__________+3
   Strongly Disagree — Neutral — Strongly Agree

4. Upsets the natural balance of the soil.

   -3__________-2_________-1_________0__________+1_________+2__________+3
   Strongly Disagree — Neutral — Strongly Agree

5. Is essential to ensuring high agricultural production.

   -3__________-2_________-1_________0__________+1_________+2__________+3
   Strongly Disagree — Neutral — Strongly Agree

6. Poses no long lasting risk to the environment.

   -3__________-2_________-1_________0__________+1_________+2__________+3
   Strongly Disagree — Neutral — Strongly Agree

7. Is a cheap way to protect crops and improve productivity yields.

   -3__________-2_________-1_________0__________+1_________+2__________+3
   Strongly Disagree — Neutral — Strongly Agree

8. Is causing a build-up of chemicals in the human race.

   -3__________-2_________-1_________0__________+1_________+2__________+3
   Strongly Disagree — Neutral — Strongly Agree

THE USE OF AGRICHEMICALS IN FARMING.......

9. Is easy to apply.

-3__________-2________-1________0_________+1________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

10. Does not cause significant harm to wildlife and game.

-3__________-2________-1________0_________+1________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

11. Allows us to keep on top of pests, diseases and weeds so they don't build up.

-3__________-2________-1________0_________+1________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

12. Endangers the health of farmworkers.

-3__________-2________-1________0_________+1________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

13. Can leave harmful residues on the crop.

-3__________-2________-1________0_________+1________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

14. Reduces long term risk of crop loss due to pests and weeds.

-3__________-2________-1________0_________+1________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

15. Is beneficial to the soil.

-3__________-2________-1________0_________+1________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

16. Is dangerous to the environment.

-3__________-2________-1________0_________+1________+2__________+3
Strongly Disagree — Neutral — Strongly Agree

ORGANIZATIONAL LEADERSHIP QUESTIONNAIRE

Listed below are some statements that describe leadership behaviours. You should indicate how often you engage in these behaviours as part of your position in your organization. Please use the following scale to respond to each statement. Place a number from 1 to 7 in the space just before each of the items.

Very infrequently 1 2 3 4 5 6 7 Very frequently

In my position, I

___ 1. listen to the personal problems of others in my organization.
___ 2. meticulously review detailed reports.
___ 3. influence decisions made outside the organization.
___ 4. do problem solving in creative, clever ways.
___ 5. clearly define areas of responsibility for others.
___ 6. display a wholehearted commitment to the job.
___ 7. facilitate consensus building in working sessions.
___ 8. protect continuity in day-to-day operations.
___ 9. compare records, reports, and so on to detect any discrepancies in them.
___ 10. show empathy and concern in dealing with others in my organization.
___ 11. set clear objectives for the organization.
___ 12. experiment with new concepts and procedures.
___ 13. work on maintaining a network of influential contacts.
___ 14. keep track of what goes on inside the organization.
___ 15. push the organization to meet objectives.
___ 16. make sure everyone knows where the organization is going.
___ 17. encourage others to share ideas in the organization.
___ 18. search for innovations and potential improvements.

FACTOR LOADINGS FOR COMPETING VALUES INSTRUMENT ITEMS (EXTENDED VERSION)
(Source: Quinn, 1988, pp. 174-177)

			Item
Factor Loadings			
1.	Innovator (Alpha = .90; Factor Variance = 2.24)		
	1.	Comes up with inventive ideas	(.69)
	10.	Experiments with new concepts and procedures	(.67)
	22.	Does problem solving in creative, clever ways	(.70)
	25.	Searches for innovations and potential improvements	(.66)
2.	Broker (Alpha = .85; Factor Variance = 1.94)		
	3.	Exerts upward influence in the organization	(.64)
	13.	Influences decisions made at higher levels	(.70)
	18.	Get access to people at higher levels	(.52)
	27.	Persuasively sells new ideas to higher-ups	(.64)
3.	Producer (Alpha = .72; Factor Variance = 1.37)		
	5.	Maintains a "results" orientation in the unit	(.58)
	15.	Sees that the unit delivers on stated goals	(.52)
	* 23.	Pushes the unit to meet objectives	
	* 30.	Emphasizes unit's achievement of stated purposes	
4.	Director (Alpha = .79; Factor Variance = 1.52)		
	7.	Defines areas of responsibility for subordinates	(.54)
	12.	Makes sure everyone knows where the unit is going	(.51)
	19.	Sets clear objectives for the work unit	(.49)
	* 26.	Clarifies priorities and direction	
5.	Coordinator (Alpha + .77; Factor Variance = 1.29)		
	2.	Protects continuity in day-to-day operations	(.43)
	9.	Minimizes disruption to the work flow	(.40)
	21.	Keeps track of what goes on inside the unit	(.56)
	** 28.	Brings a sense of order into the unit	(.48)
6.	Monitor (Alpha + .73; Factor Variance = 1.54)		
	4.	Carefully review detailed reports	(.67)
	14.	Compares records, reports, and so on to detect discrepancies	(.69)
	17.	Works with technical information	(.49)
	*32.	Analyzes written plans and schedules	
7.	Facilitator (Alpha = .89; Factor Variance = 2.07)		
	6.	Facilitates consensus building in the work unit	(.54)
	11.	Encourages participative decision making in the group	(.63)
	24.	Encourages subordinates to share ideas in the group	(.63)
	31.	Builds teamwork among group members	(.54)
8.	Mentor (Alpha = .87; Factor Variance = 2.13)		
	8.	Listens to the personal problems of subordinates	(.64)
	16.	Shows empathy and concern in dealing with subordinates	(.75)
	20.	Treats each individual in a sensitive, caring way	(.71)
	** 29.	Shows concern for the needs of subordinates	(.40)

