AN EVALUATION OF BRITISH COLUMBIA'S AGRICULTURAL PESTICIDE REGULATIONS

by

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ABSTRACT

Some scientists and industry observers are calling into question the sustainability of continued reliance on pesticides in agriculture, not only because of their toxicity to humans and the environment, but because pesticides enable the continuation of a system of agriculture that is ultimately unsustainable.

Recognizing problems of pesticide misuse in British Columbia agriculture, the provincial government passed amendments to its Pesticide Control Act Regulations in 1988. This regulatory initiative provided me with an opportunity to examine pesticide regulation in British Columbia agriculture.

My purpose was to evaluate pesticide regulation in British Columbia on two levels. First, I assess the extent to which British Columbia's amended pesticide regulations address current problems of unsafe handling and improper use of pesticides in British Columbia agriculture. Second, I examine pesticide use within a larger framework of sustainable agriculture and discuss policy approaches that could promote a shift away from reliance on pesticides in British Columbia agriculture.

A review of literature revealed that a range of factors exacerbates the risks associated with pesticide use in agriculture, including insufficient training of farmers and farmworkers, lack of knowledge of English, functional illiteracy, and the absence of a rigorous enforcement program.

The amendment to the Pesticide Control Act Regulation of greatest significance to the agriculture industry is one which requires growers to pass a certification examination in order to purchase and apply restricted pesticides on their own farms;
this requirement took effect in January 1992. This requirement was intended to mitigate factors contributing to pesticide misuse noted above. Prior to this requirement, growers and farmworkers were able to use restricted pesticides with no training whatsoever. In preparation for the certification exam, growers receive a home study course with an instructional video and practice exams. This course is available in English only. Users of commercial class pesticides are exempt from the certification requirement.

In order to place the evaluation of the new regulations in a wider context, I surveyed the following jurisdictions to determine what other approaches have been taken to pesticide regulation: Canadian provinces and territories, the states of Washington, Oregon and California, and the U.K.

An evaluation of British Columbia's certification program revealed several factors that will limit its success in achieving its goal of improving safe pesticide practice. These include: the exemption of the large class of commercial pesticides; the absence of on-site training; the lack of training for growers in how to train their employees in safe practice; the absence of course and exam materials in minority languages; the lack of additional staff to enforce and monitor the new regulations; the lack of a formal evaluation plan to determine the success of the new program. I include recommendations as to how these issues can be addressed. I urge policy makers to address two issues outside the scope of the certification program that will assist greatly in achieving improved pesticide practice: implementation of mandatory
occupational health and safety coverage for agriculture and improved pesticide labels.

Finally I present policy options that would promote a shift away from reliance on pesticides in agriculture, based on experience of other jurisdictions, and on recommendations of industry observers. These include mandated reductions in overall pesticide use, as adopted in Denmark, Sweden and Holland; and the imposition of pesticide purchase taxes. I conclude that, based on the sustainable agriculture literature, significant reductions in pesticide use can only be achieved if whole agricultural systems are redesigned to encompass ecological imperatives and that for sustainability, policy makers must address the system of agriculture, not just the subsystem of pest control.
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<td>B.C. Federation of Agriculture</td>
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<td>BCMAFF</td>
<td>B.C. Ministry of Agriculture, Fisheries and Food</td>
</tr>
<tr>
<td>BCMELP</td>
<td>B.C. Ministry of Environment, Lands and Parks</td>
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<tr>
<td>CFU</td>
<td>Canadian Farmworkers Union</td>
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<tr>
<td>IPM</td>
<td>Integrated Pest Management</td>
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<td>PCP Act</td>
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<td>WCB</td>
<td>Worker's Compensation Board</td>
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<td>WHMIS</td>
<td>Workplace Hazardous Materials Information System</td>
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AN EVALUATION OF BRITISH COLUMBIA'S AGRICULTURAL PESTICIDE REGULATIONS

CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND

Currently pesticide use in British Columbia agriculture is largely unmonitored (Deloitte Haskins and Sells 1988). Given that agriculture employs 75 percent of all pesticides used in British Columbia, and at an application rate up to 35 percent higher than the national average (Eaton 1983), this regulatory gap has become a focus of concern.

Because of the inherent toxicity of pesticides and their widespread release into the environment, Kansky (1990) asserts that pesticide use in British Columbia must be discussed within a framework of sustainable development. She applies two broad principles to pesticide use. First, risk of harm to human health and the environment from pesticides must be minimized. This principle relates directly to evidence that the level of knowledge of pesticide mixing, application and disposal among British Columbia farmers and farmworkers is generally insufficient to ensure an acceptable standard of safety for farmers, farmworkers, consumers or the environment (Moses 1988; Deloitte Haskins and Sells 1988; Oja et al. 1990; Deol Agricultural Education and Research Society 1986).

Second, Kansky argues that there must be a reduction of pesticide use over time. This contention is based on the premise that introducing large quantities of pesticides into the environment each year threatens ecosystem balance (Kansky 1990).

Other observers suggest that continued reliance on pesticides
contributes to the continuation of an agricultural system that is inherently unsustainable for other reasons. These analysts associate intensive, industrial agriculture with problems such as reliance on non-renewable resources, simplified agri-ecosystems (monoculture cropping), loss of genetic diversity and depleted soil resources (Boerma 1984; Altieri 1989; Jackson and Piper 1989; Kneen 1989; Hill 1990; Sandborn 1990).

The principal legislation governing the use of pesticides in British Columbia is the Pesticide Control Act under the administration of the Ministry of Environment, Lands and Parks. In 1988, the British Columbia Government passed amendments to the Pesticide Control Act Regulation. The amendment of greatest significance to the agriculture industry is that which requires growers to pass a certification exam in order to purchase and apply 'restricted' pesticides on their own farms. This requirement took effect in January 1992.

I took this regulatory initiative as an opportunity to evaluate the effectiveness of pesticide regulation in British Columbia agriculture.

1.2 PURPOSE AND OBJECTIVES

I examine pesticide regulation in British Columbia on two levels. First, I assess the extent to which British Columbia's amended pesticide regulations address current problems of unsafe handling and improper use of pesticides in British Columbia agriculture by evaluating both the substance and implementation of these new regulations. Second, I examine pesticide use within a larger framework of sustainable agriculture and discuss
policy approaches that could promote a shift away from reliance on pesticides in British Columbia agriculture.

The main research questions are:

1. What is the evidence of pesticide-related problems in British Columbia agriculture and what factors contribute to these problems?

2. What are the recent amendments to British Columbia's pesticide regulations and will they address the issues identified in (1) above?

3. Are agricultural systems that rely on chemical pesticides sustainable in the long term?

4. Can the sustainable agriculture literature and experience in other jurisdictions inform the policy process in British Columbia with respect to minimizing reliance on pesticides in agriculture?

1.3 THE PROBLEM

Pesticides present particular challenges to policy makers in that they are an anomaly amongst an array of toxic chemicals produced by our society. They are not viewed as toxic wastes whose escape into the environment is accidental, warranting penalties and strict clean-up procedures. Rather, they are deliberately released into the environment and the focus of regulations is on control of their legal use. As Schrecker (1984, p. 2) notes, "eliminating their release to the environment, as a basic principle of toxic substances control, is of limited relevance in the case of pesticides."

Modern agriculture has become heavily dependent on chemical pesticides since DDT and related compounds first became commercially available in the 1940s.¹ The rapid and widespread

¹Pesticides (including arsenic compounds and plant-derived insecticides) were used in agriculture before the 1940s. However, DDT and related compounds allowed a level of pest control that had been previously unattainable. The synthetic
adoption of pesticides was due to their relatively low cost and initial effectiveness; farmers were quick to abandon traditional pest control strategies in favour of pesticides (Perkins 1985).

1.3.1 Pesticides: human and environmental health concerns

Many observers note that the pesticide registration process has historically required minimal data on risks to human and environmental health (Hall 1981; Ontario Task Force on Health and Safety in Agriculture 1985; O'Brien 1986). Both the Canadian and U.S. governments are conducting reviews of registered pesticides based on new standards for human and environmental health effects. Due to the sheer number of products involved, these reviews are expected to extend well into the twenty-first century (Castrilli and Vigod 1987; U.S. General Accounting Office 1986).

Pesticide use practices in British Columbia agriculture began to attract public attention after the fatal poisoning of Fraser Valley farmworker Jarnail Deol in 1982. Subsequently, several studies of health effects of pesticides on Fraser Valley farmers and farmworkers have been completed. The results of these studies indicate that improper handling of pesticides may be widespread in the industry. Similarly, recent federal studies indicate that pesticide contamination of groundwater is cause for concern in some British Columbia farming communities.

British Columbia's policy makers face complex and often competing public and private interests regarding pesticides. Over the last decade, various groups have called for tighter pesticides introduced in the 1940s revolutionized pest control (Perkins 1985).
regulation of pesticide use in agriculture, including the Canadian Farmworkers Union, the British Columbia Federation of Labour, the B.C. Medical Association, and the West Coast Environmental Law Association. British Columbia's farmers maintain that access to a full range of pest control products is necessary to provide a "reliable supply of cheap, attractive food" (B.C. Federation of Agriculture 1989). However, they have "personal and professional concerns about pesticide safety" (B.C. Federation of Agriculture 1989), as well as a desire to avoid cases of pesticide misuse as the public outcry that surrounds these events has served to further limit access to what growers believe is an already inadequate range of pesticides (B.C. Federation of Agriculture 1989).

Prior to January 1992, no training was required of growers purchasing and applying all but the most toxic of pesticides on their own farms; currently growers applying any of hundreds of 'commercial-class' pesticides require no training. Enforcement of pesticide regulations on British Columbia farms is primarily passive. Further, as a result of lobbying efforts of the B.C. Federation of Agriculture, Occupational Health and Safety Regulations of the Workers' Compensation Board do not apply to agriculture. Pesticide handling guidelines for the industry are not legally enforceable.

The recent amendments to the Pesticide Control Act Regulation (which took effect January 1992) were introduced to address problems of pesticide misuse and improper handling through a grower certification program. I evaluate this action in the first part of this thesis.
1.3.2 Pesticides and sustainable agriculture

In the second part, I address the broader question of the role of pesticides in sustainable agriculture. There are several aspects to this question. First, the production and application of pesticides requires "massive utilization of energy and non-renewable resources" (Sandborn 1990; p. 1). Daly and Cobb (1989) raise serious concerns about the reliance of modern agriculture on fossil fuels and predict a collapse of the entire system within the next 40 years if significant changes are not made.

Second, the widespread adoption of pesticides was concurrent with a fundamental shift in agricultural practice (Perkins 1985). Practices of crop diversity, crop rotation and sanitation were replaced with monoculture and reliance on massive inputs of energy, synthetic pesticides and fertilizers (Perkins 1985; Pimentel et al. 1991). Once cultural practices were abandoned, the need for pesticides escalated; a 'pesticide treadmill' was established. Agriculture policies in Canada and the U.S. tended to encourage this shift to 'intensive' agriculture.

There is growing evidence that a reverse shift in agricultural practice, one that significantly reduces reliance on pesticides and other inputs, can provide agricultural, ecological and economic benefits (Pimentel et al. 1991). Reports indicate that, contrary to earlier industry predictions, alternate farming systems are economically viable on both large and small scale farms (MacRae et al. 1989; U.S. National Research Council 1989; Francis 1990).
Other jurisdictions are taking steps to promote this shift away from reliance on pesticides in agriculture. Sweden, Denmark and the Netherlands, for instance, have adopted policy to reduce pesticide use by 50 percent within 10 years.

Both the quantity and variety of pesticides used in British Columbia are increasing (B.C. Ministry of Environment 1991). Given the issues raised above, the final chapter addresses the question: how can the sustainable agriculture literature and the experience in other jurisdictions inform the policy process in British Columbia with respect to minimizing reliance on pesticides in agriculture?

1.4 METHODS

In order to understand the substantive changes to British Columbia's pesticide regulations and the process followed in their implementation, I interviewed representatives of the B.C. Ministry of Environment, Lands and Parks' Pesticide Control Branch, the B.C. Federation of Agriculture, the B.C. Ministry of Agriculture and Fisheries, and the Workers' Compensation Board. Relevant federal and provincial legislation was reviewed in order to understand the basis of British Columbia's regulatory authority over pesticides.

A profile of the problems associated with pesticide use in British Columbia agriculture was developed in part through the interviews mentioned above and interviews with other non-governmental interest groups. A review of a variety of published and unpublished reports contributed valuable information to this profile; many of these reports were found in the libraries of the parties mentioned above. These sources
enabled me to identify many of the factors that contribute to pesticide use problems in British Columbia agriculture.

The evaluation of British Columbia's new grower certification program is based on an analysis of the extent to which these regulations would mitigate the factors identified as contributing to pesticide misuse.

To determine the approach taken by other jurisdictions to pesticide regulation in agriculture, a letter requesting information on training, certification and enforcement was sent to appropriate officials in all nine provinces and the two territories. Letters were also sent to the states of Washington, Oregon, California, and to the U.K. These letters were followed up by telephone interviews in some cases.²

The discussion of pesticides and sustainable agriculture presented in Chapter Six is based on a review of literature addressing sustainable agriculture. Special attention was given to several new journals that focus on ecological agriculture. Publications of the Canadian Environmental Network's Pesticide Caucus and the West Coast Environmental Law Association also informed this discussion. Information on initiatives taken by other jurisdictions with respect to minimizing pesticides in agriculture was found in the literature.

1.5 ORGANIZATION OF THE THESIS

Chapter Two presents an elaboration of the problem addressed by the thesis. That is, what are the problems associated with pesticide use in agriculture such that a review of regulations

²See Appendix One for a list of persons contacted.
is warranted? This chapter raises both issues that apply generally to agriculture and issues specific to the industry in British Columbia.

Chapter Three presents the history of pesticide regulation in British Columbia and outlines the present regulatory framework. Details of recent amendments to the Pesticide Control Act Regulation are presented with emphasis on the grower certification program.

In Chapter Four a summary of approaches taken by other jurisdictions to similar regulatory challenges is presented.

In Chapter Five, British Columbia's new certification program is evaluated. The extent to which the new program will address problems with pesticide handling (as outlined in Chapter Two) is assessed. Recommendations to mitigate outstanding problems are presented.

Chapter Six presents a review of the sustainable agriculture literature as it relates to pesticides. Initiatives taken by other jurisdictions with respect to minimizing pesticides in agriculture are presented for consideration by those involved in developing agricultural pesticide policy in British Columbia. The need to redesign entire agricultural systems, not just the subsystem of pest control, in order to achieve sustainability is discussed.

1.6 SCOPE OF THE THESIS

The federal government recently completed an extensive review of the Pest Control Products Act through a nation-wide consultative process. Recommendations in the final report of the Pesticide Registration Review Team are wide ranging; some
have direct implications for pesticide use in British Columbia agriculture. This thesis does not include a detailed assessment of the national review; reference is made only to those recommendations that pertain to pesticide regulation at the provincial level.

The Ministry of Environment released its strategic plan Environment 2001 in August 1991. The Ministry simultaneously released the five year plan for the Pesticide Management Branch, New Directions in Pesticide Management. This strategic plan is not analyzed in detail in this thesis as much of my research preceded its release. The overall direction outlined in the strategic plan receives only general comment in the final chapter.

