# ECONOMIC PROGRESS AND CHANGES IN THE STRUCTURE OF CANADIAN AGRICULTURE

#### by

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### ABSTRACT

This study is based on the hypothesis that (1) economic progress has altered the input structure of Canadian agriculture and (2) that this alteration has been associated with growth in the economic efficiency of the industry. The method used to test this hypothesis has been to measure changes in; (1) the absolute and relative importance of inputs; (2) the absolute and relative importance of various categories of output and (3) the economic efficiency of Canadian agriculture over the period 1926 Inputs have been divided into eight categories. to 1952. viz., labor, land, non-land capital, cost of operating farm machinery, depreciation, taxes, fertilizers and miscellaneous items. Output was divided into four broad categories of; crops, livestock, forest products and house rent. Efficiency was measured as the ratio of total output to total input within a given year.

The results of the study strongly support the hypothesis. They indicate that economic progress has resulted in significant shifts within the input structure of Canadian agriculture as follows: (1) A decline in the absolute and relative importance of labor; (2) A decline in the relative importance of land; (3) A large increase in the relative and absolute importance of capital input. This shift in input structure has resulted in only a small change in the total of all inputs (about 10 percent over the whole period). On the other hand, the total volume of output has increased about 40 percent in the period under study. Consequently the ratio of output to input (economic efficiency) has increased in the same period by about 30 percent.

Thus the indications are that economic progress has resulted in significant adjustments in Canadian agriculture. These adjustments cannot, however, be viewed as independent events. They are part of a change resulting from technological development and the economic growth of the Nation. Thus changes in the structure and the economic efficiency in the agricultural sector of the economy are dependent upon events in the other sectors of the economy. The results of the empirical study in this thesis indicate where emphasis might be placed in order that the economic efficiency of agriculture may continue to increase.

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# ECONOMIC PROGRESS AND CHANGES IN THE STRUCTURE OF CANADIAN AGRICULTURE

#### CHAPTER I

#### INTRODUCTION

The desire for economic progress is one of the most significant motivating forces of human existence. Different societies have progressed at different rates and times in their history. Canada has been one of the nations which have achieved comparatively rapid economic progress in the last two or three hundred years; and Canadian agriculture has been a significant contributor to, as well as a benefactor from the nation's economic growth.

As a consequence of economic progress, many structural changes have taken place in the different sectors of the economy. This study is concerned with an hypothesis based on such a structural change in the agricultural sector of the Canadian economy. The hypothesis is: (1) economic progress has altered the Canadian agricultural input structure and that, (2) this alteration has been associated with an increase in the efficiency (ratio of output to input) of the industry. Although several researchers have advanced this hypothesis and some testing of it has been done, there has not been an empirical study designed to show to what extent and in what direction economic progress has altered the input structure, output and efficiency of Canadian agriculture. It is therefore proposed in this study to measure these changes over the period 1926 to 1952.<sup>1</sup>

It is necessary first to define or explain the concepts of economic progress, structure, input, output and efficiency as used in the hypothesis. Because economic progress is a broad concept involving a large number of social aspects, Chapter II has been devoted to presenting a short resume of the different concepts advanced by both classical and modern economists. This definition serves as a starting point and a guide to an understanding of the

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<sup>&</sup>lt;sup>1</sup> This period of only twenty-seven years is taken because, prior to 1926, some of the data are not available or, at best, are only rough estimations. However, this should not be a very serious handicap, since most of the adoptions of many of the technological developments that have precipitated the structural changes in Canadian agriculture took place during the period 1926 to 1952.

meaning and implications of the hypothesis. The term structure refers to: (1) the change in the absolute amount of any one class of input or output from one year to another (i.e. change in absolute importance); or (2) the relationship of one input to all other inputs, or of one class of output to total output (i.e. relative importance). The word input refers to an agent or a factor of production which is employed in agriculture. The term output, as used in this study, includes all agricultural products sold for cash or consumed at home each year. Efficiency is determined as the ratio of output to input in any given year. The methods by which inputs, output and efficiency were measured are presented under their respective headings in the different chapters of the thesis.