* New item since last analysis
** Wording modified since last analysis

APPENDIX F

CHRONOLOGICAL ANALYSIS OF POLITICAL TACTICS

The interpretation of the organizational politics surrounding the development of the agricultural products certification regulations under Bill 85 was partly based on a detailed analysis of the individual political tactics which were initiated by those who supported and those who opposed the Bill 85 initiative (see Chapter 9). The approach taken in this analysis is guided by that of researchers at the Minnesota Innovation Research Program (MIRP) (Garud & Van de Ven, 1992; Van de Ven & Poole, 1990; Van de Ven & Pooley, 1992) who have conducted longitudinal case studies of innovation development within organizations. As identified in Chapter 9, the MIRP researchers code individual incidents or events involving an innovation in terms of five variables: (1) positive or negative outcomes; (2) continue or change prior action course; (3) resource controller's interventions; (4) outcome criteria shifts; and (5) context events. A time series analysis of the events is then conducted to examine temporal relationships amongst these variables. In this case study of organizational politics, political tactics are substituted for events. 43 episodes of political action involving 105 political tactics were identified from the time of inception (March 1989) to enactment (July 1993) of the organic agricultural products regulations. Within each episode, single or multiple political tactics may have been employed. Whereas episodes are defined as events or incidents involving political action, political tactics are defined as individual actions or influence attempts initiated by one actor or group towards another actor or group. Events (7) occurring external to the B.C. agriculture sector but which had an effect or were perceived to be important to the Bill 85 initiative are also identified but are only coded as to their effect on the provincial regulations initiative. For analysis, the coded data was aggregated into seasons (winter, spring, summer, autumn) for two reasons. First, while specific dates were identified for several political tactics, others occurred over the space of weeks (e.g., networking with individual organic associations). Second, as often identified by respondents, the amount of time which they could spend on organizational activities was influenced by the seasonal work demands of their farm operations. For example, those involved in grain production had little time or energy to spare during the busy spring planting and late summer and autumn harvesting periods.

The remainder of this appendix details the coding of each of the variables of interest and provides a complete listing of the coded political tactics initiated in this case study of the organizational politics which occurred during the course of the Bill 85 initiative.

PART A. CODING PROTOCOL

Coding of Actors

GOVT	Government ministries (eg., BCMAFF), agencies and politicians
ABCOPA	Alliance of B.C. Organic Producers Associations
COABC	Certified Organic Associations of B.C./B.C. Certified Organic Farmers
OFA	Organic Farming Associations/Industry in total
FA	Individual Organic Certifying Associations which were opposed to the Bill 85 initiative
FA*	Individual Organic Certifying Associations which supported the Bill 85 initiative
BCAG	B.C. agriculture sector in general
EXT	External actors, organizations (eg., OCIA, COUP), governments (eg., EEC) outside of B.C. agricultural sector

Coding of Nature of Political Tactics
[as per Frost & Egri, 1991; Howell & Higgins, 1990; and others]

COLL	Collaborative Political Tactic [appeals to high authority for support; reasoning/rational persuasion; bargaining; coalition building; networking; strategic candidates (developing champions); building consensus; framing perspectives; etc.]
COMP	Competitive Political Tactic [budgeting; expertise; rival camps; selective use of objective criteria; rule citing; gatekeeping; assertiveness; insurgency - counterinsurgency; sanctioning; empire building; etc.]

Intended Effect of Political Tactic on Bill 85 Initiative

+	In support of Bill 85 initiative
-	In opposition to Bill 85 initiative

Success/Failure of Political Tactic

S	Political tactic successful as intended
F	Political tactic failed as intended
S/F	Mixed effect (success and failure)

PART B. CODED POLITICAL TACTICS AND EVENTS

[Note that Political episodes are indicated by numbers; Events (external and internal to B.C. agricultural sector) are indicated by letters.]