1.7 DEFINITION OF TERMS

Pesticide

The term "pesticide" generally applies to any compound or agent designed to destroy, prevent, repel or otherwise control a pest. This standard definition of pesticide is problematic as it lumps synthetic chemical compounds with plant-derived compounds, microbials and biological controls. For the purposes of this thesis, the term pesticide refers primarily to toxic, synthetic compounds. I recognize that plant-derived compounds, microbials and biological controls share the same purpose as synthetic chemicals and that they have the potential to alter ecosystems. However, as these control agents comprise only a

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3For example, the bacterial insecticide, Bacillus thuringiensis kurstaki (Btk), is widely used to control caterpillars. Btk is included on the provincial Ministry of Environment, Lands and Parks' list of restricted pesticides.
small fraction of pesticides used, they are excluded from the
definition of pesticide in this thesis.

**Pest**

The term "pest" is not applied to organisms as a biological
classification, but is applied to organisms as a judgement based
on human values. An organism is deemed a pest if it competes
with humans for resources, inflicts disease or causes any other
undesired impact. In agriculture, a pest is generally one of
the following: insect, mite, weed, fungus, bacteria, virus,
nematode, rodent.
CHAPTER TWO

PESTICIDES IN AGRICULTURE:
HUMAN AND ENVIRONMENTAL HEALTH CONCERNS

2.1 CHAPTER OVERVIEW

This chapter is an elaboration of the first main problem addressed by this thesis. That is, what is the evidence that pesticide use in agriculture poses environmental and human health risks such that a review of regulations is warranted? Problems with pesticide use in agriculture are discussed first in general terms; an outline of problems specific to British Columbia agriculture follows.\(^1,\)\(^2\)

2.2 HUMAN AND ENVIRONMENTAL HEALTH CONCERNS: GENERAL

Pesticides in agriculture pose particular challenges to policy makers in that they are an anomaly amongst toxic chemicals: "...pesticides are the one class of chemicals that are designed to be toxic and generally dispersed into the environment..." (Canadian Environmental Network Pesticide Registration Review Caucus 1990, p. 2).

Use of synthetic pesticides in agriculture has shown a substantial escalation since they first became commercially available in the 1940s. In the U.S., use of synthetic pesticides has increased 33-fold since 1945; U.S farmers currently apply 434 million kilograms of pesticides annually.

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\(^1\) I am not implying here that pesticide use in agriculture is without benefits. However, as our current food producing systems continue to rely on pesticides, this chapter raises issues that warrant recognition as appropriate public policy is contemplated.

\(^2\) Table One presents a summary of evidence for, and contributing factors of, pesticide misuse in B.C. agriculture.
(Pimentel et al. 1991). Canadian farmers more than doubled annual expenditures on pesticides in the four years from 1975 to 1979. Although pesticide applications have been reduced in certain crops due to such factors as improved pesticide delivery systems and integrated pest management programs (IPM), the agriculture industry continues to rely heavily on synthetic pesticides. Given this continued reliance on pesticides, several issues deserve the attention of policy makers.

2.2.1 Incomplete data on human health effects

Though many of the "problem pesticides" that gained notoriety in the 1960s (highly persistent pesticides such as DDT) have been banned, they have been replaced by an ever-broadening range of products "whose health and environmental effects may be more subtle, but no less critical" (Castrilli and Vigod 1987, p. 123). Chronic effects of the less acutely toxic pesticides are of particular concern. Long term health effects of continual exposure to low doses of pesticides are poorly understood (Ontario Task Force on Health and Safety in Agriculture 1985). It is more difficult yet to determine the effects of exposure to several pesticides in combination (Hall 1981). O'Brien, a U.S. pesticide policy expert, (1986, editorial page) concurs:

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3 Current statistics on pesticide use in Canadian agriculture are not readily available as distributors are not required by law to make this information public (Edwards 1991). Statistics Canada discontinued its annual pesticide sales surveys in 1977 (Kansky 1990).

4 Reduction in pesticide use overall is difficult to assess as many pesticides are now formulated to toxicity levels at least ten-fold higher than compounds produced 40 to 50 years ago (Pimentel et al. 1991).
"When pesticide users or regulators, public or private, quantify the risk associated with exposure to a pesticide...they are ignoring the limitations of their information base...Practically no testing exists on the toxic effects of mixtures of pesticides or of pesticides and other chemicals encountered daily in the environment. Some of these mixtures can be expected to be particularly potent."

The U.S. National Research Council (1989, p. 126) observes that "(t)he two major problems facing policy makers attempting to regulate pesticides are the lack of data on the health hazards of pesticides and a lack of accurate exposure data."

Over time, the U.S. and Canadian governments have developed more stringent data requirements for federal registration of pesticides. The U.S. Environmental Protection Agency is currently reviewing the registration of older pesticides based on new data requirements for health and environmental effects. It is estimated that the EPA's reassessment process will extend into the 21st century, as over 600 active ingredients and over 50,000 individual control products are subject to review (U.S. General Accounting Office 1986). Agriculture Canada is also reviewing currently registered pesticides. It is estimated that the review of all active ingredients will take between 37 and 55 years to complete (Castrilli and Vigod 1987). It is not government policy to remove pesticides from the market as they await review (Hall 1981; Castrilli and Vigod 1987).

2.2.2 Farmer and farmworker poisonings

Worldwide, agricultural pesticides account for substantial numbers of human poisonings each year. The World Health Organization has estimated that one person per minute is poisoned by agricultural chemicals in underdeveloped countries (Wier and Schapiro 1981). A U.S. report quotes an
epidemiologist's findings that over 300,000 U.S. farmworkers are made ill each year by pesticides (Wasserstrom and Wiles 1985). Pimentel et al. (1991, p. 706) report different figures for U.S. agriculture:

"Annually about 45,000 accidental poisonings occur, with 3,000 cases serious enough to cause hospitalization. In addition, these poisonings result in about 50 fatalities per year. Pesticides are also implicated in numerous other human diseases, including cancer and sterility from both the application and other contacts with pesticides. An estimated 20,000 humans are afflicted with pesticide-induced cancer."


The extent of human poisonings by pesticides in Canada is difficult to assess due to inconsistent record keeping and difficulties in diagnosing such poisonings. In 1985, the National Research Council of Canada launched a study into the epidemiological evidence of the effects of pesticides on human health only to find no inventory of pesticide use in Canada and

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5Pimentel et al. (1991) present a preliminary list of the external costs associated with pesticide use in the U.S. They conclude that if the U.S. were to reduce chemical pesticide use by 50 percent, the additional costs of implementing nonchemical alternatives would be offset by reduced environmental and public health costs. Their conclusions are discussed further in Chapter Six.
incomplete records at both hospitals and workers' compensation boards (Roberts et al. 1985). This situation is parallel to that in the U.S. The U.S. National Research Council (1989, p. 122) reports that there is "no systematic monitoring of the health or exposure to pesticides of the more than two million farmworkers, applicators, harvesters, irrigators, and field hands who work around pesticides."

2.2.3 Environmental contamination

Nicol and Heady (1977, p. 334) describe the nature of environmental contamination by pesticides:

"Pesticides pose a unique problem owing to their inherent toxic properties. They become a pollutant when they remain in the environment after their desired purpose has been accomplished or when they reach other than their intended target. The pollution characteristics of pesticides vary depending on their persistence at toxic levels and on their toxicity to non-target organisms -- in most cases the environmentally desirable organisms sharing the ecosystem with the target group."

The hazards of environmentally persistent pesticides such as DDT are widely recognized. Rachel Carson's 1962 book Silent Spring served to popularize the issue of pesticide accumulation in the food chain and resultant losses of peregrine falcons and other raptors. DDT and its close cousins have been banned from food production in Canada and the U.S., but the range of pesticides still in use continue to threaten the environment in a variety of ways.

Pesticide leaching into groundwater has become a serious problem in some agricultural districts in Canada and the U.S. A study of 351 wells in southwestern Ontario revealed that half were contaminated with pesticides (Kansky 1990). The U.S. National Research Council (1989, p. 105) reports that pesticides
have been detected in the groundwater of 26 states "as a result of normal agricultural practices." Pimentel et al. (1991) note that just monitoring wells and groundwater for pesticide contamination in the U.S. costs $1.2 billion annually.

Honey bee poisoning is of particular concern due to lost crop pollination and honey production. Aerial spraying of corn crops in Quebec in 1980 killed millions of honey bees; this occurred the following year in Ontario (Castrilli and Vigod 1987). The estimated annual cost to the U.S. economy of honey bee poisoning by pesticides is $150 million; the annual cost of fish and wildlife losses due to pesticides is estimated at $15 million (Pimentel et al. 1991).

Hall (1981, p. 36) summarizes his concern about the inadequate environmental review of pesticides registered in Canada:

"If environment safety protocols were added to the list, it is doubtful that very many, if any, candidate pesticides would pass. Moreover, if the 405 currently registered pesticides were subjected to proper environmental studies, most would likely have to be withdrawn. In brief, most pesticides in Canada arrived on the market because Environment Canada did not do its job" (my emphasis).

2.2.4 Pest resistance and loss of predators and parasites

It is clear that pesticides have altered the ecology of many insect, plant and fungus species such that pest problems are exacerbated. First, regular pesticide applications can lead to pesticide resistance. The U.S. National Research Council (1989) reports that 440 insect and mite species and more than 70 fungus species are known to be resistant to certain pesticides. Second, natural predators and parasites of pests are killed by broad-spectrum pesticides, causing secondary outbreaks which require further pesticide treatment.
As farmers began substituting pesticides for traditional methods of pest control (crop rotation, sanitation, crop diversity), a pattern of pesticide dependence developed. Pimentel et al. (1991, p. 684) illustrate the hazards of this pattern:

"During the 1940s, little or no insecticide was applied to corn and losses to insects were only 3.5 percent. Since then, insecticide use on corn has grown more than 1000-fold while losses due to insects have increased to 12 percent. This increase in insecticide use and 3.4-fold increase in corn losses to insects are primarily due to the abandonment of crop rotations."

Pesticide resistance and loss of natural predators and parasites due to pesticides cost the U.S. economy an estimated $300 million annually (Pimentel et al. 1991).

2.3 HUMAN AND ENVIRONMENTAL HEALTH CONCERNS: BRITISH COLUMBIA

The points raised in the preceding discussion apply generally to pesticide use in agriculture. It is instructive, however, to look specifically at the evidence for and underlying causes of pesticide-related human and environmental health risks in British Columbia agriculture.

A recent report on Occupational Safety and Health in the British Columbia agriculture industry outlines several concerns related to pesticide use:

"Until recent legislation, pesticides were largely unregulated in farming even though agriculture employs about 75 percent of the total chemicals used. Also, agricultural pesticides in British Columbia appear to be applied at a rate 35 percent above the national average. Of all 150 active ingredients available for use, 35 types

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6 The 'recent legislation' mentioned here refers to the 1988 amendment to the Pesticide Control Act Regulation which requires growers to be certified to apply restricted class pesticides on their own farms. This requirement took effect in January 1992.
dominate, with about 20 of particular concern regarding acute toxicity and as possible cancer causing agents" (Deloitte Haskins and Sells 1988, Summary).

2.3.1 Farmer and farmworker poisoning

There have been several incidences of on-farm pesticide poisoning in British Columbia over the last decade. Pesticide-use practices in British Columbia agriculture began to attract public attention after the fatal poisoning of Fraser Valley farmworker Jarnail Deol in 1982.

Several studies of the health effects of pesticides on British Columbia farmers and farmworkers have been completed over the last ten years. A summary of key findings of these reports follows.

A 1982 federally funded study of Fraser Valley farmworkers concluded that:

"Current agricultural practices in British Columbia ensure widespread, low-level exposure to dozens of extremely toxic pesticides. In addition, sloppy or non-existent safety precautions result in hundreds of minor accidents yearly with only a fraction ever being reported through official government channels (Matsqui-Abbotsford Community Services 1982, p. 5).

A later survey of 331 farmworkers reported that farmworkers experienced headaches, dizziness, persistent skin rashes, runny noses and frequent severe vomiting in the 1984 field season (Deol Agricultural Education and Research Society 1986).

A 1987 field study of pesticide-related working conditions on Fraser Valley farms reports a pattern of substandard pesticide use practices and evidence of farmworker poisoning by pesticides (Moses 1988). 

7,8 The authors of these reports indicated difficulties in achieving random sampling of farmworkers for interviews.
Gallagher et al. (1984) conducted research into occupational mortality in agriculture for male farmers from 1950 to 1978. Though they suggest that further research is needed to confirm associations, the researchers found that farmers had significantly elevated risks of death from cancer of the lip, stomach, prostrate, and from leukemia and aplastic anaemia. The researchers noted case reports where aplastic anaemia was reported after exposure to a variety of pesticides, especially the organo-chlorine compounds as well as some organophosphate insecticides.

2.3.2 Environmental contamination by pesticides in British Columbia

There is little doubt that the application and disposal of agricultural pesticides threaten British Columbia's soil and water resources. As with other non-point source pollutants however, the degree to which this contamination occurs is not clear. In addressing pesticide pollution from agriculture and forestry in British Columbia, Oldham (1977, p. 314) notes:

"Pesticide residues have been measured in various waters of the province but there has been no correlation established between concentration of pesticides and effects on any particular part of the aquatic environment -- unless one is dealing with massive concentrations that begin to cause acute symptoms in select organisms. The threshold levels of pesticide active ingredients that cause subtle, long-term changes in the aquatic environment are not known. However, it is because of this unknown effect, not in spite of it, that careful control of pesticide use must be exercised."

Pesticide contamination of groundwater in British Columbia is becoming a serious problem in some regions. Environment Canada is currently surveying groundwater for agricultural pesticides around British Columbia. According to Liebscher (1991),
pesticide contamination of groundwater in some Fraser Valley locations is cause for concern.  

Agriculture Canada reported that Dinoseb, a herbicide used in raspberry, pea, bean and potato crops in British Columbia was found in wells near Aldergrove and Grand Forks. Dinoseb is acutely toxic; further, recent reviews indicate appreciable risk for birth defects. It has been banned in the U.S. but continues to be used in British Columbia (MacQueen 1990b).

In May 1992, Jerry Kozak of Fisheries and Oceans Canada reported that a highly toxic pesticide, probably used to fumigate a greenhouse, had been spilled into Langley Creek where it killed 2,000 salmon fry. Kozak is quoted as saying, "The substance we think we found is legal only under very, very restrictive circumstances" (Chapman 1992).

Canadian Wildlife Service scientist John Elliot recently reported that farm pesticides are killing bald eagles that seek winter refuge in the Fraser Valley. Elliot notes that no one was looking at pesticides in dead eagles and hawks until a couple of years ago, but that there has probably been pesticide-induced raptor mortality over the last twenty years (Bohn 1992a,b).

Each year over 200,000 pesticide containers are disposed of in British Columbia. Though a deposit-return system is being considered, British Columbia farmers are currently instructed to

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9 In October 1991, Dr. Richard Sweeting, an orthopedic surgeon in the Fraser Valley, reported 100 cases of an unusual muscle disease among Fraser Valley residents. Sweeting, in conjunction with an environmental toxicologist, is pursuing a theory that the patients' symptoms are caused by exposure to agricultural pesticides. Sweeting says he continues to see more such patients all the time. Tests for pesticides in groundwater are now underway (Saenger 1991).
either triple rinse pesticide containers into their spray tanks prior to landfill disposal or bury containers on their property. I have not encountered reference to specific pesticide hazards in British Columbia landfills; however studies show that this disposal practice has caused environmental hazards in some Alberta landfills (Castrilli and Vigod 1987).

2.4 IMPROPER PESTICIDE HANDLING

The manner in which pesticides are handled has a direct influence on the extent to which environmental and human health is impacted. Though it has been suggested that even "proper" pesticide handling\textsuperscript{10} inevitably threatens human and environmental health (Chant 1981; Ontario Task Force on Health and Safety in Agriculture 1985; U.S National Research Council 1989), clearly pesticide misuse exacerbates these threats.