The latter part of the thesis deals with the implications of the results of the empirical study and the ways in which these results may be employed so as to achieve or maintain the desired rate of economic growth.

Finally, it should be mentioned that this analysis is concerned entirely with secular changes in the input and output structure and the efficiency of Canadian agriculture. It was necessary, therefore, to abstract from short run changes that are caused by variations in short period factor prices, and any instability in agricultural output associated with the vicissitudes of nature.

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### CHAPTER II

### ECONOMIC PROGRESS

#### Concept of Economic Progress

The concept of economic progress can be explained in terms of the processes and conditions which contribute to economic growth. Thus, Boulding defines economic progress as consisting in "...an improvement in the efficiency of the use of means to attain ends."<sup>1</sup> Economic progress is concerned with the creation and adoption of processes which will increase the supply and accumulation of material things which satisfy human wants. It is concerned with the means in achieving these wants and not in the wants themselves.

The significance of economic progress arises from the fact that society's means of achieving wants are modified by time and nature. Thus the achievement of a desired amount of a given product may be restricted by the available resources and by the limited number of hours per day that human beings can work. Economic progress reduces

<sup>2</sup> Loc. cit.

<sup>&</sup>lt;sup>1</sup> K. E. Boulding, <u>The Economics of Peace</u>, New York, Prentice Hall, 1945, p. 74.

the restrictions on production imposed by the scarcity of resources, and extends the total amount of output produced per man hour.

## Conditions Necessary for Economic Progress

The conditions which make economic progress possible have been stated by both classical (particularly J. S. Mill) and modern economist, and may be summarized as follows: (1) Economic progress is made possible because of the "...perpetual, and so far as human foresight can extend, the unlimited growth of man's power over (2) Economic progress is possible only when nature." there is security of persons and society. Since economic progress consists in the improvement and accumulation of capital goods, there must be security of persons and property (the right of ownership and use of physical possessions) if economic progress is to take place. As society advances, the individual is protected from other individuals by legislation and police; from the government by better institutions; and from natural hazards by insurance

<sup>1</sup> J. S. Mill, <u>Principles of Political Economy</u>, New York, D. Appleton and Company, 1909, II, 271-301.

<sup>3</sup> Boulding, <u>op. cit.</u>, pp.78-79.

<sup>&</sup>lt;sup>2</sup> Ibid., p. 273.

and technological advances which reduce production varia-(3) For a nation to advance economically there bility. 2 must be greater cooperation between its individual members. and at the same time, the customs and manners must be flexible enough to accept and encourage innovations. The most rapid progress throughout the history of the world has taken place in societies where individual or group innovators found an atmosphere conducive to change and a willingness to accept new and better methods of satisfying human This implies that individuals or groups of indiwants. viduals must not hamper the free play of competition between new and old methods, i.e., "...superior methods must displace inferior methods if progress is to take place. and the operators of inferior methods must therefore be driven out of business." (4) A nation must consume less than it produces for, as has been stated above, economic progress requires the accumulation of capital. Consequently, the consumption of goods as soon as they are produced is not conducive to economic development. Historically, societies which have encouraged frugality have

- <sup>1</sup> Mill, <u>loc. cit</u>.
- <sup>2</sup> Ibid., p. 213.
- <sup>3</sup> Boulding, op. cit., pp. 78-90.
- <sup>4</sup> Ibid., p. 92.

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been the ones which have achieved the most rapid economic 1 growth.

Therefore, "it is evident that the rate of economic progress is very closely allied to the social and political environment of a society...where property is secure, government responsible and stable, and customs and manners highly flexible and subject to change, economic progress is likely 2to be rapid."

#### Characteristics of Economic Progress

Economic progress is characterised by growth of: (1) population, (2) capital and (3) production skills. The relationship between the rate of growth of these three characteristics determines the changes in the amounts used and the prices paid to each of the factors of production. Two cases may be cited to illustrate this fact.