	ACTORS Initiator	ACTORS Target	NATURE OF OF TACTIC	SUCCESS OF TACTIC	EFFECT ON BCCOF/COABC PROPOSAL INTENDED	EFFECT ON BCCOF/COABC PROPOSAL REALIZED
SPRING 1989						
1. Throne Speech announcement (expansion of power)	GOVT	BCAG	COMP	S	+	+
2. BCMAFF research and meetings re: organic certification (building consensus)	GOVT	BCAG	COLL	S/F	+	+
A. Federal meeting re: national organic certification system						+/-
SUMMER 1989						
3. BCMAFF contacts with organic certifying assns. (networking/rational persuasion)	GOVT	OFA	COLL	S/F	+	+/-
AUTUMN 1989						
4. BCMAFF seminar on organic food marketing (rational persuasion)	GOVT	OFA	COLL	S/F	+	
WINTER 1990						
5. ARDSA govt. grant for Bill 85						-
5a. BCMAFF meets with BCARA (reasoning)	GOVT	FA*	COLL	S	+	
5b. BCARA submits grant application to ABCOPA (appeal to higher authority for support)	FA*	ABCOPA	COLL	F	+	
5c. ABCOPA rejects govt. grant (gatekeeping)	ABCOPA	GOVT	COMP	S	-	
5d. ABCOPA directs BCARA to withdraw from grant (gatekeeping)	ABCOPA	FA*	COMP	S	-	

	ACTORS Initiator	Target	NATURE OF TACTIC	SUCCESS OF TACTIC	EFFECT ON BCCOF/COABC PROPOSAL INTENDED	REALIZED
SPRING 1990						
B. COUP organizes regional meetings						+/-
C. U.S. Organic Foods Production Act						+
SUMMER 1990						
AUTUMN 1990						
6. OCIA attacks on PROPA						+
6a. OCIA solicits PROPA growers for membership (empire bldg.)	EXT	FA*	COMP	F		
6b. OCIA affiliated marketers refuse to recognize PROPA certification (rule citing)	EXT	FA*	COMP	S		
6c. PROPA response to OCIA (resisting empire bldg.)	FA*	EXT	COMP	S		
6d. PROPA lobbies local MLA to approach BCMAFF re: Bill 85 (appeal to higher authority)	FA*	GOVT	COLL	S	+	
WINTER 1991						
7. ABCOPA meeting in January						-
7a. BCMAFF present Bill 85 proposal (rational persuasion)	GOVT	ABCOPA	COLL	F	+	
7b. ABCOPA rejects BCMAFF proposal (gatekeeping)	ABCOPA	GOVT	COMP	S	-	
7c. ABCOPA members to continue work on ABCOPA standards (blocking; gatekeeping)	ABCOPA	OFA	COLL	S/F	-	

	ACTORS Initiator	Target	NATURE OF TACTIC	SUCCESS OF TACTIC	EFFECT ON BCCOF/COABC PROPOSAL INTENDED	REALIZED
8. Two organic assns. start work on Bill 85 proposal						+
8a. BCARA/PROPA coalition bldg.	FA*	FA*	COLL	S	+	
8b. BCARA/PROPA ignore ABCOPA instructions (insurgency; covering up)	FA*	ABCOPA	COMP	S	+	
8c. BCMAFF funds BCARA/PROPA (budgeting)	GOVT	FA*	COLL	S	+	
8d. BCMAFF response to ABCOPA (selective use of objective criteria)	GOVT	ABCOPA	COMP	S	+	
SPRING 1991						
9. ABCOPA meeting re: BCCOF proposal						+
9a. BCARA/PROPA rival camp strategy	FA*	ABCOPA	COLL	F	+	
9b. ABCOPA members confront BCARA/PROPA members (counterinsurgency)	ABCOPA	FA*	COMP	F	–	
9c. BCARA/PROPA assertiveness	FA*	ABCOPA	COMP	S	+	
9d. COPA reps. proposal for compromise solution (building consensus)	FA*	FA*	COLL	F	+	
9e. ABCOPA letter to BCARA/PROPA (counterinsurgency)	ABCOPA	FA*	COMP	F	–	
10. Development of BCCOF proposal						+
10a. BCARA/PROPA (now BCCOF) continue work on proposal (insurgency)	BCCOF	ABCOPA	COMP	S	+	
10b. BCMAFF gives Bill 85 marketing initiatives grant to BCCOF (budgeting)	GOVT	BCCOF	COLL	S	+	
10c. BCMAFF response to ABCOPA (strategic candidates)	GOVT	ABCOPA	COMP	S	+	

	ACTORS		NATURE OF	SUCCESS	EFFECT ON BCCOF/COABC PROPOSAL	
	Initiator	Target	OF TACTIC	OF TACTIC	INTENDED	REALIZED
11. COPA joins BCCOF, stays in ABCOPA						+
11a. COPA support to BCCOF (interlocking directorships)	FA*	BCCOF	COLL	S	+	
11b. Managing rival camps within COPA	FA*	FA	COLL	S/F	+	
12. BCCOF circulates proposal to individual organic assns.						+
12a. BCCOF towards organic assns. (networking; building coalitions)	BCCOF	OFA	COLL	S/F	+	
12b. BCCOF bypasses ABCOPA reps (defending against gatekeeping)	BCCOF	ABCOPA	COMP	S	+	
13. PROPA withdraws from ABCOPA (withholding support)	FA*	ABCOPA	COMP	S	+	
14. ABCOPA proposals for non-govt. system						–
14a. ABCOPA secretary's proposal (reconciling rival camps)	ABCOPA	OFA	COLL	F	–	
14b. ABCOPA Chair's proposal (use of strategic candidates; building consensus)	ABCOPA	ABCOPA	COLL	F	–	
14c. ABCOPA Chair's response to BCCOF (rival camps)	ABCOPA	BCCOF	COMP	F	–	
14d. ABCOPA Chair sends proposal to researcher (developing a champion)	ABCOPA	EXT	COLL	F	–	
SUMMER 1991						
D. EEC regulation for organic certification equivalency						+
15. BCCOF submits proposal to BCMAFF (strategic candidate)	BCCOF	GOVT	COLL	S	+	+