Several factors contributing to pesticide misuse (here defined as improper storage, mixing, application and disposal of pesticides) have been identified in the literature. These include inadequate information and education on pesticide hazards and precautionary procedures, and inadequate pesticide labels (Moses 1988; Ontario Task Force on Health and Safety in Agriculture 1985; Canadian Centre of Toxicology 1984; Kansky 1990). These factors are in turn exacerbated by low literacy rates among farmers and farmworkers in some regions in Canada and the U.S. (Moses 1988; Vinski 1991). In underdeveloped countries, "a lack of regulation, illiteracy, and repressive

\textsuperscript{10}Proper pesticide handling implies adherence to both regulations and pesticide label instructions.
working conditions can turn even a 'safe' pesticide into a deadly weapon" (Weir and Schapiro 1981, p. 3).

The Canadian Centre for Toxicology (1984) notes that pesticide dealers and agricultural representatives supply much of the safety information on pesticides to the farm community even though these persons may lack formal training in the hazards associated with pesticide use.11

Attitudes and perceptions about pesticides influence pesticide use practices. The Canadian Centre for Toxicology (1984, p.iii) notes that:

"...many other pesticides can be tolerated at quite high doses with little in the way of distinct symptoms of toxicity. This tends to breed a more casual attitude to their use and handling and is of concern in the case of those compounds which may have chronic effects."

Federal registration itself may affect attitudes about safety:

"The registration procedure in a sense becomes a device that lulls unsuspecting politicians and citizens into believing that a bureaucratic stamp, labeled 'safe', shields them from the dangers of environmental poisoning" (Hall 1981, p.17).

Farmers convinced of the merits of pesticides may be inclined to use more than recommended on the label:

"Very few farmers have been applying excessive amounts of chemical for economic reasons but there has always been the mentality which would think 'let's put in a little bit more to make certain'" (Tinsley 1988, p. 293).

Spanish-speaking farmworkers in California customarily refer to pesticides as "medicinos" since their supervisors, by way of explanation, liken the benefits of pesticides to crops to those of humans taking medicines for illness (Moses 1989). One might

11Seehra (1988) noted that 35% of interviewed Fraser Valley fruit and vegetable growers relied on chemical company reps for information on pesticide use.
expect these farmworkers to treat pesticides with an inordinately low degree of care.

2.4.1 Improper pesticide handling in British Columbia agriculture

Table One summarizes evidence for, and contributing factors of, pesticide misuse in British Columbia agriculture.

Following a 1987 field survey of pesticide-related working conditions in the Fraser Valley, Dr. Marion Moses, a California occupational health official, made the following comments:

"There is a serious misperception regarding pesticide-related problems in North America. It is assumed that adequate legislation as well as standards of health, hygiene, and literacy in the U.S. and Canada are such that serious problems do not occur; that such problems are confined to developing countries with less adequate laws and lower standards of living. This has led to unwarranted assumptions about the safety and conditions of use of pesticides in the United States and Canada" (Moses 1988).

Evidence of improper pesticide handling generally arises from two sources. The more dramatic cases are reported in the media; the day to day incidences of improper handling are described in a variety of reports analyzing pesticide-related issues on British Columbia farms. Most evidence of improper handling is anecdotal in nature; there is no way to assess in definitive terms the extent to which this occurs. Collectively, however, these reports identify a range of pesticide misuse problems and provide insights into the main factors that contribute to misuse on British Columbia farms. The results of these studies indicate that improper handling of pesticides may be widespread in the industry. A summary of this information follows.
2.4.1.1 Evidence of improper pesticide handling

In 1985, 20 people became ill after eating cucumbers that had been treated with the insecticide aldicarb at a Maple Ridge farm (Easton 1988). Aldicarb is the most acutely toxic insecticide available to commercial growers in British Columbia; it was not registered for use on cucumbers.

In the early 1980s, a seven year old child drowned in an uncovered tank of pesticides on a Saanich farm (MacQueen 1990a).

In May 1991, Guthion, an acutely toxic insecticide, drifted onto a Surrey schoolground from an airplane spraying a blueberry field. Several students experienced sore eyes and headaches after exposure (Clark 1991).

The 1982 death of farmworker Jarnail Deol resulted from exposure to insecticide drift from a sprayer run by his brother. The brother, Jagdev Deol, was spraying into the wind while people were working in the fields. The pesticide label warned against this hazard; Jagdev, however, did not read English (Deol Agricultural Education and Research Society 1986). The jury at the coroner's inquest found that Deol's pesticide poisoning was a preventable homicide (Castrilli and Vigod 1987).

One report on pesticide use in British Columbia agriculture includes a photograph showing blueberry pickers washing their hands at a faucet; strewn about the faucet are empty Gramoxone (paraquat) containers (Moses 1988). Some East Indian farmworkers had filled these containers with water and taken them into the fields with their lunches. Paraquat, a non-selective herbicide used widely in British Columbia agriculture, is acutely toxic to humans. It causes irreversible lung damage.
and is fatal in moderately low doses. There is no known antidote.

Moses (1988) relates accounts of U.S. and British Columbia farmworkers using pesticide containers to carry harvested crops, water and toys both at work and in their homes.

Seehra (1988) reports that of 90 East Indian berry and vegetable growers interviewed in the Fraser Valley, 34 percent stated they used an illegal nematicide that had been brought across the border from the U.S.

2.4.1.2 Factors contributing to pesticide misuse on British Columbia farms

It appears that most cases of improper pesticide handling occur not as a result of deliberate misuse but of ignorance and complacence. The lack of information on pesticide hazards available to both farmers and farmworkers is referred to repeatedly in the literature.

Several studies link pesticide misuse with functional illiteracy among farmers and farmworkers. For handlers who have not been trained, the ability to read pesticide labels is critical to proper handling. A 1988 study of occupational health and safety in British Columbia agriculture outlines the composition of the agricultural work force:

"Accurate estimates of the ethnic composition of the provincial agricultural work force are not available. The Canada Farm Labour Pool is of the opinion that 60 percent of farmworkers in the Fraser Valley are East Indian and that the majority of seasonal pickers in the Okanagan are French-Canadian. Estimates of the East Asian work force in the Fraser Valley and Lower Mainland vary from several hundred...to more than a thousand" (Deloitte Haskins and Sells 1988, p. 92).
Studies of Fraser Valley farmworkers over the last decade indicate high levels of functional illiteracy in English (54 to 92 percent of interviewed farmworkers); many East Indian farmworkers do not read in any language (Deol Agricultural Education and Research Society 1986; Oja et al. 1990; Matsqui Abbotsford Community Services 1982). Sarwan Boal, past president of the Canadian Farmworkers Union, explains that farmworkers who are unable to read labels and other pesticide safety information generally assume that pesticides, if registered by the government, are safe to use (MacQueen 1990a).

In addition to farmworkers, there are significant numbers of East Indian and Asian growers in the Fraser Valley who have English language difficulties. In 1984, nearly half of berry and vegetable growers in the Fraser Valley were East Indian; a 1988 study found that 60 percent of East Indian growers interviewed were unable to read pesticide labels (Seehra 1988). A 1989 field study of the Fraser Valley berry industry also indicates low functional English literacy among East Indian growers (Oja et al. 1990).

The general lack of pesticide training of farmers and farmworkers can in part be attributed to the fact that under Section 44 of British Columbia's Pesticide Control Act commercial growers have been exempt from certification requirements in the use of pesticides on their own farms (Deloitte Haskins and Sells 1988; Oja et al. 1990; Kansky 1990). That is, there was no legal requirement for growers to have any training whatsoever to purchase and apply all but the most toxic of pesticides prior to January 1992.¹² This lack of training in

¹²See Note 6.
turn impacts those farmworkers who rely on growers for their information on pesticide handling.

A 1988 study of East Indian berry and vegetable growers found that although 98 percent of interviewed growers had personal experience applying pesticides, 60 percent had no formal training regarding pesticide hazards. Sixty percent prepared pesticide tank mixes by approximation; forty-two percent were directly sprayed while loading, mixing or spraying pesticides due to faulty equipment; only seven percent used proper safety gear while mixing and applying pesticides (Seehra 1988).

A 1989 study of the Fraser Valley berry industry found that, depending on the crop, 50 to 70 percent of growers interviewed had no formal training in pesticide handling (Oja et al. 1990). This study also found that nearly 50 percent of farmworkers either did not know where to get information on pesticide handling or stated there was none available. The majority of farmworkers that did receive information on pesticides obtained it from the growers (Oja et al. 1990).

Several reports indicate that hand washing and shower facilities are not provided to most farmworkers, and that first aid supplies are not generally available (Deol Agricultural Education and Research Society 1986; Matsqui Abbotsford Community Services 1982; Sandborn and Dean 1982).

The extent to which a rigorous enforcement program would affect pesticide handling practices in British Columbia is not assessed in the literature, though lack of enforcement is noted by several authors. Enforcement and monitoring of existing pesticide regulations by Pesticide Control Branch officials is passive; that is, enforcement action is generally taken only
when problems are brought to their attention. A similar approach to enforcement is taken across Canada. Witness the case in Ontario:

"In all but emergency situations, the present administration of the Act leaves observance of the performance regulations almost entirely up to the user, that is, there is no active enforcement program except where complaints are received or serious problems are identified" (Ontario Task Force on Health and Safety in Agriculture 1985, p. 113).

Under the provisions of health and safety regulations, the Workers' Compensation Board of B.C. has the authority to enforce safe pesticide practices. However, the British Columbia agriculture industry is exempt from these regulations; in their place is a set of guidelines that do not carry the weight of law.
TABLE 1. Pesticide use problems and contributing factors in British Columbia agriculture, as identified in the literature.

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>SOURCE</th>
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<tbody>
<tr>
<td>1. FARMWORKER/FARMER EXPOSURE</td>
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<tr>
<td>a) Pesticide exposure of pesticide applicators</td>
<td></td>
</tr>
<tr>
<td>(i) examples/evidence</td>
<td></td>
</tr>
<tr>
<td>long and short term health effects</td>
<td>Gallagher et al. 1984; Deol Society 1986; MACS 1982; Moses 1988</td>
</tr>
<tr>
<td>(ii) contributing factors</td>
<td></td>
</tr>
<tr>
<td>lack of supervision of pesticide handlers</td>
<td>Moses 1988</td>
</tr>
<tr>
<td>labelling concerns include: small print</td>
<td></td>
</tr>
<tr>
<td>lack of safety information</td>
<td></td>
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<tr>
<td>ambiguous language</td>
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<tr>
<td>confusion re: metric/standard measures</td>
<td></td>
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<tr>
<td>label format not standardized</td>
<td></td>
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<tr>
<td>field re-entry periods not always given</td>
<td></td>
</tr>
<tr>
<td>labels printed in English and French only</td>
<td></td>
</tr>
<tr>
<td>illiteracy, esp. the inability of farmers and workers to read English</td>
<td>BCFA Crop Protection Committee 1991; Deloitte Haskins &amp; Sells 1988; Deol Society 1986; Kansky 1990; MACS 1982; Oja et al. 1990; Seehra 1988</td>
</tr>
</tbody>
</table>
personal protective equipment not always available to workers

failure of workers to use safety equipment

poor maintenance of pesticide application and safety equipment

inadequate on-farm washing facilities

poor pesticide storage practices

improper pesticide mixing procedures

poor enforcement of pesticide regulations on farms

fear of employer retaliation (workers disinclined to complain or refuse unsafe work)

b) Pesticide exposure of other farmworkers (non applicators)

(i) examples/evidence

long and short term health effects

(ii) contributing factors

poor pesticide storage practices

inadequate on-farm washing facilities

lack of on-farm pesticide information
sprayed fields not posted  BCMA 1982; Kansky 1990; Moses 1988
minimum field re-entry periods not legislated  BCMA 1982; Kansky 1990; Sandborn and Dean 1982
re-entry times not posted  BCMA 1982, Sandborn and Dean 1982
re-entry times not followed  AIC 1990; Kansky 1990
workers sprayed while in field  MACS 1982
illiteracy, esp. the inability of farmers and workers to read English  BCFA Crop Protection Committee 1991; Deloitte Haskins & Sells 1988; Deol Society 1986; Kansky 1990; MACS 1982; Oja et al. 1990; Seehra 1988
poor pesticide container disposal practices  AIC 1990; BCFA 1989; Kansky 1990; Moses 1988
poor enforcement of pesticide regulations on farms  Deloitte Haskins and Sells 1988; Kansky 1990; MACS 1982; Oja et al. 1990
poor monitoring of pesticide residue levels on farms  Kansky 1990; Sandborn and Dean 1982
poor first aid standards  BCMA 1982; Deol Society 1986; MACS 1982; Sandborn and Dean 1982
fear of employer retaliation (workers disinclined to complain or refuse unsafe work)  Deloitte Haskins and Sells 1988; Moses 1988; Sandborn and Dean 1982
exposure of farmworkers' children (children often accompany parents into fields)  Deol Society 1986; MACS 1982; Oja et al. 1990
2. OTHER DELETERIOUS EFFECTS

a) Groundwater/environmental contamination

(i) examples/evidence

<table>
<thead>
<tr>
<th>Effect</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater contamination in Fraser Valley, Creston Valley</td>
<td>Liebscher 1991; MacQueen 1990b</td>
</tr>
<tr>
<td>Loss of wildlife</td>
<td>Bohn 1992a,b; Bowman 1950; Castrilli and Vigod 1987; Chapman 1992; Pimentel et al. 1991</td>
</tr>
<tr>
<td>Loss of honeybees</td>
<td>Castrilli and Vigod 1987; Easton 1992; Pimentel et al. 1991</td>
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(ii) contributing factors

<table>
<thead>
<tr>
<th>Factor</th>
<th>References</th>
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</thead>
<tbody>
<tr>
<td>Poor pesticide container disposal practices</td>
<td>Castrilli and Vigod 1987; Kansky 1990; Moses 1988</td>
</tr>
<tr>
<td>Environmental effects of pesticides under British Columbia conditions not well understood</td>
<td>Kansky 1990; Oldham 1977</td>
</tr>
<tr>
<td>Lack of on-farm monitoring of pesticide levels</td>
<td>Kansky 1990; Sandborn and Dean 1982</td>
</tr>
<tr>
<td>Lack of legislated standards for pesticides in groundwater</td>
<td>AIC 1990; Kansky 1990</td>
</tr>
<tr>
<td>Poor enforcement of pesticide regulations on farms</td>
<td>Deloitte Haskins &amp; Sells 1988; Kansky 1990; MACS 1982; Oja et al. 1990</td>
</tr>
</tbody>
</table>


c) Consumer/public pesticide exposure

(i) examples/evidence

contaminated produce  Easton 1988
human bystander poisoning  Clark 1991; MacQueen 1990a

(ii) contributing factors

use of inappropriate pesticides on food crops  Easton 1988; Seahra 1988
inadequate monitoring of pesticide levels in food  Easton 1988
sprayed fields not posted  BCMA 1982; Kansky 1990; Moses 1988

3. PESTICIDE PROBLEMS: BROADER ISSUES

inadequate health data collection, especially regarding chronic effects  BCMA 1982; Moses 1988
poor accident and illness reporting  BCMA 1982; MACS 1982; Moses 1988; Sandborn and Dean 1982; Seehra 1988
poor recording of pesticide applications  BCMA 1982, Oja et al. 1990
poor recording of agricultural pesticide sales  AIC 1990; Castrilli and Vigod 1987; Kansky 1990
inadequate public access to information re: pesticide use in food production  Kansky 1990
Table 1 Notes:

Several source names are abbreviated in this table. They are as follows:

AIC Agricultural Institute of Canada
BCFA British Columbia Federation of Agriculture
BCMA British Columbia Medical Association
CEN Canadian Environmental Network Pesticide Registration Review Caucus
Deol Society Deol Agricultural Education and Research Society
MACS Matsqui-Abbotsford Community Services
CHAPTER THREE

PESTICIDE REGULATION IN BRITISH COLUMBIA AGRICULTURE:
HISTORY AND NEW INITIATIVES

3.1 CHAPTER OVERVIEW

This chapter details the evolution of pesticide regulation in British Columbia agriculture. The regulatory amendments which took effect January 1992 are presented with emphasis on the grower certification program. A variety of government agencies and non-governmental organizations have been involved in some way with the regulatory process; these are introduced here.