1. In the case where population is increasing while capital and production skills are kept constant, the owners of capital and land will benefit; because, under this condition, wages will fall since the supply of labor is

<sup>1</sup> Mill, <u>loc. cit</u>.

<sup>2</sup> Boulding, <u>op</u>. <u>cit</u>., pp. 78-79.

<sup>3</sup> Mill, <u>loc</u>. <u>cit</u>.

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increased while the demand for it does not increase. Profits will rise because the fall in wages enables owners of capital to obtain a larger share of the total product. Rent will also rise because, to meet the additional demand for food, land of poorer quality will have to be used for production.

2. In the more general case, however, where population, capital and production skills may be increasing; and where increasing demand for food is satisfied by a corresponding increase in the supply of food, then there will be "...a greater aggregate production, a greater produce divided among the labourers and a larger gross profit; but the wages being shared among a larger population, and the profits spread over a larger capital, no labourer is better off, nor does any capital derive from the same amount of capital a greater income."

# Economic Progress and Agriculture

Economic progress in agriculture is a result of the acquisition of knowledge which improves the production process and the dissemination of this knowledge to farmers. Economic progress takes place in agriculture when individual farmers use new methods in order to produce more from the

<sup>1</sup> Mill, <u>op</u>. <u>cit</u>., p. 307.

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same amount of resources, or to produce the same with lesser amounts of resources. In both cases the improvement enables farmers to expand their output per unit of input.

The important types of changes that have taken place on farms as a result of technological progress, have been mechanization, improved crop varieties, improvements in cultural practice (e.g., use of fertilizer and sprays) and improvement of livestock (through improvements in breeding, nutrition, sanitation, and disease control).

Economic development from without affects agriculture in two ways, (1) the demand for its products, (2) the supply of its factors of production. Over a long period of time the demand for agricultural products of any particular country is altered by: (a) changes in population (b) changes in income per capita (c) changes in consumer preferences and (d) changes in foreign markets; while the supply of the agents of production is altered by (a) discovery of new resources, (b) changes in technology and improvement in skills, and (c) growth of the agricultural

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<sup>&</sup>lt;sup>1</sup> J. A. Hopkins, "Technological Development Affecting Farm Organization," Journal of Farm Economics, XXI, (February, 1939), 165-177.

<sup>&</sup>lt;sup>2</sup> T. W. Schultz, <u>The Economic Organization of Agri-</u> <u>culture</u>, New York, McGraw-Hill Book Company, Inc., 1953, pp. 1-10.

1 population.

It is the interactions of these forces that alter the efficiency of the industry, and the relative importance of individual factors of production. It is necessary, therefore, to comment briefly on these forces before examining the changes that have taken place in the case of individual inputs.

> Forces Affecting the Growth of Demand for Agricultural Products

<u>Changes in population</u> - Most countries now are experiencing population growth. Changes in population are significant to agriculture because of the fact that the addition or subtraction of one person to the total number of people means a corresponding increase or decrease in the demand for food and other products of agriculture. <sup>2</sup> Malthus associated the growth of human population with the expansion of the food supply. He said that population tends to increase up to the limits of the means of subsistence because the rate of population growth was greater than that of the means of subsistence. This difference

<sup>1</sup> Schultz, <u>op</u>. <u>cit</u>., pp. 1-14.

<sup>2</sup> T. R. Malthus, <u>An Essay on the Principles of Popula-</u> <u>tion</u>, New York, E. P. Dutton & Co., pp. 5-26. between the rates of increase in population and food supply indicated that the ultimate check (limited means of sub-1 sistence) is an important fact of human existence. Aside from this ultimate check on population growth, Malthus distinguished also two immediate checks, viz.: (1) "preventive checks" (those calculated by man's own reasoning, such as postponement of marriage), and (2) "positive checks" (such as wars, plagues, diseases, etc.).

In some countries of today the implications of his theory seem to exist, but in countries like Canada and generally most of the western group of nations, economic progress has involved increases in production as well as increases in population. Consequently, population has not increased to the point where the level of living is one of subsistence. As may be seen in the table below the population in Canada has been increasing on the average 18.4 percent per decade. It is a well known fact that this increase has been accompanied by increasing levels of real income.