	ACTORS Initiator	ACTORS Target	NATURE OF TACTIC	SUCCESS OF TACTIC	EFFECT ON BCCOF/COABC PROPOSAL INTENDED	EFFECT ON BCCOF/COABC PROPOSAL REALIZED
16. BCCOF/BCMAFF reps. travel to individual organic assns.						
16a. BCCOF networking	BCCOF	OFA	COLL	S	+	+
16b. BCMAFF sponsorship	GOVT	BCCOF	COLL	S	+	
16c. BCCOF response to ABCOPA	BCCOF	ABCOPA	COMP	S	+	
E. COUP stops work due to lack of funds						+
AUTUMN 1991						
17. Progress on BCCOF proposal stalls in BCMAFF due to internal dept. conflicts (budgeting)	GOVT	GOVT	COMP	S/F	+/-	-
F. COUP II starts again						-
18. ABCOPA applies to register name with Ministry of Consumer & Corporate Affairs						+
18a. C&CA consults BCMAFF, then rejects application (networking)	GOVT	GOVT	COLL	S	+	
(gatekeeping/selective use of objective criteria)	GOVT	ABCOPA	COMP	S	+	
18b. ABCOPA appeals decision (reasoning/rational persuasion)	ABCOPA	GOVT	COMP	F	-	
19. PROPA growers issue ultimatum to their executive re: Bill 85 (threat of sanctions)	FA*	FA*	COMP	S	+	+
20. NOOA joins BCCOF (withholding support)	FA*	BCCOF	COLL	S	+	+

WINTER 1992	ACTORS Initiator	ACTORS Target	NATURE OF TACTIC	SUCCESS OF TACTIC	EFFECT ON BCCOF/COABC PROPOSAL INTENDED	EFFECT ON BCCOF/COABC PROPOSAL REALIZED
21. IOPA letters re: sewage sludge in BCCOF standards				?		
21a. letter to BCCOF (assertiveness; reasoning; strategic candidates)	FA	BCCOF	COMP	F	-	
21b. copy to BCMAFF Deputy Minister (appeal to higher authority)	FA	GOVT	COLL	F	-	
21c. copy to ABCOPA members (coalition building)	FA	ABCOPA	COLL	S	-	
21d. copy to West Coast Environmental Law Assn.(WCELA) (appeal to higher authority)	FA	EXT	COLL	?	-	
22. BCMAFF submits BCCOF proposal to B.C. Legislative Council						+
23. ABCOPA contacts WCELA						
23a. asks WCELA to evaluate Bill 85 (use of expertise)	ABCOPA	EXT	COLL	F	-	
23b. WCELA declines due to conflict of interest with prior work for BCCOF/BCARA (expertise)	BCCOF	EXT	COLL	S	+	+
24. ABCOPA Meeting re: Bill 85						
24a. BCARA refuses to compromise (assertiveness)	BCCOF	ABCOPA	COMP	S	+	
24a. ABCOPA forms Steering Ctee. to resolve differences (initiating negotiation)	ABCOPA	BCCOF	COLL	?	+/-	+/-
25. BCCOF Appeals to BCMAFF Minister						+
25a. PROPA sends letter to Minister (appeal to higher authority)	FA*	GOVT	COLL	S	+	
25b. ABCOPA Chair telephones Minister (appeal to higher authority)	ABCOPA	GOVT	COLL	S/F	-	
25c. SOOPA member telephones Minister (appeal to higher authority)	FA	GOVT	COLL	S/F	-	
25d. ABCOPA/SOOPA response to BCCOF (rival camps)	ABCOPA	BCCOF	COMP	S/F	-	
25e. BCARA pres. approaches Minister at LMHIA Course(assertiveness)	FA*	GOVT	COLL	S	+	

	ACTORS Initiator	ACTORS Target	NATURE OF TACTIC	SUCCESS OF TACTIC	EFFECT ON BCCOF/COABC PROPOSAL INTENDED	EFFECT ON BCCOF/COABC PROPOSAL REALIZED +/-
26. ABCOPA Chair's letters re: BCCOF						
26a. to Premier (appeal to higher authority)	ABCOPA	GOVT	COLL	F	-	
26b. to BCMAFF Minister (appeal to higher authority)	ABCOPA	GOVT	COLL	F	-	
26c. to BCMAFF Asst. Deputy Minister (appeal to higher authority)	ABCOPA	GOVT	COLL	F	-	
26d. to Minister of Environment (appeal to higher authority)	ABCOPA	GOVT	COLL	F	-	
26e. tactic towards BCCOF (rival camps; neutralization)	ABCOPA	BCCOF	COMP	S/F	-	
BCCOF's response to letters					+	+/-
26f. letter to ABCOPA Chair (rule citing; assertiveness)	BCCOF	ABCOPA	COMP	F		
26g. copy to ABCOPA member assns. (coalition building)	BCCOF	ABCOPA	COLL	S/F	+/-	
26h. copy to BCMAFF Ministers (appeal to higher authority)	BCCOF	GOVT	COLL	S	+	
26i. sending copies of letter (countering neutralization/ intimidation)	BCCOF	ABCOPA	COMP	S/F	+	
26j. BCARA newsletter account (labelling)	BCCOF	ABCOPA	COMP	S/F	+	
ABCOPA Chair's response to BCCOF						-
26k. letter to BCCOF (assertiveness)	ABCOPA	BCCOF	COMP	S	-	
26l. correspondence to IOPA members (coalition building)	FA	FA	COLL	S	-	
27. B.C. organic agricultural products regulations submitted to Attorney General's office						+
28. NOOA votes to withdraw from ABCOPA (withholding support)	FA	ABCOPA	COMP	S	+	+
29. CCOF asks BCCOF to change name -- name now COABC (rational persuasion)	EXT	BCCOF	COLL	S		+