3.2 HISTORY OF PESTICIDE REGULATION IN BRITISH COLUMBIA

The Constitution Act of 1867 provides for concurrent federal and provincial jurisdiction to legislate in relation to both agriculture and the environment. Division of authority with respect to pesticides is as follows:

"In general, it may be said that the jurisdiction over pesticides divides between federal registration, the classification and labelling of such products and provincial control over their actual use through licences, permits and related regulatory techniques" (Castrilli and Vigod 1987, p. 40).

The principal legislation controlling pesticides in Canada is the federal Pest Control Products Act (PCP Act) which is binding on both the federal and provincial Crown; the PCP Act is administered by Agriculture Canada. Castrilli and Vigod (1987, p. 120) note the extent of provincial authority over pesticides:

"To the extent that there is overlap between federal and provincial legislation, for example with respect to use, a long line of decided cases indicates that as long as compliance with provincial law does not result in violation of federal law, both may stand. Therefore, the provinces will usually be able to set more stringent requirements within their legislative competence."
3.2.1 Federal pesticide regulation

The federal government recently completed an extensive review of the PCP Act through a multi-stakeholder consultation process (Pesticide Registration Review Team 1990). Though this thesis is concerned primarily with provincial legislation, I recognize that certain aspects of pesticide regulation are beyond provincial jurisdiction. Indeed some federal legislation necessarily influences conditions of pesticide use at the provincial level. Relevant federal issues are briefly outlined here.

First, the PCP Act gives the Minister of Agriculture authority to set standards for scientific data which are used to evaluate the acceptability of a pesticide. The PCP Act also gives the Minister of Agriculture final authority in deciding which pesticides will be registered for use in Canada. Second, the Minister can withhold health and safety data, including environmental impact information, from consulting agencies in Environment Canada and Health and Welfare Canada, and from the provinces and the public. These data are considered to constitute trade secrets and are withheld to protect the submitting company. Finally, the PCP Act sets standards for the pesticide label, which, as previously noted, is a key source of application and safety information for agricultural pesticide users (Castrilli and Vigod 1987).

The final report of the federal Pesticide Registration Review Team (1990) includes recommendations that are relevant to pesticide use in British Columbia agriculture. Key recommendations are summarized in Appendix Two.
3.2.2 Provincial pesticide regulation

Pesticide regulation at the provincial level is complicated by the fact that three government agencies have mandates concerning pesticide use in agriculture. These are the B.C. Ministry of Environment, Lands and Parks (administrator of the Pesticide Control Act via the Pesticide Management Branch), the B.C. Workers' Compensation Board, and the B.C. Ministry of Agriculture, Fisheries and Food. Though the interests of these agencies overlap to some extent, they are responsible for different aspects of pesticide use. This section outlines the role of these agencies and documents the positions of two key non-governmental organizations (the B.C. Federation of Agriculture and the Canadian Farmworkers Union) that have influenced pesticide regulation in British Columbia agriculture.

3.2.2.1 1973 Royal Commission of Inquiry Into the Use of Herbicides and Pesticides

Prior to 1973, control of pesticides in British Columbia was the responsibility of the Ministry of Agriculture. In 1973, the British Columbia Government struck a Royal Commission of Inquiry Into the Use of Herbicides and Pesticides. Two of its recommendations are of particular importance. First, the Commissioners recommended that administration of pesticide control and safety in British Columbia be transferred from the Ministry of Agriculture to a "Department of Environmental Protection." Secondly, they recommended that a "Pesticide
Control Act" be brought into effect, to be administered by the Department of Environmental Protection. Both these recommendations were subsequently enacted. The Pesticide Control Act remains under the administration of the Environment Ministry to this day; through this Act, the Environment Ministry is granted the greatest degree of authority over pesticide regulation in British Columbia.

The Commissioners stated that:

"In order to protect the general environment and man's food and water supplies, one governmental agency should be charged with control of pesticides of all types and for all uses. This governmental agency should have a vital interest in the protection of the environment but at the same time should not have a vested interest in the actual use of pesticides, private or corporate" (Royal Commission of Inquiry into the Use of Herbicides and Pesticides 1974).

The following recommendation was not enacted:

"All commercial growers who wish to apply pesticides by ground application shall be required to pass a course specifically designed to provide information on pest identification and habits, need for pesticides, biological and integrated control, handling, storage and application of pesticides, safety and the impact of pesticides on the environment. Each course will stress the pest problems of a grower. A re-examination will be required every five years" (Royal Commission of Inquiry into the Use of Herbicides and Pesticides 1975, p. 108).

This recommendation places significant emphasis on integrated pest management techniques; otherwise it very nearly states the British Columbia Government's recent amendment to the Pesticide Control Act Regulation.

The Pesticide Control Act Regulation (1981) outlines conditions of proper sale, storage, transport, use and disposal of pesticides. It outlines conditions for issuance of permits,

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1This rationale is shared by those calling for a transfer of the PCP Act away from Agriculture Canada.
certificates and licences for dispensers and applicators, and sets penalties for violation of the Act and its Regulation.

Prior to the 1988 amendment to the Pesticide Control Act, commercial growers under Section 44 of the Regulation were exempted from licence, permit and certification requirements when applying pesticides on their own farms, or on other farms on a non-payment basis. This exemption was modified by the 1988 amendment which took effect in January 1992.

3.2.2.2 Jurisdiction of the Workers' Compensation Board of British Columbia

As the B.C. Workers' Compensation Board (WCB) has legal authority to enforce workplace health and safety, it has a potential role to play in enforcing proper pesticide handling on British Columbia farms. However it was not until 1983 that the agriculture industry fell under WCB coverage. At that time the B.C. Federation of Agriculture voiced considerable opposition to compulsory coverage and industrial health and safety regulations based on concerns over impractical implementation, costs and bureaucratic intervention (Deloitte Haskins and Sells 1988). In response to this opposition, the WCB announced that compulsory coverage would stand but that industrial health and safety guidelines for agriculture would remain guidelines; they

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2 This point must be qualified. Growers have always been required to obtain a permit to apply Schedule I (permit restricted) pesticides -- the small number of pesticides that pose exceptional hazards including lead and mercury compounds, DDT and certain fumigants.

3 The B.C. Federation of Agriculture is an umbrella group of agricultural producers and marketing agencies in British Columbia.

4 In 1982, the WCB, the B.C. Federation of Agriculture and the Canadian Farmworkers Union drew up health and safety guidelines
would not be regulations enforceable under WCB law. This is still the case today.

Based primarily on concerns over pesticide-related occupational and environmental risks, a variety of groups lobbied (unsuccessfully) for agricultural safety regulations and inspection, including the B.C Federation of Labour, the B.C. Medical Association, the Canadian Farmworkers Union (Deloitte Haskins and Sells 1988) and the West Coast Environmental Law Association (Sandborn and Dean 1982).

In 1988 the WCB commissioned a study of occupational health and safety in British Columbia agriculture (Deloitte Haskins and Sells 1988). The researchers recommend that the WCB act to confirm the inclusion of agriculture within the regulatory provisions of the Workers’ Compensation Act. They note that "In effect, we can find no substantive reason to justify removal of the industry from the jurisdiction of the Board given the safety and health risks inherent in farming..." (Deloitte Haskins and Sells 1988, p. 97).

The WCB has recently published a revised manual for pesticide applicators which includes extensive coverage of safe pesticide handling; it is written for an audience with grade eleven education (Eaton 1991). The WCB also produces a variety of pesticide safety brochures and posters which are printed in minority languages.

for the agriculture industry which the WCB accepted as a basis for an accident prevention program.
3.2.2.3 Pesticide regulation and the B.C. Ministry of Agriculture, Fisheries and Food

The B.C. Ministry of Agriculture, Fisheries and Food (BCMAFF) has a clear interest in the regulation of pesticides. The mandate of the BCMAFF is to support all aspects of the agriculture industry; assistance with pest control is a major part of this mandate (Kluge 1990). The BCMAFF is not a regulatory agency with respect to pesticide use; its main function is to provide education and extension services to commercial growers on pest control (Kluge 1990). One of the key ways the BCMAFF passes pest control information on to growers is through 'production guides'. The BCMAFF publishes up to date production guides for each crop type (berry, tree fruit, vegetable etc.) and makes them available to all commercial growers. These guides outline which pest problems can be expected in each crop and list the available control options. Though non-chemical control methods are included for some crops, the guides concentrate on chemical controls. Details on pesticide formulations, optimal application rates and spray schedules are included. Basic principles of pesticide safety are outlined. These guides are available in English only.

Oja et al. (1990, p. 15) report that of 89 berry growers interviewed, between 24 and 37 percent (depending on the crop) relied on the Berry Production Guide for their primary source of information on pesticides. No other source of information was relied upon so heavily as the production guides. Seehra (1988, p. 40) reports that of 90 vegetable and berry growers interviewed, 51 percent relied on BCMAFF materials for pest management information.
3.2.2.4 Pesticide safety programs under the B.C. Federation of Agriculture

The B.C. Federation of Agriculture, as noted, objects to government imposed occupational health and safety regulations. Aside from concerns about bureaucratic interference, the Federation feels that agriculture is sufficiently unique among industries that WCB inspectors without farm experience would be unable to serve the industry. The Federation maintains that it should be self-policing on matters of farm safety. The Federation has organized a variety of farm safety committees that investigate farm accidents, offer safety inspection services and organize training courses. This approach to farm safety has been criticized:

"Overall, the record of the respective committees has been uneven. Certain commodity groups take an active involved role while others remain in a comparative state of inactivity. The programs are essentially low key and without focus. They lack coordination, urgency, influence, commitment and proper funding" (Deloitte Haskins and Sells 1988, Summary).

In 1990, the B.C. Federation of Agriculture established the "Farm and Ranch Safety Agency" in an effort to address some of the concerns listed above. The Federation is lobbying the provincial government to re-route .02 percent of assessments farmers pay to the WCB to fund this safety agency (Morrison 1991). No such arrangement has been made to date.

With respect to pesticides, the Federation of Agriculture has offered pesticide safety training courses for Punjabi speaking growers in the Fraser Valley over the past few years through Baldev Seehra, a bilingual Punjabi-English graduate of Simon
Fraser University's Masters of Pest Management program (Thompson 1990).  

3.2.2.5 Pesticide safety programs of the Canadian Farmworkers Union

The Canadian Farmworkers Union is based in Surrey, B.C. and focuses its efforts on improving the working conditions of British Columbia farmworkers. Much of the Union's work over the last five years has centred on reducing farmworker exposure to pesticides. Farmworkers face potential exposure during mixing, application, weeding and harvesting operations; given low literacy levels and a lack of active enforcement on farms, British Columbia's farmworkers are particularly vulnerable.  

The Canadian Farmworkers Union has undertaken pesticide safety projects in two areas. First, it established an English as a Second Language program designed specifically for farmworkers. This program has been suspended due to lack of funds. Second, in conjunction with the Deol Agricultural Research and Education Society, it has developed a pesticide safety video directed at Punjabi speaking farmworkers; a companion leaflet was also

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6 The BCFA cancelled this program for the 1992 season. It is not clear whether it will be reinstated in the future (Seehra 1992).

7 British Columbia's farmworkers face hardships beyond exposure to pesticides. Detailed discussion of these issues will not be presented here, though working conditions do have an impact on pesticide use practices, and vice versa. As Sandborn and Dean (1982, p. 24) note:

"It may be that under optimal conditions and with proper precautions a chemical like captan could be safely used. However the point of this brief is that because of legislative neglect, farmworkers do not work under optimal conditions."

produced in Punjabi (Deol Agricultural Research and Education Society 1990).

The Canadian Farmworkers Union was directly involved in developing the 1982 Health and Safety Guidelines for the Agriculture Industry for the WCB. However the Union has repeatedly called for enforceable occupational health and safety regulations in the agriculture industry.

3.3 BRITISH COLUMBIA'S NEW PESTICIDE REGULATIONS FOR AGRICULTURE

As noted above, the British Columbia Government passed amendments to the Pesticide Control Act Regulation in 1988. One amendment reorganizes British Columbia's pesticide classification system to parallel the federal five-category system. In decreasing order of hazard rating, these categories are: permit restricted; restricted; commercial; domestic; exempted. The amendment of greatest significance to the agriculture industry is that which requires commercial growers to pass a certification exam in order to purchase and apply restricted class pesticides on their own farms. In order to purchase and use pesticides in the permit restricted class, growers require, as implied, a Restricted Permit from the Ministry of Environment, Lands and Parks. Legislation has always required a permit for use of these pesticides, which were classed 'Schedule I' prior to the amendment (see note 2).
material covered by the certification course and implementation of the program.

3.3.1 The Grower Certification Program

The British Columbia Government's initiative to require mandatory pesticide certification of commercial growers is not the first in Canada. As noted in Chapter Four, the Northwest Territories, Quebec and Ontario all have mandatory certification programs in place.

3.3.1.1 Development of the Certification Program

In proposing amendments to the Pesticide Control Act Regulation, both the Ministry of Environment, Lands and Parks (BCMELP) and the Ministry of Agriculture, Fisheries and Food (BCMAFF) recognized that a certification program for growers could improve the conditions of pesticide use on British Columbia farms. Though the certification program is administered by BCMELP's Pesticide Management Branch, the BCMAFF is considered the lead agency and holds the copyright on the course materials.

Despite its resistance to regulations in the industry, the B.C. Federation of Agriculture supports the certification program and has been directly involved in its development. The Federation has two main interests in the grower certification program. First, it recognizes that pesticide safety can only benefit farmers. "Farmers, as (pesticide) users, have personal as well as professional concerns about health and safety; we are on the front line" (B.C. Federation of Agriculture 1989, p. 1). Second, the Federation knows that the public outcry surrounding
serious incidents of misuse serves to limit access to what growers believe is an already inadequate range of pesticides (B.C. Federation of Agriculture 1989). The grower certification program is seen as a means to prevent such incidents.

The program has two main components: a home study course for growers and the certification exam. The Pesticide Management Branch is responsible for overall administration, including printing and distributing course materials to growers, and administering certification exams. The BCMAFF is primarily responsible for the technical information covered in the course. Both ministries wanted to ensure that the certification course achieved a sufficient technical level to make the legal certification requirement meaningful. The Open Learning Agency has been extensively involved with developing materials for the home study course. The B.C. Federation of Agriculture, through its Pesticide Safety Committee, has been involved at all stages of the program. Agriculture Canada contributed funding but was not directly involved in course development; approval of the course was granted after the fact (Adams 1991).

3.3.1.2 Scope of the certification requirement

The certification requirement under the new Pesticide Control Act Regulation does not apply to all pesticides used in British Columbia agriculture; it applies to restricted class pesticides only. This means that commercial, domestic and exempted class pesticides can still be purchased and applied without any training whatsoever. It is important to note that the majority of pesticides used in British Columbia agriculture are classed commercial. The BCMAFF and the B.C. Federation of Agriculture
maintain that including all pesticides under the certification program would unduly restrict growers' access to pesticides in the short term (Kluge 1990; Thompson 1990). The BCMAFF, however, is encouraging all growers to take the certification course whether or not they are using restricted class pesticides (Kummen 1990).