<u>Changes in income</u> - A rising level of real income per capita is the second most important factor affecting the demand for agricultural products in the long run. As a country advances technologically, the income per capita

<sup>2</sup> Loc. cit.

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<sup>&</sup>lt;sup>1</sup> Loc. cit.

# TABLE I

POPULATION OF CANADA BY CENSUS YEARS 1871 TO 1951

Censús Year	Population	Increase over previous decade	Percent Increase
1871 1881 1891 1901 1911 1921 1931	3,689,257 4,324,810 4,833,239 5,371,315 7,206,643 8,787,949 10,376,786	635,553 508,429 538,076 1,835,328 1,581,306 1,588,837	17.2 11.8 11.1 34.2 21.9 18.1
1941 1951	14,009,429	2,502,774	10.7 21.8 Ave. = 18.4

Source: Canada, Dominion Bureau of Statistics, <u>The Canada</u> <u>Year Book, 1952-53</u>, 1953, pp.xxvi, xxvii.

tends to increase because of the increase in the output per unit of input in the different sectors of the economy. In Canada, total personal income increased from \$4,092 millions in 1926 to \$15,818 millions in 1951 in current dollars, or from \$3,360 in 1926 to \$8,573 millions in 1951 in terms 1 of constant dollars. However, the significant fact as far as agriculture is concerned is that the income spent on food does not increase in proportion to increases in total income. The proportion decreases as income increases, i.e., the income elasticity of food expenditure decreases as

<sup>1</sup> Canada, Dominion Bureau of Statistics, <u>The Canada Year</u> <u>Book, 1952-53</u>, 1953, pp. 1084 and 1010.

<sup>2</sup> Engel's Laws.

<sup>3</sup> Percentage increase in amount spent on food resulting from a one percent increase in income.

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income increases.

Schultz gives the following estimates of income elasticity of food expenditure for "low food drain communities" (those which are at the stage of economic development comparable to that of Canada and the United States). In such communities the income elasticity of food expenditure is about 0.5 for all food. The figure approximates 0.25 on the farm produced part of food. The corresponding figure for non-farm services added to the farm produced part of food is 0.625 when eaten at home, and 1.25 when eaten away from home. Thus the indications are that a given percent increase in personal income of Canadians will mean a lesser percentage increase in the gross income of farmers.

<u>Changes in consumer preferences</u> have come about through (1) shifts in the proportion of the total population in a large amount of occupations requiring physical energy to those requiring less physical exertion which results in decreased per capita caloric requirements, (2) advances in the science of nutrition and the dissemination of knowledge in the composition of foodstuffs, resulting in increased consumption of "protective foods," and (3) rising level of income resulting in increase in the proportion of food expenditure that is spent on high quality of foods. Consequently the per capita consumption of certain agricultural products such as fruit, milk

<sup>1</sup> Schultz, <u>op</u>. <u>cit</u>., p. 45.

and meats has been increased while the per capita consumption of other products such as cereals and pulses have been decreased.

The combined effect of changes in occupations, better knowledge of the make-up of balanced diets, and rising level of real income upon consumer preferences in Canada may be shown by the following data. The per capita consumption of fruit increased from an average of 138.7 pounds in the prewar period of 1935-39, to 199.0 pounds in 1951, or by 43.5 percent. Consumption of milk and cheese increased from a prewar average of 52.0 lbs. per head to an average of 64.7 lbs. (24.4 percent) in 1951. Similarly per capita consumption of vegetables, meats and eggs increased from 78.4 lbs. to 95.4 lbs., 118.3 to 133.9 pounds and 30.7 to 34.6 pounds respectively. On the other hand, the consumption of cereals and starch decreased from 205.7 pounds and 2.5 pounds per head to 172.6 and 1.6 pounds respectively in the period 1935-39 to 1951. The table below gives a more detailed analysis of the changes in consumer food purchases in Canada expressed as index numbers.