	ACTORS Initiator	ACTORS Target	NATURE OF TACTIC	SUCCESS OF TACTIC	EFFECT ON BCCOF/COABC PROPOSAL INTENDED	EFFECT ON BCCOF/COABC PROPOSAL REALIZED
G. EEC extends deadline on organic certification equivalency						+
SPRING 1992						
30. April 13 Meeting in Cabinet Chambers						+/-
30a. BCMAFF arranges meeting to resolve differences (building consensus)	GOVT	OFA	COLL	S	+	
30b. ABCOPA-COABC pre-meeting to develop compromise (negotiation)	OFA	OFA	COLL	S/F	+/-	
30c. COABC withdraws commitment to compromise solution (rival camps)	COABC	ABCOPA	COMP	S	+	
31. BCARA vote to withdraw from ABCOPA (sanctioning)	FA*	ABCOPA	COMP	S	+	+
32. Proposals for negotiation						+/-
32a. SOOPA members' proposal (building consensus)	FA	OFA	COLL	F	-	
32b. SOOPA toward BCMAFF(gatekeeping)	FA	GOVT	COMP	F	-	
32c. ABCOPA steering ctee. proposal (building consensus)	ABCOPA	OFA	COLL	F	-	
32d. ABCOPA proposal re: BCMAFF (gatekeeping)	ABCOPA	GOVT	COMP	F	-	
32e. COABC response to ABCOPA (assertiveness)	COABC	ABCOPA	COMP	S	+	
32f. BCMAFF ADM efforts to arrange meeting (building consensus)	GOVT	OFA	COLL	S	+	

	ACTORS Initiator	Target	NATURE OF TACTIC	SUCCESS OF TACTIC	EFFECT ON BCCOF/COABC PROPOSAL INTENDED	REALIZED
33. May 22 Meeting in Vancouver						+
33a. Govt. hires facilitator	GOVT	OFA	COLL	S	+	
33b. B-D Society boycotts meeting (sanctioning/withholding support)	FA	GOVT/COABC	COMP	S	-	
33c. STOPA boycotts meeting (withholding support)	FA	GOVT/COABC	COMP	S	-	
33d. Negotiation of compromise	OFA	OFA	COLL	S	+	
33e. Agreement for govt. to arrange for Independent Legal Assessment (building consensus)	OFA/GOVT	OFA/GOVT	COLL	S	+/-	
33f. ABCOPA/IOPA Chair asks for veto on selection of party to conduct ILA (controlling decision premises)	ABCOPA	GOVT/COABC	COMP	F	-	
33g. COABC Task Force established (coalition building)	OFA	OFA	COLL	S	+	
SUMMER 1992						
34. Country Life in B.C. article about problems in B.C. organics						
34a. COABC statements about opponents (labelling)	COABC	ABCOPA	COMP	S	+	+/-
34b. Impression management with B.C. agriculture sector	COABC	BCAG	COLL	S	+	
35. Chair of ABCOPA steering ctee. contacts researcher (developing a champion)	ABCOPA	EXT	COLL	F	-	
36. Independent Legal Assessment by Rankin supports Bill 85						+
37. ABCOPA files complaint with B.C. Ombudsman(appeal to higher authority)	ABCOPA	GOVT/COABC	COMP	F	-	-
38. COABC task force travels to bioregions re:Bill 85 (networking;rational persuasion)	COABC	OFA	COLL	S	+	+

	ACTORS Initiator	Target	NATURE OF TACTIC	SUCCESS OF TACTIC	EFFECT ON BCCOF/COABC PROPOSAL INTENDED	REALIZED
39. IOPA delegate to COABC Task Force boycotts task force (withholding support)	FA	COABC	COMP	S	–	+/-
AUTUMN 1992						
40. Newspaper articles re: COABC and Bill 85 regulations (impression management)	COABC	EXT/BCAG	COLL	S	+	+
WINTER 1993						
41. COABC presentation at LMHIA Growers Short Course (rational persuasion)	COABC	BCAG	COLL	S	+	+
SPRING 1993						
42. B-D Society selected as provincial representative to COAB						–
42a. B-D Society accepts nomination (making out)	FA	COABC/GOVT	COMP	S	–	
42b. BD rep accepts positions on COAB Board (coalition building)	FA	EXT	COLL	S	–	
42c. BCMAFF/COABC oppose B-D Society nomination (rival camps)	GOVT/COABC	FA	COMP	F	+	
42d. BCMAFF/COABC lobby Minister of AgCanada, COAB for COABC to be prov. rep.	GOVT/COABC	EXT	COLL	F	+	
42e. COAB and AgCanada Minister decline BCMAFF/COABC request (rule citing)	EXT	GOVT/COABC	COMP	S	–	
SUMMER 1993						
43. Organic Agricultural Products Regulations receive royal assent						+