3.3.1.3 Contents of the certification course

In preparation for the certification exam, growers receive home study kits which include ten written lessons, a video outlining safe application practices, a practice exam and the BCMAFF production guide appropriate to the grower's crop. The video covers pesticide use in field crops only.

The course materials are substantially different from the Pesticide Management Branch's Handbook for Pesticide Applicators and Dispensers on which previous permit exams were based. The new materials better define safe pesticide practice and are designed specifically for agricultural pesticide users.

The new course incorporates information from BCMAFF publications, from the Pesticide Management Branch's pesticide handbook and from the Workers' Compensation Board's manual for pesticide applicators. The first nine of ten lessons address pesticide use in detail; topics include legislation, labels, toxicity, personal and environmental safety, and proper calibration of pesticide equipment. The final lesson, titled "Pest Management", addresses the question of how growers decide to use pesticides (or any other control measure) in the first place. It is designed to help growers make the best pest management decisions for their situation. An integrated pest
management (IPM) approach is encouraged: "IPM brings together monitoring, a knowledge of pest biology, and the use of all available control methods in order to create a program which is as cost effective and environmentally safe as possible" (B.C. Ministry of Agriculture, Fisheries and Food 1990, p. 10-10).

Thus, a large majority of the course materials pertain to the actual use of pesticides in agriculture. When asked about the relatively low content of information on IPM and information on pesticide alternatives, a BCMAFF official stated that it is assumed that growers taking the course are using pesticides and are thus in need of education on safe handling and effective application. He added that use of IPM needs to be advanced in the industry through other avenues; this was not the goal of the certification program (Kluge 1990).

3.3.1.4 Delivery of the Certification Program

As noted, the certification course is designed as a home study course for growers. The Ministry of Environment, Lands and Parks, through its six regional offices, has arranged to offer the course in a classroom setting on a limited basis (through community colleges etc.). Further, growers' associations offer course instruction as a service to growers. The Pesticide Management Branch has compiled a list of trainers that is available to the growers' associations (Adams 1991).

The course materials and exam are available in English only. There are limited provisions for administering oral exams to illiterate growers. The Ministry continues to seek instructors who are bilingual in English and the minority languages of
British Columbia's farmers to make the course accessible to those who are not functionally literate in English.

The Open Learning Institute was contracted to conduct a needs assessment in the Okanagan orchard industry. Most orchardists will require certification due to reliance on a restricted insecticide to control codling moths in apples. As many orchardists speak primarily Portuguese, the Open Learning Agency has developed special lesson plans that are offered at various locations in the Okanagan.

3.3.1.5 Certification program evaluation plan

There is no formal evaluation plan in place to assess the effectiveness of the certification program in improving pesticide practices on British Columbia farms. The ministries involved plan to approach the industry for feedback once the program is underway. In addition, a course evaluation form is included in the certification home study kit for growers to complete on a voluntary basis (Adams 1990).

3.3.1.6 Program enforcement

The Ministry of Environment, Lands and Parks is not allocating additional resources to enforce the certification program at this time. The five year strategic plan for the Pesticide Management Branch states that "about 100 farm sites will be inspected to each year to ensure that farmers trained to use restricted products are in compliance with the Pesticide Control Act" (B.C. Ministry of Environment 1991, p. 7).
CHAPTER FOUR
SURVEY OF OTHER JURISDICTIONS

4.1 CHAPTER OVERVIEW

In order to place the evaluation of British Columbia's new pesticide regulations in a wider context, I surveyed a number of other jurisdictions to determine what other approaches have been taken to pesticide regulation in agriculture. The information presented here was obtained through correspondence and telephone contact with appropriate authorities in Canadian provinces and territories, the states of Washington, Oregon and California, and the U.K.1 A brief summary of this review is presented in Table Two.

4.2 CANADIAN PROVINCES AND TERRITORIES

There is significant disparity among the Canadian provinces and territories respecting pesticide regulation; some regulatory controls are extensive while others are minimal. Pesticide legislation is administered by 'neutral' ministries in all provinces and territories except Saskatchewan and Manitoba where administration remains with the agriculture ministry. Quebec and Ontario have adopted policy to significantly reduce use of pesticides in agriculture; these initiatives are discussed more fully in Chapter Six.

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1See Appendix One for a list of persons contacted.
4.2.1 Grower certification requirements across Canada

Quebec, Ontario and the Northwest Territories have mandatory grower pesticide certification requirements. Newfoundland is in the process of developing a mandatory certification program; the other provinces exempt farmers from certification requirements, although New Brunswick and Alberta are considering mandatory certification.

Certification requirements are most extensive in Quebec and the Northwest Territories where regulations apply to commercial as well as restricted class pesticides. Ontario's regulations presently exclude commercial class pesticides though this exclusion expires in 1996. Regulations in Ontario and the Northwest Territories require certification of any user of pesticides that are subject to certification; Quebec's regulations permit non-certified employees to handle pesticides if a certified applicator supervises the operation.

4.2.2 Grower certification courses

The Ontario certification course is offered throughout Ontario by the Ridgetown College of Agricultural Technology; the significant illiteracy rate among Ontario farmers would have limited the effectiveness of a home study approach (Vinski 1991). The certification exam is offered in four languages other than English to accommodate those growers who are illiterate in English. For those growers who do not read in any language, oral exams are arranged. In Quebec, a home study course for growers was developed by the Ministry of Education; courses are also offered through secondary schools. In addition, Quebec's Environment Ministry recognizes pesticide
courses offered by the Ministry of Science and Technology. As in B.C., recertification in Quebec and Ontario is required every five years.

Though Alberta, Saskatchewan and Prince Edward Island do not have mandatory certification programs, pesticide safety courses are offered to growers on a voluntary basis. In Saskatchewan, both the University of Saskatchewan's Extension Division and the Saskatchewan Institute of Applied Science and Technology offer courses. Alberta has involved a local community college in developing its program. Manitoba is developing a pesticide safety course in conjunction with Assiniboine Agricultural College; the course will be voluntary only.

4.2.3 Monitoring and enforcement of pesticide practices

Enforcement of agricultural pesticide use practices across Canada is generally passive, whether certification is mandatory or not. When Quebec's Pesticide Act was passed in 1987, two employees were allocated to enforce the Act at the farm level across the province. Quebec's Environment Ministry has adopted the position that a balanced combination of enforcement and education is necessary to significantly improve farmers' pesticide practices (Dansereau 1991). There is no formal pesticide inspection program in Ontario at the farm level. However the Environmental Youth Corps will be engaged in compliance monitoring; questionnaires will be administered to growers to determine if pesticide users are in fact certified (Vinski 1991).

Prior to 1990, Saskatchewan had no pesticide enforcement personnel. An official in the Saskatchewan Ministry of
Agriculture and Food stated, "There is a commitment to increase the monitoring and enforcement of pesticide legislation on Saskatchewan farms. An Enforcement Officer was hired in 1990. However, the focus will remain on education and training" (Billett 1991; my emphasis).

4.3 PESTICIDE REGULATION AND CERTIFICATION IN THE UNITED STATES

The three western American states (Washington, Oregon and California) were surveyed for information on pesticide regulations. The literature also provides information on a variety of U.S. legislative initiatives. The three western states were targeted as the nature of pesticide use in agriculture is relatively similar to that in British Columbia; further, these states share similar challenges posed by large numbers of farmworkers who do not read English. The main issues addressed in this section are grower certification and pesticide-related health and safety requirements on farms. Several states have enacted legislation specifically designed to protect the environment from pesticides. These initiatives will be discussed in Chapter Six.

4.3.1 Grower certification requirements

Washington, Oregon and California all require certification of growers purchasing and handling restricted pesticides. Washington and California allow uncertified farmworkers to apply

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2 See Appendix One for a list of persons contacted.

3 For comparative purposes, pesticides classed as "restricted" in the three states discussed here are roughly equivalent to those classed "restricted" in Canada.
restricted pesticides if they are directly supervised by a certified applicator. Recertification is required every five years.

In both Washington and Oregon, pesticide certification courses are developed jointly by the State Department of Agriculture and the State University’s Extension Service. The courses are offered by a variety of organizations, including the State University’s Extension Service, user groups and colleges. The Washington Department of Agriculture offers certification courses in Spanish.

California has not developed specific course materials for certification, though a variety of organizations, including the California Agricultural Personnel Management Association, the Pesticide Applicators Professional Association and the California Farm Bureau conduct training sessions for growers. The certification exam was developed by the California Department of Agriculture and Food in conjunction with the Environmental Protection Agency.

Though the chemical component is emphasized, integrated pest management (IPM) principles are covered in the certification course and exam in California and Washington; it is anticipated that IPM will gain greater emphasis in the program in coming years (Tucker 1991; Magee 1991). Oregon's certification program does not give IPM any particular emphasis (Sandeno 1991).

4.3.2 Occupational health and safety requirements

Enforceable occupational health and safety regulations are more prominent in U.S. than Canadian agriculture.
"In contrast to Canadian practice, both in the United States and North West Europe, agriculture is included in comprehensive programs of education and occupational safety and health regulation. Experience has shown in those jurisdictions that a program of education alone is not as effective as one that combines education with the development of farming standards of safe working practice, inspections and enforcement" (Deloitte Haskins and Sells 1988, Summary).

As U.S. occupational health and safety regulations apply to pesticide handling, it is worth noting key aspects of these programs.

Washington's Hazard Communication Standard (under the Washington Industrial Health and Safety Act) requires growers to provide training to employees on the hazards of chemicals including pesticides. Central to the Standard is the principle of workers' right-to-know. Growers must record details of each pesticide application and of all pesticides stored at the workplace; the State provides specialized forms for this data. In addition, Material Safety Data Sheets must be provided for all pesticides.\(^4\) Recent legislation requires growers to post signs in fields treated with pesticides with a reentry interval greater than 24 hours;\(^5\) these signs must be in English and Spanish. Under the Washington Industrial Health and Safety Act, employers can request free consulting services to ensure health and safety standards are being met; free specialized safety training is also available (Deloitte Haskins and Sells 1988).

\(^4\)Federal legislation in the U.S. and Canada requires manufacturers of hazardous materials to supply Material Safety Data Sheets to promote workplace safety. See Appendix Two, point 1.

\(^5\)Reentry interval refers to the time that must elapse before workers can reenter a field after a pesticide application. Minimum reentry periods are not legislated in British Columbia and are thus not enforceable by the British Columbia Workers' Compensation Board.
Similar to Washington, the Occupational Safety and Health Division is responsible for farmer and farmworker safety training in Oregon. Informational materials and programs are available for Spanish speaking people (Sandeno 1991).

California's Title 3 Code of Regulations provides for perhaps the most stringent safety regulations for agricultural workers. Considerable attention is given to proper pesticide handling. The regulations specify employers' responsibilities for employees who may mix, load, apply, store, transport or otherwise handle pesticides. The comprehensive worker regulations include training, medical care, protective safety equipment, washing facilities, safe working conditions, equipment maintenance, extended worker reentry intervals, field posting and record maintenance (Magee 1991). As an example of the thoroughness of these regulations, employees handling certain pesticides must have the written consent of a physician; the employer must keep detailed records of each handling incident for each employee involved (California Department of Food and Agriculture 1990, Section 6728). For all employees, the employer must provide training in safety procedures, recognition of poisoning and on-farm emergency medical procedures; this training must be repeated each year (California Department of Food and Agriculture 1990, Section 6724).

The California Labour Code applies to farm employees which provides the right to file confidential complaints alleging

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6 This provision applies to organophosphate and carbamate insecticides in particular. These compounds inhibit cholinesterase, an enzyme that is vital to neural transmission in animals; exposure can cause serious physiological damage.
unsafe working conditions; to have complaints promptly investigated; and to be protected from retaliation if a complaint is filed (California Department of Food and Agriculture 1990, Section 6704). In California, labour contractors must be licensed by the state. Crop sheets, safety information series and training are made available to these labour contractors in English and Spanish (Magee 1991).

4.3.3 Public access to pesticide use information

There is a greater commitment to making pesticide use information accessible to the public in the U.S. than there is in Canada. Growers are generally required to keep detailed pesticide use records which are submitted to state agriculture departments. Aside from medical information, all pesticide use records are available to the public (Magee 1991; Sandeno 1991; Tucker 1991).

4.4 PESTICIDE REGULATION AND CERTIFICATION IN THE UNITED KINGDOM

I solicited information on pesticide regulation from U.K. officials in part because the U.K. shares our parliamentary and legal systems. Further, I was aware that the U.K. had taken a somewhat different approach to regulating pesticides in agriculture.

In 1985, the U.K. passed the Food and Environment Protection Act which enabled Government Ministers to make regulations concerning the control of pesticides. Prior to this, pesticide use was largely unregulated. The new Act included a provision that gave a number of Ministries direct and concurrent
responsibility for pesticide regulation; the 1986 Control of Pesticides Regulations were signed by Ministers in six government departments (Johnson 1990). 7

Enforcement of the Regulations is carried out by the Ministry of Agriculture, Fisheries and Food; the Department of Employment's Health and Safety Executive; and Local Authorities. Since 1989, growers born after 1964 have been required to obtain certificates of competence in order to use pesticides on their own farms (Jay 1990). 8 Courses are offered by the Agricultural Training Board and agricultural colleges. Certificates are granted by the National Proficiency Tests Council. Certified growers are required to train their employees in pesticide safety; non-certified growers must be directly supervised if handling pesticides.

The Health and Safety Executive in the U.K. has a similar mandate to British Columbia's Workers' Compensation Board. Its Field Operations Division supervises a national force of 148 agricultural inspectors whose enforcement responsibilities include proper pesticide practice. As part of the Government's commitment to public access to pesticide information, the Field Operations Division publishes a detailed listing of all incidents of human and environmental poisoning investigated by their team each year (Health and Safety Executive 1990).

7These Ministries are: Agriculture, Fisheries and Food; Secretary of State for Employment; Secretary of State for the Environment; Secretary of State for Social Services; Minister of State, Scottish Office; Parliamentary Under-Secretary of State for Wales.

8The Act does not qualify this requirement; presumably certification is required for the use of all agricultural pesticides.
Legislation requires growers to keep detailed records of all pesticide applications and of pesticides stored on their farms. The U.K. has established a Pesticide Usage Survey Group which compiles information on regional and national pesticide use, the amounts applied to each crop, total area treated, methods and timing of application and proportion of crops treated. This information plays a key role in government policy considerations and setting research and development priorities (Jay 1990). The reports of the Survey Group are made available to the public.
Table 2. Summary of pesticide certification requirements in British Columbia and other jurisdictions: Canadian provinces and territories, Washington State, Oregon and California, and the United Kingdom.