<u>Changes in Exports</u> - The demand for Canadian agricultural products is partly dependent upon the export markets, because of particular production advantages in

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<sup>&</sup>lt;sup>1</sup> All figures taken from <u>The Canada Year Book, 1952-53</u>, pp. 441-445.

# TABLE 2

# INDEX NUMBERS OF PER CAPITA CONSUMPTION

OF FOOD IN CANADA, 1949, 1950 and 1951

(1935-39 = 100)

	35-			
<u>Food Item</u>	39	49	50	51
Cereals Potatoes Sugar and syrup Starch Pulses and nuts Fruit Vegetables Oils and Fats Meats Poultry & Fish Eggs	100 100 100 100 100 100 100 100 100 100	$ \begin{array}{r} 81.4\\ 108.2\\ 104.8\\ 64\\ 84.1\\ 128.1\\ 110.2\\ 102.4\\ 117.1\\ 110.3\\ 108.8\\ 122.5 \end{array} $	84.0 122.8 106.5 64 89.7 131.9 120.5 108.2 113.0 117.0 112.4	83.9 104.2 101.5 64 85.5 143.5 121.6 106.3 113.2 120.1 112.7
Beverages	100	145.8	138.9	129.2

Source: The Canada Year Book, 1952-53, pp. 442-5.

certain products such as wheat. The forces which determine changes in domestic consumption (population, income, and changes in consumer preferences) also affect export demand. The fact that Canadian exports go mainly to countries which have experienced similar trends in income and population growths would seem to indicate that the export demand for Canadian agricultural products is subjected to the same general type of forces as in the domestic demand. However, certain other forces, primarily of a political nature, may produce results which tend to restrict growth in export demand. Thus changes in tariff rate policies and the striving toward agricultural selfsufficiency of certain importing countries, when they occur, will counteract the secular forces of growth.

The above discussion of the effect of economic growth on the demand for agricultural products, particularly that in Canada, may be summarized as follows: in the long run, the demand for agricultural products increases as a country progresses. The factors which bring this about are: growths in population and real income, and the development of facilities for both domestic and foreign trade.

> Forces Affecting the Supply of Factors of Production in Agriculture

The developments in the supply of the factors of production in agriculture, often classified as land, capital and labor, come about as a result of any increase in the amount of physical resources, improvements in the arts and skills, and growth in the farm population.

The amount of land resource may be increased by bringing new land under cultivation, or by more intensive cultivation of the land already being used. This is achieved through such practices as conservation, soil

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improvement, irrigation and drainage. The use of capital may be extended through further improvements in the productive capacity of machines, and through further research in the improvement of livestock, plants and production techniques. An increase in the supply of labor results from a high rural birth rate, substitution of capital for labor, and from any improvements in the productivity of subsistence farmers.

# CHAPTER III ECONOMIC PROGRESS AND CHANGES IN THE INPUT STRUCTURE OF AGRICULTURE

### Hypothesis

The hypothesis which is to be tested empirically is that technological development has had two significant economic effects. The first is that overall economic efficiency in agriculture has increased. The second is that technological advances have brought about changes in the relative amounts used in agriculture of the various agents of production. That is to say the rates of increase in the efficiency in the various agents of production have not been the same. There may be: (1) an increase in both the absolute and relative shares of the total product inputed to a given factor of production; (2) a decrease in both the absolute and relative shares or (3) an increase in its 1 relative share but decrease in its absolute share.

The new share attributable to a given factor will depend upon the effect of the particular innovation upon the marginal productivity of the individual input. If, for example, the new discovery or technique increases the

<sup>&</sup>lt;sup>1</sup> Based on J. R. Hicks' analysis of "Distribution and Economic Progress," <u>The Theory of Wages</u>, New York, Peter Smith, 1948, pp. 112-134.

marginal productivity of both capital and labour, and increases that of capital more than that of labor, then the relative share of the total product accruing to capital will increase. But if the new technique increases the marginal productivity of capital but decreases that of labor, then both the absolute and relative shares of capital will increase while the relative and absolute shares of labor In both cases capital will be substituted will decrease. for labor, and the new invention is termed a "labor saving" technique. On the other hand, a "capital saving" invention will increase the marginal productivity of labor more than This will increase the relative importance that of capital. of labor and will result in the substitution of labor for capital. Similarly, a "land saving" invention will increase the importance of one or all of the other agents of production and decrease that of land. A "neutral" invention will not affect the relative shares but if it is to be used it must increase their absolute productivity. In this case there will be no substitution of factors.