APPENDIX TABLE F-1. SUMMARY OF POLITICAL TACTICS IN SUPPORT OF AND OPPOSED TO BILL 85 INITIATIVE

TIME PERIOD	TOTAL TACTICS NO.	(% COMP.)	TACTICS IN SUPPORT TOTAL	COMP.	COLL.	TACTICS OPPOSED TO TOTAL	COMP.	COLL.
1989								
SPRING	2	(50%)	2	1	1	0	–	–
SUMMER	1	(0%)	1	0	1	0	–	–
AUTUMN	1	(0%)	1	0	1	0	–	–
1990								
WINTER	4	(50%)	2	0	2	2	2	0
SPRING	0	(0%)	0	–	–	0	–	–
SUMMER	0	(0%)	0	–	–	0	–	–
AUTUMN	2	(50%)	2	1	1	0	–	–
1991								
WINTER	7	(57%)	5	3	2	2	1	1
SPRING	17	(53%)	11	6	5	6	3	3
SUMMER	4	(25%)	4	1	3	2	2	0
AUTUMN	7	(71%)	5	3	2	2	2	0
1992								
WINTER	27	(37%)	10	5	5	17	5	12
SPRING	19	(47%)	9	3	6	10	6	4
SUMMER	6	(50%)	3	1	2	3	2	1
AUTUMN	1	(0%)	1	0	1	0	–	–
1993								
WINTER	2	(50%)	2	1	1	0	–	–
SPRING	5	(60%)	2	1	1	3	2	1
TOTALS	105	(47%)	60	26	34	45	23	22

COMP. = Competitive Political Tactic
COLL. = Collaborative Political Tactic

APPENDIX G

GLOSSARY OF TERMS

Active ingredient: The ingredient in a formulated pesticide that destroys or controls a pest, as distinct from other additives such as inerts.

Alternative agriculture: Alternative agriculture is any system of food or fibre production that systematically pursues the following goals: more thorough incorporation of nature processes such as nutrient cycles, nitrogen fixation, and pest-predator relationships into the agricultural production process; reduction int he use of off-farm inputs with the greatest potential to harm the environment or the health of farmers and consumers; greater productive use of the biological and genetic potential of plant and animal species; improvement of the match between cropping patterns and the productive potential and physical limitations of agricultural lands to ensure long-term sustainability of current production levels; and profitable and efficient production with emphasis on improved farm management and conservation of soil, water, energy, and biological resources.

Biological control: The use of natural enemies to control pests, including both classical control with imported natural enemies and augmentation and conservation of natural enemies through the manipulation of the pest host, the environment and/or the enemies themselves.

Biomass: Matter of biological origin, e.g., the living and decaying matter in soil as opposed to the inorganic mineral components.

Biotechnology: the application of scientific and engineering principles to the processing of materials by biological agents to provide goods and services.

Cell and tissue culture: A biotechnology technique used to regenerate plants from single cells. Used to propagate and regenerate whole plants from tissues, isolated plant cells and even protoplants (plant cells with their cell wall removed) in culture.

Cell fusion: A biotechnology technique by which two different cells, each having some useful functions, are fused together artificially to create a new cell having merits of the parent cells. This technique can be used to transfer genes that are otherwise difficult to identify, isolate and clone, or in cases where polygenic traits are to be transferred. Also, it can be used in cases where plants are sexually incompatible.

Chemical control: The use of a pesticide to control a pest.

Clean tillage: Cultivation of a field so as to cover all plant residues and to prevent the growth of all vegetation except the particular cop desired.

Compost: the fertilizer resulting from the decomposition of a mixture of organic matter, including plant material and manure.

Conservation tillage: Any tillage system that reduces loss of soil or water compared to unridged or clean tillage.

Conventional tillage: the combined primary and secondary tillage operations normally performed in preparing a seedbed for a given crop grown in a given geographical area.

Cover crop: A close-growing crop grown primarily for the purpose of protecting and improving soil between periods of regular crop production or between trees and vines in orchards and vineyards.

Crop yield: The amount of a crop harvested, commonly expressed in bushels or other units per acre.

Cropland: Land used primarily for the production of adapted, cultivated, close-growing fruit or nut crops for harvest, along or in association with such crops.

Crop residue: The portion of a plant or crop left in the field after harvest.

Crop residue management: Use of that portion of the plant or crop left in the field after harvest for protection or improvement of the soil.

Crop rotation: Growing different crops in recurring succession on the same land.

Cultivation: to mechanically loosen or break up soil between the rows of growing crops, uproot weeds, and aerate the soil.