<table>
<thead>
<tr>
<th>REGULATION/PROVISION</th>
<th>JURISDICTION</th>
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<tbody>
<tr>
<td>1. Certification requirements for pesticide handlers</td>
<td></td>
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<tr>
<td>Mandatory certification required for all N.W.T. users of both restricted and commercial pesticides</td>
<td>N.W.T.</td>
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<tr>
<td>Mandatory certification required for Quebec users of both restricted and commercial pesticides; non certified employees may use pesticides under supervision of certified applicator</td>
<td>Quebec U.K.</td>
</tr>
<tr>
<td>Mandatory certification required for all B.C. users of restricted pesticides only</td>
<td>B.C. Ontario</td>
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<tr>
<td>Mandatory certification required for California users of restricted pesticides only; non certified employees may use such pesticides under supervision of certified applicator</td>
<td>California Washington</td>
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<tr>
<td>2. Certification courses and exams</td>
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<tr>
<td>Home study certification course</td>
<td>B.C.C Quebec</td>
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<tr>
<td>Classroom certification course</td>
<td>Ontario Washington</td>
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<td>Non-mandatory pesticide safety courses</td>
<td>P.E.I. Alberta Saskatchewan</td>
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<td></td>
<td>Manitoba</td>
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</table>
3. Steps taken to address language barriers

Certification course and exam offered in primary and minority languages
Certification exam offered orally for illiterate students
Pesticide information materials offered in primary and minority languages by government agencies

Ontario
Washington
B.C.
Ontario
B.C.
Washington
Oregon
California

4. Recertification requirements

Recertification required every 5 years

B.C.  
Ontario
Quebec
California
Oregon
Washington

Table Two

Notes:

a. In 1996, Ontario's certification requirements will also apply to commercial pesticides.

b. In British Columbia, recertification is required sooner than five years if the mark achieved on the exam is below a certain standard.

c,d. The certification courses in British Columbia and Quebec were designed as home study courses, but classroom sessions are also available on a limited basis.

e. This program is being developed; it is not currently in place.
5.1 CHAPTER OVERVIEW

In this chapter I first assess the extent to which British Columbia's new grower certification program will address the range of problems associated with pesticide use that fall within its purview. I include recommendations as to how the program could be strengthened. Second, there are several aspects to safe pesticide practice (identified in Chapter Two) that do not fall within the mandate of the certification program. I argue in the latter part of this Chapter that the certification program must be viewed by policy makers within the context of other regulatory limitations, and that these limitations must be addressed in order for the certification program to make a practical contribution to safe pesticide practice. An overall assessment of pesticide regulation in British Columbia is included as an introduction to Chapter Six.

5.2 EVALUATION CRITERIA

The criteria I use to evaluate the grower certification program are derived from the factors contributing to pesticide misuse documented in Chapter Two. In the form of questions, my evaluation criteria are as follows:

i) Is the scope of the certification program sufficiently broad to ensure that all agricultural pesticides are handled only by certified growers and farmworkers?

ii) Does the certification program explicitly emphasize alternatives to pesticides as a means to reduce growers' reliance on pesticides?
iii) Does the certification program impart to growers sufficient knowledge and skills to ensure proper pesticide practice?

iv) Does the certification program provide growers with skills to train their employees in safe pesticide practice?

v) Is the certification course accessible to illiterate growers and farmworkers?

vi) Have sufficient resources been made available to enforce and monitor the new certification requirement?

vii) Is a formal evaluation plan in place to assess the effectiveness of all aspects of the certification program?

5.3 EVALUATION OF THE GROWER CERTIFICATION PROGRAM

As noted in Chapter Three, the grower certification program was designed in recognition that the majority of British Columbia's commercial growers use pesticides, and that it is in society's best interest that these growers handle and apply pesticides safely and effectively. This goal is outlined in the preface to the course materials:

"Everyone who applies pesticides in agriculture has a responsibility to ensure they are knowledgeable about safe practices. Applicators should be trained to protect themselves, co-workers, family, the public and environment. If you are an employer, you must ensure that your workers who apply pesticides are trained in safe practices. This course and the certification exam is intended to satisfy these training requirements ... It is hoped that this course will set the standards for safe and effective use of pesticides in agriculture" (B.C. Ministry of Agriculture and Fisheries 1990, p. 3, p.5).

The grower certification course (ten written lessons with practice quizzes, a practice exam and a video outlining safe application practices) includes a comprehensive range of pesticide safety information. The course has taken relevant information from existing documents prepared by the B.C. Ministry of Agriculture, Fisheries and Food, the Workers'
Compensation Board and the B.C. Ministry of Environment, Lands and Parks, and has been packaged by the Open Learning Institute.

Though the certification course provides a thorough treatment of safe and effective pesticide handling for British Columbia agriculture, there are several aspects of the certification program that will limit the extent to which its goals will be achieved.

5.3.1 Scope of the certification requirement

As discussed in Chapter Three, the grower certification is required only for the purchase and application of restricted class pesticides. Though all growers using the less acutely toxic commercial class pesticides will be encouraged to take the certification course on a voluntary basis, this exemption affects a large number of British Columbia growers. In British Columbia's berry industry, for example, very few pesticides recommended for use by the B.C. Ministry of Agriculture, Fisheries and Food production guide are restricted; and for those that are listed, less toxic alternatives are generally available. Thus berry growers could continue to use a wide range of commercial class pesticides, as in any regular season, and be completely unaffected by the certification requirement. As discussed in Chapter 2.2.1, these less acutely toxic pesticides are by no means free of risk to human and environmental health.

Certification requirements in Quebec, the Northwest Territories and the United Kingdom currently include all pesticide classes. Ontario's certification requirements will apply to commercial class pesticides in 1996.
5.3.2 Course content: Integrated Pest Management

As noted in Chapter 3.3.1.3, the course materials primarily pertain to the actual use of pesticides in agriculture. Only in the last chapter of the course is integrated pest management addressed. The question of how growers decide to use pesticides in first place is not given sufficient profile. The B.C. Ministry of Environment (1991, p. 6) acknowledges this in their strategic plan for pesticide management: "Over the next five years, we will be gradually introducing IPM methods into each category of our pesticide training course."

5.3.3 Does a home study course constitute training?

As noted in Chapter 3.3.1.4, the certification course is designed as a home study course with practice quizzes and an open book exam. It is not likely that a grower could pass the written exam in the allotted time if she had not familiarized herself extensively with the course materials. Exposure to the course materials is clearly an important aspect to improving knowledge about safe pesticide practice. However, at least two observers with experience in pesticide-use training note that there is a danger in assuming that completion of a home study course is equivalent to "training" in safe pesticide practice.

Rex Eaton, an occupational health and safety specialist with the B.C. Workers' Compensation Board, states that certification is only one step, and that training in specific on-farm procedures is needed to ensure that growers learn safe pesticide practices (Eaton 1991). Robin Mullett, who has experience teaching courses for pesticide applicators under previous
regulations, shares Eaton’s view that passing a certification exam does not constitute training, particularly if the grower goes through the course on a home study basis. Mullett feels growers are more receptive to on-site training. Training imparts practical skills, which helps growers gain confidence and develop a professional interest in achieving high safety standards (Mullett 1991).

Mullett points to the course video to illustrate his concerns about the limited training value of the certification course. The video demonstrates safe practices from start to finish of a pesticide application, but in a field crop situation only. This video is thus of limited value to orchardists and greenhouse operators.

Eaton and Mullett argue that the certification course without training will provide an important base of information to growers, but will be of questionable long term benefit in improving pesticide handling practices. Mullett adds that, "The question of how to best meet the needs of the growers themselves was not well addressed" (Mullett 1991).

The Canadian Association of Pest Control Officers (CAPCO) is developing national guidelines for training and certification of agricultural users (Pesticide Registration Review Team 1990). I note that this organization makes a distinction between training and certification. The national training standards developed by CAPCO should be reviewed in British Columbia and applied as appropriate.

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1The short section on protecting groundwater (p. 7-39) is a case in point. It is not likely that a grower, after reading these 20 lines, will have a better idea as to whether or not they have a vulnerable groundwater source on their farm.
As noted in Chapter 3.2.2.4, the B.C. Federation of Agriculture has employed Baldev Seehra, a bilingual (Punjabi-English) pest management professional, to train Punjabi speaking growers in the Fraser Valley in proper pesticide practice. His experience in training these growers over the last few years could provide important insights into requirements for successful pesticide use training.

Oja et al. (1990) note that illiterate farmers and farmworkers share a common need in terms of safe pesticide training, and recommend that farmworkers through the CFU and farmers through growers' associations work together to develop a pesticide safety program that addresses the special needs of illiterate pesticide users.

The Canadian Farmworkers Union has experience training farmworkers in pesticide safety, but was not invited to contribute to the development of the certification program. As the CFU has considerable experience with the specific needs of illiterate farmworkers, this omission is regrettable.

5.3.4 Farmworker training

Under the new regulations, certification is required for any person using restricted class pesticides. It is not legal for a farmworker to handle restricted class pesticides without certification, even if supervised by a grower holding a certificate. However, farmworkers may apply commercial class pesticides without certification. In addition, there are many cases in agriculture where farmworkers work around hazardous pesticides, though they may not handle them directly. The certification course recognizes this, and makes several
references to the need for growers to ensure that farmworkers are made aware of pesticide hazards and safety procedures (see, for example, pages 5-2, 7-2, 7-27). Strongest reference to this need for employee training is made in the preface to the course materials:

"If you are an employer, you must ensure that your workers who apply pesticides are trained in safe practices. This course and the certification exam is intended to satisfy these training requirements" (B.C. Ministry of Agriculture and Fisheries 1990, p. 3.).

I conclude from this that success of the program is dependent to some extent on the ability of certified growers to train their employees in pesticide safety. However, the course materials make no reference whatsoever to techniques for successfully training employees.

In 1990, the federal Pest Control Products Sectoral Committee affirmed the responsibility of employers to train workers at risk of exposure to pesticides (Pesticide Registration Review Team 1990). Eaton (1991), from an occupational health and safety perspective, stresses the importance of training employers how to train employees. This critical link in workplace safety has recently been recognized by U.S. authorities. A new occupational health and safety centre for agriculture in Iowa will, among other programs, "provide health and safety 'train-the-trainer' programs" (Olenchock 1991).

Mullett (1991) notes that "pesticide trainer training" has historically been overlooked in British Columbia, and suggests that this gap in the new certification course must be addressed

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2This committee was struck to coordinate the application of pesticides to WHMIS provisions. It is chaired by Agriculture Canada, and includes labour, industry and government representatives.
if pesticide safety standards are to be significantly improved on British Columbia farms.

5.3.5 Illiteracy and language problems

The certification course and exam are available in English only. At this early stage in the implementation of the program, it is difficult to assess the extent to which growers with language difficulties have been successful in gaining certification. Bilingual instructors have been employed in the Fraser Valley and in the Okanagan to conduct classes for growers with language difficulties. Oral exams have been available on a limited basis for illiterate growers.

Given the extensive illiteracy among British Columbia growers and farmworkers (outlined in Chapter 2.3.3.2), it seems reasonable to expect that not all pesticide users will have successfully completed the certification course. Those in need of restricted class pesticides will either do without, rely on certified neighbours or friends to treat their crops, hire a professional applicator, or apply the pesticide themselves without certification.3

As discussed in Chapter Four, Ontario delivers its certification course and exam in four minority languages; Washington State offers its course and exam in Spanish as well as English.

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3Growers were advised in 1988 that the certification requirement would take effect January 1992. The practice of stockpiling of discontinued pesticides is not unheard of among British Columbia growers. I expect that for some growers who feared they would be unable to pass the certification course, this five year notice period was used as an opportunity to stockpile restricted class pesticides.
5.3.6 Enforcement of the certification requirement

As noted in Chapter 3.3.1.6, no additional government resources will be allocated to enforce the certification requirement. Oja et al. (1990) found that only 25 percent of 90 berry growers interviewed had ever seen a government inspector on their farm. Concern about lack of enforcement of pesticide regulations has been expressed by a number of parties, including some growers. Oja et al. (1990) report that of 55 berry growers interviewed, 75 percent indicated that they would favour regular inspection of on-farm pesticide practices. These growers were primarily interested in ensuring that their industry be protected from pesticide misuse problems, and in gaining information on proper pesticide practice from inspectors.

Deloitte Haskins and Sells (1988) conducted an extensive review of occupational health and safety in British Columbia agriculture in 1988. With respect to pesticides, the authors recommend that the Pesticide Management Branch and the Workers' Compensation Board work cooperatively to address the issue of "how to provide for effective regulation involving inspection at the farm level" (Deloitte Haskins and Sells 1988, p. 98). Their report rejected the B.C. Federation of Agriculture's position that self regulation in the industry was most effective:

"This self regulated approach would likely not be accepted by the public nor by the Canadian Farmworkers Union...The industry would be perceived as placing its own interests ahead of the well-being of the farmworker and acting without benefit of an objective, outside governor to ensure compliance with good safety practice...Emphasis on education would, in all likelihood, greatly overshadow the voluntary inspection and compliance elements of the overall program" (Deloitte Haskins and Sells 1988, p. 95).
The Ontario Task Force on Health and Safety in Agriculture (1985, p. 114) drew this conclusion with respect to regulations, enforcement and pesticide safety:

"If the regulations that are already in place were consistently observed and the information that is already available known and understood by all farmers, there should be little, if any, concern about farmer and farmworker exposure to pesticides. However, in situations in which thousands of people are involved, it may be impractical to expect that either consistent observance or high levels of understanding can be achieved through an almost wholly passive process of regulatory guidelines and comprehensive, but low-key information programs."

The Pesticide Management Branch has indicated that, "About 100 farm sites will be inspected each year to ensure that farmers trained\(^4\) to use restricted products are in compliance with the Pesticide Control Act" (B.C. Ministry of Environment 1991). This does not represent an increase in monitoring over past years.

When Quebec passed its Pesticide Act in 1987, two employees were specifically allocated to enforce the Act at the farm level. Quebec's Environment Ministry has adopted the position that a balanced combination of enforcement and education is necessary to significantly improve farmers' pesticide practices (Dansereau 1991).

Deloitte Haskins and Sells (1988) recommends increased enforcement of pesticide practices, and encourage that an enforcement program be developed cooperatively between the

\(^4\)This Branch administers the legislation governing the certification requirement. I note their assumption that a certified applicator has been "trained." That the agencies responsible do not recognize this distinction suggests that the "training" issue warrants review by program administrators.
Pesticide Management Branch and the Workers' Compensation Board.\textsuperscript{5}

The U.S. and parts of Europe have adopted enforceable occupational health and safety regulations for agriculture. Deloitte Haskins and Sells (1988, Summary) explains the success of this approach:

"In contrast to Canadian practice, both in the United States and North West Europe, agriculture is included in comprehensive programs of education and occupational safety and health regulation. Experience has shown in those jurisdictions that a program of education alone is not as effective as one that combines education with the development of farming standards of safe working practice, inspections and enforcement."

The U.K. has committed substantial resources to enforcement of safety standards in agriculture. The Health and Safety Executive (equivalent to the British Columbia's Workers' Compensation Board) employs 148 agricultural inspectors under its Field Operations Division whose enforcement responsibilities include proper pesticide practice. The Field Operations Division publishes a detailed listing of all incidents of human and environmental poisoning investigated by their team each year (Health and Safety Executive 1990).

Though the above examples refer to enforcement primarily in the context of occupational health and safety, Sandborn (1990, p. 9) notes that increased enforcement of pesticide safety regulations offers greater protection to the environment and the public in addition to pesticide handlers:

"(S)afety regulations will inevitably reduce the environmental impact of pesticides, for the improper and unsafe application of pesticides inevitably increases the

\textsuperscript{5}See 5.6.2 for a discussion of WCB occupational health and safety regulations for British Columbia agriculture.
amount of pesticide that contaminates the environment and the food supply."

Occupational health and safety standards for agriculture clearly fall outside the scope of the certification program. The relevance of occupational health and safety standards to proper pesticide practice will be discussed further at 5.6.2.

5.3.7 Formal evaluation plan for the certification program

Growers are encouraged to fill out a course evaluation form on a voluntary basis. In addition, as noted in 5.3.6 above, the Pesticide Management Branch has indicated that about 100 farms will be inspected each year to ensure farmers using restricted pesticides are in compliance with the regulations.

These two steps combined, however, do not constitute a comprehensive evaluation plan; the responsible agencies have not developed a formal evaluation plan for the certification program.

Important questions raised above regarding the ultimate impact of certification on pesticide practice in the field and the rate of certification for illiterate growers could be answered and effectively addressed if a thorough evaluation was conducted.

5.4 EVALUATION SUMMARY

Here I summarize the conclusions of the program evaluation presented in the preceding section.

5.4.1 Scope of the certification requirement

Commercial class pesticides comprise the largest class of pesticides used in British Columbia agriculture. The program's
ability to ensure that all agricultural pesticide users "are knowledgeable about safe practices" is seriously limited by the exemption of commercial class pesticides.

5.4.2 Course content: Integrated Pest Management

The mandatory certification course provides an opportunity to promote important issues around alternatives to pesticides. IPM represents a direct means of reducing human and environmental health effects from pesticides, yet this topic receives no emphasis and is relegated to the end of course.

5.4.3 Does home study constitute training?

There is no on-farm training component to the certification course. I believe that there is a danger in assuming that completion of a home study course is equivalent to "training" in safe pesticide practice. Training in specific on-farm procedures is needed to ensure that growers learn safe pesticide practices and that they develop a professional interest in achieving high safety standards (Mullett 1991). The course video demonstrates safe practices in a field crop situation only, and is thus of limited value to orchardists and greenhouse operators.

5.4.4 Farmworker training

As noted in the course materials, the success of the program is dependent to some extent on the ability of certified growers to train their employees in pesticide safety. However, no reference whatsoever is made to techniques for successfully training employees.
5.4.5 Illiteracy and language problems

I expect that many of the illiterate growers and farmworkers in British Columbia will not be able to complete or pass the certification course in its present form. If this body of information remains inaccessible to those growers and farmworkers who need it most, the program will clearly not meet its goals.

5.4.6 Enforcement of the certification requirement

Pesticide regulations are poorly monitored at present (Deloitte Haskins and Sells 1988) and no additional resources will be allocated to enforce the new certification requirement.

5.4.7 Formal evaluation plan for the certification program

The agencies responsible for the certification program have not developed a formal evaluation plan for the program. Given the complexity of the industry, the critical importance of achieving the program's goal of safe pesticide practice and the lack of previous experience with such a certification program, I would argue that the certification initiative is seriously undermined without a systematic evaluation of all aspects of the program.

5.5 RECOMMENDATIONS

This section lists specific recommendations that follow from the foregoing evaluation of the certification program.
5.5.1 Scope of the certification requirement

The B.C. Ministry of Environment, Lands and Parks should further amend the Pesticide Control Act Regulations to include commercial class pesticides under the certification requirement, and adjust course materials accordingly.

5.5.2 Course content: Integrated Pest Management

Though safe pesticide handling clearly must be addressed, IPM and alternatives to pesticides must be incorporated throughout the course materials. The Pesticide Management Branch should 'fast track' its plan to introduce IPM into all of its pesticide courses.

5.5.3 Does home study constitute training?

The agencies responsible for developing the certification program must evaluate\(^6\) the extent to which certification improves on-farm pesticide practices to determine: (a) if training is required in addition to certification, and, (b) if needed, what specific aspects of pesticide handling should such a training program address.

The agencies should also review the national training standards developed by The Canadian Association of Pest Control Officers (Pesticide Registration Review Team 1990) and incorporate them as appropriate.

The agencies should utilize the experience and knowledge of Baldev Seehra (see Chapter 3.2.2.4) with regard to the training of Punjabi speaking growers.

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\(^6\) See discussion of formal evaluation of the certification program at 5.3.7.
Farmworkers through the CFU and farmers through growers' associations should work together to develop a pesticide safety program that addresses the special needs of illiterate pesticide users.

The input and involvement of the CFU should be sought in revisions to the program, particularly if a training program is developed.

5.5.4 Farmworker training

The agencies responsible for developing the certification program must evaluate the ability of certified growers to train their employees in safe pesticide practice. Such an evaluation is needed to determine: (a) if growers require training in how to train their employees, and, (b) if needed, how would this training best be delivered to growers.

If farmworker training is deemed necessary, Baldev Seehra should be consulted on this matter as he has extensive experience training pesticide handlers.

Relevant British Columbia authorities should also become familiar with Iowa's "train-the-trainer" program and, if appropriate, incorporate aspects of this program into the certification program.

5.5.5 Illiteracy and language problems

The agencies responsible for the certification program should prepare course materials and exams in the main languages of British Columbia's growers and farmworkers. Prior to

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7 See discussion of formal evaluation of the certification program at 5.3.7.
preparation of these materials in minority languages, other jurisdictions with experience in this aspect of certification should be consulted.

5.5.6 **Enforcement of the certification requirement**

The agencies responsible for the grower certification program should develop a plan to ensure increased government inspection and enforcement of pesticide handling practices. There are several models that British Columbia authorities should review in developing such an enforcement program.

5.5.7 **Formal evaluation plan for the certification program**

The agencies responsible for the program should develop a formal, comprehensive evaluation plan that will assess the effectiveness of all aspects of the program.

5.6 **BEYOND THE CERTIFICATION PROGRAM**

The grower certification program was designed to achieve a specific set of goals relating to proper pesticide handling in agriculture. The assessment and recommendations presented in 5.3 to 5.5 above are directed to this set of stated goals.

In Chapter Two, I identified several aspects of pesticide misuse which do not fall under the mandate of the certification program but which deserve consideration by policy makers in the interests of achieving safe pesticide practice on British Columbia farms. Two issues of particular importance are inadequate pesticide labels and the lack of occupational health and safety regulations for agriculture. These are discussed in turn.
5.6.1 Pesticide labelling

Chapter 2.4.1.2 outlines the critical importance of the pesticide label to applicators, and the extent to which British Columbia growers and farmworkers have difficulty reading and interpreting pesticide labels.

The Ontario Task Force on Health and Safety in Agriculture echoes concerns about pesticide labelling, and reports problems that are not restricted to the user's inability to read English:

"A recurring theme in Task Force discussions at its public hearings was that improved labelling of pesticides would substantially increase care in their use. Related concerns ranged from size of print to inadequate information on the labels. The matter about which most dissatisfaction was expressed was complexity or ambiguity of statement. The requirement is for simple, easy to read, step by step instructions that specify how the product should be used, the symptoms of misuse and the action to be taken if an accident occurs" (Ontario Task Force on Health and Safety in Agriculture 1985, p. 115).

The federal Pesticide Registration Review Team has recommended to the federal government that labelling standards be changed (see Appendix Two, Point d). The Review Team's proposals include that: pesticide labels be revised to provide WHMIS panels for health and safety information; the telephone number of a Pesticide Information Centre be provided; entry and re-entry periods be included; and federal and provincial agencies cooperate to develop supplemental information sheets on health, safety and environmental matters, to be printed in additional languages as appropriate. Sandborn (1990) has also called for supplemental pesticide sheets to be made available in the language used by farmworkers and farmers.

Kansky (1990) and the Canadian Environmental Network Pesticide Registration Review Caucus (1990) have called for further steps
to improve accessibility of information on labels to all pesticide users. They recommend that labels be available in the languages that are most common to the users and farmworkers, and that labels contain internationally recognized pictograms to enable use by those who are illiterate.

Kansky (1990) and the Canadian Environmental Network Pesticide Registration Review Caucus (1990) also call for specific label information regarding protection of human and environmental health, including buffer zone requirements and the use of protective gear. This would address current inadequacies. As the British Columbia's certification course materials point out, "Often more protective clothing may be needed than is mentioned on the label" (B.C. Ministry of Agriculture and Fisheries 1990, pp. 6-3).

Pesticide labelling falls under federal jurisdiction; that is, a pesticide may not be registered in Canada unless it meets specific labelling requirements. The province, however, may be able to legislate further standards for pesticide labels. Castrilli and Vigod (1987, p. 120) note that provinces may have considerable authority to legislate with regard to pesticides:

"To the extent that there is overlap between federal and provincial legislation, for example with respect to use, a long line of decided cases indicates that as long as compliance with provincial law does not result in violation of federal law, both may stand. Therefore, the provinces will usually be able to set more stringent requirements within their legislative competence."

Given the particular problems British Columbia growers and farmworkers face with respect to illiteracy, and the heavy reliance of users on labels for safety information, the province should consider developing, in conjunction with the
federal government, a new set of enforceable labelling standards for pesticides that will be sold and used in British Columbia.

5.6.2 Occupational health and safety regulations for agriculture

Several industry observers have suggested that acceptable standards of safe pesticide practice will not be achieved on British Columbia farms without enforceable occupational health and safety regulations in the industry (Deloitte Haskins and Sells 1988; Sandborn 1990; Oja et al. 1990; Moses 1988). As discussed in Chapter 3.2.2.2, the agriculture industry is exempt from occupational health and safety regulations of the B.C. Workers' Compensation Board.

The mandate of the Workers' Compensation Board reveals how mandatory coverage of the agriculture industry would be an important compliment to the grower certification program in achieving improved pesticide practice:

"(A)ccident prevention is a prime responsibility of the Board...the Board functions on the basis of a dual and concurrent philosophy of accident prevention based on standards of effective safety management tied to education and a regulatory process to ensure that standard practices are followed (Deloitte Haskins and Sells 1988, p. 4).

Deloitte Haskins and Sells recommends that the WCB and the Pesticide Management Branch of the Environment Ministry develop a cooperative approach to the delivery of occupational pesticide regulations. They state:

"We do not necessarily favour the prospect of two separate agency inspectors - one concerned with pesticides and the other with all other work practices - as it is difficult to segregate these from an occupational aspect. While we understand that the Pesticide (Management) Branch has responsibility for pesticide management, one approach would be to provide for WCB enforcement of occupational
regulations within a protocol agreement between the two agencies" (Deloitte Haskins and Sells 1988, p. 98).

The Deloitte Haskins and Sells report includes a range of recommendations regarding an appropriate implementation plan for the introduction of occupational health and safety regulations which takes into account the unique nature of the agriculture industry.

The WCB is equipped with both the mandate and the resources to ensure that standards for safe pesticide use are met on British Columbia farms. For example, regulations could require provision and inspection of pesticide safety equipment, inspection of pesticide application equipment, formal accident reporting systems, mandatory posting of treated areas, provision of pesticide safety materials in minority languages.

Clearly the goal of achieving safe pesticide practice on British Columbia farms will not be achieved through a certification program that is implemented in the absence of enforceable occupational health and safety regulations.

5.7 BRITISH COLUMBIA'S PESTICIDE REGULATIONS:
OVERALL CONCLUSIONS

The most significant aspect of the 1988 amendment to British Columbia's pesticide regulations is that anyone purchasing or applying restricted class pesticides must be certified after January 1st, 1992.

As noted in Chapter 4.4, the U.K. addressed problems with overlapping jurisdiction in pesticide regulation by ensuring that the regulation was signed by Ministers of six government departments, including environment, agriculture, social services and employment. This approach to pesticide regulation warrants consideration in British Columbia.
Given that agricultural users of restricted class pesticides have previously required no education or training in proper pesticide practice, this regulation clearly represents a significant improvement in public policy. I would argue, however, that the British Columbia government missed an important opportunity to implement pesticide policy that would more effectively address pesticide misuse problems in British Columbia agriculture and set a clearer direction for pesticide management overall. As considerable resources are required to amend regulations and develop and implement a certification course on the scale of the present program, I believe it would have been beneficial to have taken a longer term, proactive approach to pesticide regulation when the amendment was passed in 1988.

Reduced reliance on pesticides will necessarily reduce the degree of risk associated with their use. Further, agricultural systems that shift away from reliance on pesticides become inherently more sustainable. Policy initiatives that could promote a more sustainable agriculture in British Columbia are presented in the final chapter.
CHAPTER SIX
PESTICIDE POLICY AND SUSTAINABLE AGRICULTURE

6.1 CHAPTER OVERVIEW
As noted in Chapter Five, recent amendments to British Columbia's pesticide regulations address immediate problems of unsafe and inefficient use of pesticides. The grower certification program that arose from this policy initiative clearly represents a step towards improved human and environmental protection from pesticide poisoning. As outlined in Chapter One, however, a growing number of observers are arguing that pesticide regulation must begin to take place within a broader context of sustainable agriculture, and must be predicated on a goal of minimizing use of pesticides in food production. This chapter presents a variety of policy options that would promote a shift towards minimized reliance on pesticides. These are based on current initiatives in other jurisdictions and on recommendations of various authors, and are presented for consideration by policy makers in British Columbia. This chapter concludes by noting that in order to significantly minimize reliance on pesticides, alternatives to the whole system of agriculture must be found, not just alternatives to the subsystem of pest control.

6.2 WHAT IS SUSTAINABLE AGRICULTURE?
Defining the term sustainable agriculture is as problematic as defining its parent, sustainable development. As Francis (1990) notes, the term has been widely adopted in the agriculture industry, and represents everything from organic farming to
maximum economic yields. For the purposes of this discussion, I have adopted the following working definition of sustainable agriculture:

"Sustainable agriculture is a philosophy based on human goals and on understanding the long-term impact of our activities on the environment and on other species. Use of this philosophy guides our application of prior experience and the latest scientific advances to create integrated, resource-conserving, equitable farming systems. These systems reduce environmental degradation, maintain agricultural productivity, promote economic viability in both the short and long term, and maintain stable rural communities and quality of life" (Francis 1990, p. 97).

6.3 THE SUSTAINABILITY OF CONVENTIONAL AGRICULTURE

As outlined in Chapter One, the widespread adoption of pesticides during the 1940s was concurrent with a fundamental shift in agricultural practice. Encouraged by government crop subsidy programs, agriculture became both more extensive (more and more land was cultivated) and intensive (higher outputs per unit of land were achieved via monocropping and replacing labour with chemical, mechanical and fossil fuel inputs) (Reichelderfer 1990; Perkins 1985; Reganold et al. 1990). This intensive agriculture is what is now known as conventional agriculture.

6.3.1 Problems in conventional agriculture

Five decades after this shift in agricultural practice, myriad problems must now be addressed: soil erosion, soil depletion, loss of wetlands and wildlife habitat, contaminated and depleted groundwater, reduced biodiversity, pesticide reliance, reduced profitability. Reliance of current systems on fossil fuels,

1Sustainable agriculture is also commonly referred to in the literature as low input agriculture, regenerative agriculture, agroecology, and alternative agriculture.
both as an energy input and as a primary ingredient in fertilizers and pesticides poses additional problems. Daly and Cobb (1989, p. 273) explain why this reliance is of concern: "Sometime in the next 40 years the cost of oil will necessarily rise to the point where the present agricultural system will collapse."

I will not detail here the many aspects of conventional agriculture that are unsustainable. I will note, however, one of the most significant exposures of the problems inherent in current agricultural practice: recognizing declining economic, environmental and social circumstances in U.S. agriculture, the U.S. National Research Council (1989) undertook a major study of the structure of U.S. agriculture and its problems. The report, titled *Alternative Agriculture*, identified a series of policy changes that needed to be considered to promote a shift away from unsustainable practices.

### 6.3.2 Pesticides in conventional agriculture

As discussed in Chapter 2.2.4, agricultural systems became reliant on pesticides as traditional cultural practices were abandoned in favour of monocropping. Pest resistance and the loss of natural predators and parasites resulted in a 'pesticide treadmill' where pesticide applications necessitated further pesticide applications. Pesticides presently play a key role in enabling conventional agricultural systems to function:

"Advent of the synthetic pesticides has encouraged a restructuring of agricultural practice. Pesticide application has become an integral part of agricultural technique. Consequently, yields and quality of most crops now grown in Canada could not be sustained if pesticide use were suddenly withdrawn, accompanied by no other changes in agricultural practices" (Hall 1981, p. 4).
6.4 THE INFLUENCE OF POLICY IN CONVENTIONAL AGRICULTURE

"In many countries, growing recognition of the relationship between government policies and environmental quality has led to increased scrutiny of farm programs, and with good reason" (Reichelderfer 1990, p. 33).