Cultural pest control: Pest control practices that generally refer to physical or mechanical changes in an agricultural method. These may include clearing crop residue soon after harvest, crop rotations, clearing weds from the field borders, change sin irrigation, or altering the timing or way of planting.

Ecosystem: A system made up of a community of animals, plants and bacteria and its interrelated physical and chemical environment.

Environment: Surroundings, including water, air, soil and their inter-relationships, as well as all relationships between them and any living organisms.

Erosion: (1) The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep. (w) Detachment and movement of soil or rock fragments by water, wind, ice, or gravity.

Eutrophication: The process by which a body of water becomes rich in nutrients. This can happen naturally or by human activity, usually in the form of industrial of municipal wastewater or agricultural runoff.

Fallow: allowing cropland to lie idle, either tilled or untilled, during the whole or greater portion of the growing season.

Fertilizer: Any organic material of natural or synthetic origin that is added to a soil to supply elements essential to plant growth.

Fixed costs: Costs of production that generally do not change as a result of the volume or type of crop produced. Fixed costs include insurance, rent or land mortgage payments, interest, and machinery depreciation.

Gene transfer: The process of moving a gene from one organism to another. Current biotechnology methods permit the identification, isolation, and transfer of individual genes as a molecule of DNA. These methods make it possible to transfer genes between organisms that would not normally be able to exchange them.

Green manure: The use of leguminous crops as a source of nitrogen when they are plowed into a field.

Groundwater: Supplies of water below the ground, usually in aquifers.

Herbicide: A chemical substance used for killing plants, especially weeds.

Inorganic: Composed of matter that is not animal or vegetable, generally derived from mineral sources and not containing carbon (such rock fertilizers).

Inorganic insecticides: Formerly the most commonly used class of insecticides, they generally have been replaced by synthetic organic compounds because of problems posed by their persistence, relative ineffectiveness and high toxicity to mammals.

Inputs: Items purchased to carry out a farm's operation. Such items include fertilizers, pesticides, seed, fuel, and animal feeds and drugs.

Insect: Any of a large class of small anthropod animals (including beetles, bees, flies, wasps and mosquitoes) characterized, in the adult state, by division of the body into head, thorax and abdomen, three pairs of legs on the thorax, and usually, two pairs of membranous wings. Does not include mites and ticks.

Integrated pest management (IPM): A pest control strategy based on the determination of an economic threshold that indicates when a pest population is approaching the level at which control measures are necessary to prevent a decline in net returns. In principle, IPM is an ecologically based strategy that relies on natural mortality factors, such as natural enemies, weather, and crop management, and seeks control tactics that disrupt these factors as little as possible.

Intensive cropping: Maximum use of the land by means of frequent succession of harvested crops.

Interplanting: (1) In cropland, the planting of several crops together on the same land -- e.g., the planting of beans with corn. (2) In orchards, the planting of farm crops among the trees.

Irrigation: Application of water to lands for agricultural purposes.

Method: A systematic way to accomplish a specific farming objective by integrating a number of practices.

Minimum tillage: Limiting the number of soil-disturbing operations to those that are properly timed and essential to produce a crop and prevent soil damage.

Monoculture: Raising crops of a single species, generally even-aged.

Mulch tillage: Soil tillage that employs plant residues or other materials to cover the ground surface.

Nematode: Any of a plant subkingdom of worms, often parasites of animals and plants, with long, cylindrical unsegmented bodies.

Nitrogen fixation: The chemical transformation of atmospheric nitrogen (N2) into forms available to plants for growth.

Nonpoint pollution: Pollution whose sources cannot be pinpointed; can best be controlled by proper soil, water, and land management practices.

Nonselective insecticide: Has a wide spectrum of action, showing little discrimination in its effects on nontarget organisms.

Nonselective herbicide: A herbicide which kills all plants. Used to remove all weeds before planting or to clear areas of vegetation.

No-tillage: A method of planting crops that involves no seedbed preparation other than opening the soil for the purpose of placing the seed at the intended depth. There is usually no cultivation during crop production. Chemical weed control is normally used.

Organic matter: Living biota present in the soil or the decaying or decayed remains of animals or plants. The living organic matter in the soil decomposes the dead organic matter. Organic matter in soil increases moisture and soluble nutrient retention, cation exchange, and water infiltration and can reduce soil erosion.

Organochlorine insecticides: The first and most widely known class of synthetic organic insecticides. They have high insecticidal activity, low cost and great resistance to degradation. However, there have been problems with insect resistance, bioaccumulation and environmental persistence and contamination. Although they generally do not have extremely high acute toxicity, they do cause serious chronic effects (including reproductive problems and tumors). There are three groups: chlorinated hydrocarbons (e.g., DDT), cyclodienes (e.g., heptachlor/chlordane, toxaphene, aldrin, dieldrin and endrin, and pentachorophenol), and hexachlorocyclohexane (lindane/HCH).

Organophosphate insecticide: A class of insecticides first developed from World War II nerve gas research, they tend to be more toxic, much more biodegradable and less subject to bioaccumulation than organochlorines. However, organophosphate use has led to insect resistance, extensive damage to natural insect enemies and a dramatic rise in poisonings, due to their extreme toxicity. Includes parathion, malathion and dichlorvos, among others.