Many authors have noted the key role of agriculture policy in promoting and entrenching unsustainable agricultural practices (Reganold et al. 1990; U.S. National Research Council 1989; McRae et al. 1990; Pimentel et al. 1991; Reichelderfer 1990).

The U.S. National Research Council (1989, p. 6) notes that:

"A wide range of federal policies, including commodity programs, trade policy, research and extension programs, food grading and cosmetic standards, pesticide regulation, water quality and supply policies, and tax policy, significantly influence farmers' choices of agricultural practices. As a whole, federal policies work against environmentally benign practices and the adoption of alternative agricultural systems, particularly those involving crop rotations, certain soil conservation practices, reductions in pesticide use, and increased use of biological and cultural means of pest control."

A striking example of the effect of food policy on agricultural practice follows. Research by Pimentel et al. (1977) revealed that U.S. laws which set higher cosmetic standards and lower tolerance levels for insect parts in food products resulted in a 10 to 20 percent increase in insecticide use with the following effects: a greater proportion of food contaminated by pesticides; a greater number of human pesticide poisonings; continued environmental pollution from insecticides; increased use of energy in pesticide control; increased food costs for the consumer; increasing crop losses as a greater proportion of food is classified unfit for commercial sale.
6.5 SUSTAINABLE AGRICULTURE: THE ROLE OF POLICY

As we recognize the enormous role agriculture policy has played in bringing about an unsustainable food production system, and as we seek solutions, it is critical that we recognize the equally large role policy can play in changing this system. This section presents some of the pesticide policies adopted by other jurisdictions or suggested by industry analysts that will promote a shift towards a more sustainable agriculture.

6.5.1 Pesticide reduction policies

At least three European countries have adopted policy to reduce agricultural pesticide use: in 1985, Denmark made a commitment to reduce pesticide use by 50 percent in 12 years; Sweden approved a program in 1988 to reduce pesticide use by 50 percent within five years; the Netherlands is developing a program to reduce pesticide use by 50 percent within 10 years (Pimentel et al. 1991).

Both Quebec and Ontario have adopted policies to reduce the use of pesticides in agriculture. Quebec's Pesticides Act (1987) goes so far as to require the Minister of Environment to devise and propose programs "fostering a decrease in and the rationalization of the use of pesticides" (Quebec Pesticides Act, Chapter II, section 8).² These programs are to assess the effects of pesticides on human and environmental health and to contribute to the development of alternatives to the use of pesticides. In 1988 the Ontario Ministry of Agriculture and

²Prior to the adoption of Quebec’s progressive Pesticides Act of 1987, pesticide use in the province was essentially unregulated.
Food published a policy document committing the province to a 50 percent reduction in the use of agricultural pesticides within 15 years. This will be achieved primarily through increased research into alternatives to pesticides, education and increased extension services to farmers, all of which have required financial commitments from the Ontario government (Vinski 1991).

Pimentel et al. (1991) conducted a study of the environmental and economic impacts that would result if pesticide use in U.S. agriculture was reduced by half. Based on a study of 40 major crops, the authors report that a 50 percent reduction in pesticide use would cost about $1.0 billion in the implementation of alternative controls. But this total is small compared to the $2 to $4 billion pesticide use costs the U.S. economy annually through damage to human and environmental health. The authors conclude that:

"...if one assumes that reducing pesticide use by 50% might also eventually reduce the environmental and public health risks from pesticides from one quarter to one half, then the added costs for the nonchemical alternatives ($818 million) would be approximately offset by the reduced environmental and public health risks..." (Pimentel et al. 1991).

6.5.2 Economic incentives

The West Coast Environmental Law Research Foundation recently completed a report titled Preventing Toxic Pollution: Toward a British Columbia Strategy. Pesticides are addressed as non-point sources of toxic pollution. The authors recommend that the province "implement economic incentives and disincentives to the use of pesticides" (Sandborn et al. 1991, p. 64).
In 1977, a group of researchers addressed this very question at a symposium titled *The Practical Application of Economic Incentives to the Control of Pollution*. Several researchers addressed pesticides specifically; a summary of their conclusions follows.

Nicol and Heady (1977) note that since agricultural pesticides are non-point sources of pollution, economic incentives to control pesticides must be applied at the point of purchase in order to effectively prevent pollution. They suggest that economic incentives may be used selectively to offset price differentials between environmentally desirable chemicals and cheaper, less desirable chemicals. Nicol and Heady also note that many pesticides are used as insurance rather than as treatment. That is, growers will pay to apply pesticides to protect their crop from an expected level of crop loss from pests. Nicol and Heady consider this approach to be economically sound but ecologically burdensome. To counter this pattern, they propose an insurance system that requires growers to pay premiums to cover costs of pesticide application; compensation; and supervisory personnel that would both evaluate damages and determine when pesticide applications were warranted.

Carlson (1977) concurs that pesticide purchase taxes can be effective in reducing quantities used. However, Carlson notes the difficulty in applying tax levels which accurately reflect the environmental costs associated with a given pesticide, as these environmental costs are not well understood. He also notes that lower administrative costs are incurred if the input is taxed as opposed to the final product (that is, it is more
cost efficient to tax the pesticide at the point of purchase as opposed to taxing produce at the supermarket).

Campbell (1977) developed an economic model to compare the effectiveness of taxes and regulatory mechanisms in limiting pesticide use in the Okanagan Valley. As the results of his comparisons were not conclusive, he recommends that the administrative and enforcement costs of these two approaches be compared in order to develop the least expensive pesticide-reduction program.

Pesticide purchase taxes have already been imposed in some jurisdictions. As part of Iowa's 1987 Groundwater Protection Act, taxes levied against the sale of pesticides are used to fund the Leopold Center for Sustainable Agriculture (Reganold et al. 1990).

Sandborn (1990, p.2) recommends a similar fund be created in Canada:

"A tax or surcharge should be placed on all registered pesticides. The monies raised should be applied to a "sustainable agriculture" fund. This fund would finance research into alternative methods of pest control."

6.5.3 Regulating pesticides with high pollution potential

A number of American states have adopted legislation that provides environmental protection from pesticides. Regulations in Washington include a list of pesticides that are declared "restricted" based on their potential to contaminate groundwater (Washington Administrative Code 16-228-164). California's regulations also list, by management zone, those pesticides with potential to pollute groundwater. In addition, "several U.S. states, including Wisconsin, Iowa, Minnesota, South Dakota and
Montana have passed ground water protection laws that restrict pesticide use or modify current application patterns" (Kansky 1990).

6.5.4 Federal pesticide registration

Sandborn (1990, p. 4) notes that federal registration criteria could be altered to reduce unnecessary risk to public and environmental health: "One of the criteria for registration of any pesticide should be that no product can be registered if a safer, effective pest control product or control strategy is available."

6.5.5 Organic food standards

In order to support growers shifting away from pesticide use, efforts must be made to support the marketing of their produce. Currently there are no regulations enabling certification of organically grown produce in British Columbia, though government is in the process of developing regulations in conjunction with the province's organic food industry (Helmersen 1991).

6.6 BEYOND PESTICIDE REGULATION: THE CHALLENGES OF ACHIEVING SUSTAINABLE AGRICULTURE

The preceding section discusses a variety of policy initiatives that could be implemented as short term measures to promote a shift away from reliance on pesticides. It is doubtful, however, that these independent steps will achieve a pesticide-free agriculture. The current design of conventional agricultural systems will prevent this.
Hill (1990) argues that high levels of pests in crops need to be seen as indicators of a poorly designed agricultural system, one that has seriously disrupted natural ecological balances. Hill notes that the only successful way to reduce reliance on pesticides is to redesign entire agricultural systems so that they better reflect pre-agricultural ecosystems. Boerma (1984, p. 218) concurs, noting that "if we are serious about finding alternatives to current pesticide use, we must consider alternatives to the whole system of agriculture, not just to the subsystem of pest control."

Jackson and Piper (1989, p. 1591) are more direct: "Our subject here is the problem of agriculture, not problems in agriculture."

If reduced reliance on pesticides in agriculture is to be achieved, the real challenge faced by policy makers is that of redesigning current agricultural systems. It is beyond the scope of this thesis to discuss these broader questions in detail. However I will mention that some jurisdictions have taken steps towards developing policy that will reorient agriculture. One notable example follows.

The University of California (Santa Cruz) has developed an Agroecology Program which investigates the ecological, social and economic basis for sustainable agriculture. Among a variety of 'scientific' courses are courses such as "Preserving California Agriculture: Policy Options for the Future." The mandate of this program is sufficiently broad to begin to address the fundamental barriers to sustainability in agriculture.
6.7 SUSTAINABLE AGRICULTURE IN BRITISH COLUMBIA: IS IT FEASIBLE?

Policy makers considering a significant shift towards promoting sustainable agriculture in British Columbia will no doubt be challenged by practitioners of conventional agriculture, who have historically maintained that low input agriculture is not economically viable. Numerous recent reports from industry observers, however, indicate that this is not the case. The 1989 U.S. National Research Council Report, Alternative Agriculture, as noted by Reganold et al. (1990, p. 115), "is perhaps the most important confirmation of the success of farms that rely on biological resources and their beneficial interactions instead of chemicals." Francis (1990) notes that the organic food business is the fastest growing sector of the food industry in the U.S. Francis also notes that the notion that low input methods are only suitable for small scale farmers has been proven a myth. Pimentel et al. (1991), McRae et al. (1990) and McRae et al. (1989) all observe that low input agricultural systems are economically viable.

The agriculture industry is a long way from consensus as to the direction agriculture should be heading. The following illustrates the divergence of views: In 1991, the B.C. Federation of Agriculture's magazine included a guest editorial by the president of the Crop Protection Institute of Canada which says: "The chemical pesticide industry should adopt the motto 'silence is not golden' and make a greater effort to convince Canadians of the benefits of responsible pesticide use...CPIC is trying to educate the government, public interest groups and consumers about the need for new technology if we are to advance. Yet many activists insist they would rather see a wide variety of new non-chemical alternatives" (King 1991, p. 8).
6.8 TOWARDS SUSTAINABLE AGRICULTURE IN BRITISH COLUMBIA

In 1991, the B.C. Ministry of Environment, Lands and Parks issued its strategic plan for pesticide management. This plan sets a goal for a 25 percent reduction of pesticide use in 10 years, but does not include a detailed strategy for how this goal will be achieved. The plan allocates $200,000 for research into integrated pest management methods, and states that "over the next five years, we will be gradually introducing IPM methods into each category of our pesticide training courses" (B.C. Ministry of Environment 1991, p. 6).

These steps, in conjunction with the new grower certification course discussed in previous chapters, are important steps towards reducing risks from pesticide use in agriculture. I assert, however, that policy makers have not yet begun to address the question of how policy can be used to promote a shift towards a truly sustainable agriculture in British Columbia. Attention must be given to the experience and leadership of other jurisdictions as we begin to reorient agriculture policy towards this goal.

* * *

"We should take heart for it is not just the ecologists who know the story. At some level nearly everyone knows that care of the earth is our real work, more than shuttling into space or bioengineering for some ideal feedlot pig" (Jackson and Piper 1989, p. 1593).
REFERENCES CITED


California Department of Food and Agriculture. 1990. *1990 extracts from the Food and Agricultural Code and Title 3 Code of Regulations.* Sacramento: California Department of Food and Agriculture.


Eaton, R. 1991. Research and Standards Department, Occupational Safety and Health Division, B.C. Workers' Compensation Board. Personal communication. March 5.


_______. 1990b. Toxic herbicide found in B.C. wells, papers show. The Vancouver Sun. October 5.


Magee, R. 1991. Associate Director, California Department of Food and Agriculture. Personal communication. February 28.


APPENDIX ONE

PERSONS CONTACTED REGARDING
PESTICIDE REGULATIONS IN OTHER JURISDICTIONS

CANADA

Alberta

Neil Wandler
Pesticide Management Branch
Ministry of Environment
Letter, February 28, 1991

Saskatchewan

Doug Billett
Supervisor, Crop Protection Section
Ministry of Agriculture and Food
Letter, February 12, 1991

Manitoba

Joanne Buth
Weeds Specialist
Ministry of Agriculture
Telephone interview, August 23, 1991

Ontario

Violet Vinski
Environmental Scientist
Hazard Contaminants Branch
Ministry of Environment
Telephone interview, July 24, 1991

Quebec

Pierre-Paul Dansereau
Direction du milieu agricole et
du controle des pesticides
Ministere de l'Environnement
Letter, May 27, 1991
Newfoundland

Richard Martin
Manager, Pesticides Control Section
Department of Environment and Lands
Letter, February 12, 1991

Nova Scotia

Letter/telephone calls as yet unanswered

New Brunswick

W. A. Sexsmith
Director, Pesticides Control
Department of the Environment
Letter, March 15, 1991

Prince Edward Island

Brian Craig
Pesticide Specialist
Department of Agriculture
Telephone interview, August 15, 1991

North West Territories

Lorne James
Inspector, Pesticide Act
Ministry of Renewable Resources
Letter, February 12, 1991
UNITED STATES

Washington

Margaret Tucker
Chief, Certification and Training
Washington Department of Agriculture
Letter, February 14, 1991

Dan Locke
Industrial Hygienist
Washington Department of Labor and Industries
Letter, April 1, 1991

Oregon

James Sandeno
Registration/Certification Supervisor
Plant Division
Oregon Department of Agriculture
Letter, February 27, 1991

California

Rex Magee
Associate Director
California Department of Food and Agriculture
Letter, February 28, 1991

UNITED KINGDOM

Corinna Jay
Pesticides Safety Division
Ministry of Agriculture, Fisheries and Food
Letter, November 27, 1990

Dr. S. A. Johnson
Pesticides Registration Section
Health and Safety Executive
Department of Employment
Letter, October 9, 1990
The following is a summary of those recommendations of the federal Review Team that have particular relevance to pesticide regulation in B.C.:

a) That a Pest Management Regulatory Agency be established to regulate pest control products (p. 5, Section 2.1). This takes sole responsibility for registering pesticides away from Agriculture Canada, thus removing perceived conflict of interest.

b) That a Pest Management Promotion Office be established under Agriculture Canada to, among other things, promote judicious use of pesticides and encourage the development of viable ecologically sound pest management strategies (p. 7, Section 2.3).

c) That the Pest Management Regulatory Agency make available to the public summaries of health, safety and environmental data prepared by the Agency. The public may request data submitted by the company once a Confidentiality Undertaking Form is signed (p. 13, Section 3.4).

d) That labels clearly and prominently provide information necessary to ensure safe use in both official languages; that the phone number to a new Pesticide Information Centre be included; that information on toxicity to bees be included; and that the Agency, in consultation with provincial authorities, develop supplemental information sheets on health, safety and environmental matters, to be printed in additional languages as appropriate (p. 27, Section 5.5).
e) That Material Safety Data Sheets meeting Workplace Hazardous Material Information System (WHMIS)\(^1\) standards be provided by the supplier for all pesticides intended for use in a workplace, including farms that employ workers; that users of pesticides who employ workers be required to train these workers; and that pesticide labels include WHMIS-style panels for health and safety information (p. 28, Section 5.6).

f) That the Agency, in cooperation with the provinces, develop minimum national guidelines addressing a wide range of pesticide safety issues for vendors and users of pesticides. "In areas of provincial jurisdiction these guidelines may then be considered by the provinces for inclusion in their provincial legislation" (p. 31, Section 7.1; my emphasis).

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\(^1\)WHMIS was established in 1988 under the federal Hazardous Products Act to protect workers from the adverse effects of hazardous materials through provision of relevant information. Under the Act, pesticides were exempted as it was deemed they were adequately regulated under other legislation. Thus pesticide suppliers currently are not required to provide Material Safety Data Sheets.