Output: A marketable product of a farming operation, such as cash crops, livestock products, or breeding stock.

Pathogen: Any microorganism or virus that lives and feeds (parasitically) on or in a larger host organism and thereby injures it.

Permeability, soil: The quality of a soil horizon that enables water or air to move through it.

Pest: An organism (insect, mite, weed, fungus, disease, animal, tc.) that humans wish to control or eliminate for any of a number of reasons, including possible harm to crops, animals (including humans) or structures.

Pesticide: An umbrella term used to describe any substance intended for preventing, destroying or controlling any pest. Pesticides are generally classed by the type of pest they control: insecticide (insects), herbicide (weeds), fungicide (fungus), rodenticide (rodents), nematicide (nematodes), acaricide (mites, ticks and spiders), etc. Some are also defined by their method of application (fumigant) or mode of action (ovicide). It also includes substances intended for use as a plant growth regulator, defoliant, desiccant, fruit thinning agent, an agent to stop premature fruit fall or a substance applied to protect commodities from deterioration during storage and harvest.

Pesticide treadmill: The situation triggered by pesticide use in which increasing amounts of stronger and stronger pesticides must be used to combat the effects of pesticide resistance, pest resurgence and secondary pest outbreaks.

Pest management: The manipulation of pest or potential-pest populations so as to diminish their injury or render them harmless.

Plant biotechnology: The development of new, exploitable biological and biochemical methods for the control and genetic alteration of plant development, especially at the cellular and molecular levels.

Polyculture: Growing more than one crop on the same land in one year, or growing two or more crops simultaneously. Variations include multiple cropping, intercropping, interculture, and mixed cropping.

Recombinant DNA techniques: A fundamental tool in the sciences of genetic engineering and molecular biology. In essence scientists identify a particular gene, one that encodes for the desired trait, and isolate it. They then study the structure, function and regulation of the gene, perhaps modify and reintroduce it into the natural host or another organism. The researcher transfers the isolated gene to the new host by means of a 'vector' such as a virus, plasmid or mobile DNA segment.

Reduced tillage: A tillage sequence designed to reduce or eliminate secondary tillage operations.

Residue: The quantity of an agricultural chemical, usually expressed in parts per million (p.p.m.), either in or on plants or animals at the time of testing. The term includes any derivatives, such as conversion products, metabolites, reaction products or impurities considered to be of toxicological significance.

Resistance: The ability of a living organism to survive the disruption of life processes brought about by pesticides, disease, etc., which would normally cause the death of other similar organisms. Repeated chemical exposures create a genetically selected tolerance to pesticides.

Resurgence: the increase in a pest population after it is freed from natural controls, most commonly following the application of a pesticide that destroys its natural enemies.

Risk: The expected frequency of undesirable effects arising from exposure to a pesticide. Also refers to the chance of loss associated with a particular farming practice.

Secondary pest outbreak: The phenomenon in which an insect that was formerly a minor pest becomes a primary pest after pesticides are applied that destroy its natural enemies and allow its population to grow unchecked.

Selective herbicide: A pesticide intended to kill only certain types of plants, especially broad-leafed weeds, and not harm other plants such as farm crops or lawn grasses.

Selective insecticide: Kills only target insect pests.

Soil amendment: any material, such as lime, gypsum, sawdust, or synthetic conditioner, that is worked into the soil to make it more amenable to plant growth.

Soil conditioner: Any material added to a soil for the purpose of improving its physical condition.

Soil conservation: Using the soil within the limits of its physical characteristics and protecting it from unalterable limitations of climate and topography.

Soil-conserving crops: Crops that prevent or retard erosion and maintain or replenish rather than deplete soil organic matter.

Soil-depleting crops: Crops that under the usual management end to deplete nutrients and organic matter in the soil and permit deterioration of soil structure.

Stubble: The basal portion of plants remaining after the top portion has been harvested.

Stubble mulch: The stubble of crops or crop residues left essentially in place on the land as a surface cover during fallow and the growing of a succeeding.

Synthetic: Produced by a chemical or artificial synthesis rather than of natural origin.

System: The overall approach used in crop or livestock production, often derived from a farmer's goals, values, knowledge, available technologies, and economic opportunities. A farming system influences the choice of methods and practices used to produce a crop or care for animals. Farming systems entail a combination of methods to accomplish farming operations. conventional and alternative systems may use common practices or methods, but they usually differ in overall philosophy.

Systemic pesticide: A pesticide that is absorbed within a plant system and distributed throughout the plant and fruit.

Tillage: The operation of implements through the soil to prepare seedbeds and root beds.

Toxicity: The physiological or biological property which determines the capacity of a chemical to do harm, with the unit of measurement generally in terms of milligrams of chemical pr kilogram of body weight of the organism under test.

Variable costs: The portion of total cash production costs used for inputs needed to produce a specific yield of a specific crop. Variable costs typically include fertilizers, seed, pesticides, hired labour, fuel, repairs, and animal feed and drugs.

Weed: An ordinary plant in a place where it is not wanted by humans.

Sources: Canter (1986); Gips (1987); Katz (1989); National Research Council (1989).