<sup>1</sup> i.e., the addition to total output resulting from additional units of capital or labor.

<sup>2</sup> For one factor to be substituted with another, its "elasticity of substitution" must be greater than one." An increase in the supply of any factor will increase its relative share...if its 'elasticity of substitution' is greater than unity"--the elasticity of substitution being "...a measure of the ease with which the varying factor can be substituted for others." (Hicks, <u>op. cit.</u>, pp.117 ff.) That is, if to produce a given output, a given ratio of labor to capital is used, no matter what the prices to

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The above theoretical analysis of the changes in the input structure of an industry resulting from technological progress is valid under the assumption of perfect competition. Within an industry, under perfect competition, factors of production would be substituted one for the other until the ratio of their marginal productivities to their prices were equal. Between industries, factors of production would be distributed so that their respective marginal value productivities were equal to that of equivalent units of the factor in all sectors of the economy. There are in fact, several impediments to the attainment of perfect competition in agriculture. Some of these impediments are capital rationing, imperfect knowledge, difficulties associated with moving labor out of agriculture, and the instability of agricultural prices and production. However, these impediments are more significant in the short than in the long run; because over short periods, land,

<sup>&</sup>lt;sup>1</sup> (Continued from page 19) labor and capital are, then the elasticity of substitution of labor to capital will be zero. If, on the other hand, a small change in the price of one of the factors results in a given output being produced by one factor alone, then the elasticity of substitution between the two factors is infinity. Elasticity of substitution is one if, for example, a given change in wages results in an equal percentage (but opposite direction) change in the quantity of labor that is combined with capital to produce a given output. Elasticity of substitution will be greater than unity if the change in wages resulted in more than a proportionate change in the quantity of labor that is combined with capital, and if the change is less than proportional then elasticity of substitution is less than one. (Hicks, loc. cit.)

capital and labor are relatively fixed and are not easily adjusted to conform with changing marginal productivities. Over longer periods the fixity of factors is eventually overcome. Thus in the long run factors of production tend to find alternative uses and to be substituted according to their marginal revenue productivities.

While inventions in agriculture have increased the marginal productivities of all factors (land, capital and labor), they have increased that of capital more than the other two factors, i.e., inventions in agriculture have tended to be either labor or land saving. In Chapter IV, an attempt is made to measure these changes empirically.

#### CHAPTER IV

# CHANGES IN THE RELATIVE AND ABSOLUTE IMPORTANCE OF VARIOUS INPUTS IN CANADIAN AGRICULTURE

#### Method

The measurements of the changes which have taken place in the economic efficiency of agriculture and the relative importance of the various factors of production were arrived at as follows: (1) the values of each input, for the period 1926 to 1952, were deflated by their respective price indexes to give values in terms of constant dollars (the deflated figures are therefore measurements of the total amount of agricultural input); (2) an index series (1935-1939 = 100) of the deflated values of each input was constructed; (3) in order to measure relative importance, the deflated values of each input were calculated as a percentage of the sum of the deflated values of all inputs.

The inputs were divided into eight categories and were measured in terms of yearly cost to Canadian farmers. The eight classes of inputs were: (1) labor, (2) land, (3) non-land capital, (4) cost of operating farm machinery, (5) depreciation, (6) taxes, (7) fertilizers and (8) miscellaneous items. The method by which the value of each of these inputs was derived is set out below.

Labor - The yearly labor input from 1926 to 1952 was determined by multiplying the Canadian agricultural labor force estimate by average monthly wages without board. For the period 1931 to 1952 the labor force figures used for this purpose were the Dominion Bureau of Statistics June estimates of all persons, 14 years or over, with jobs in agriculture. The figures for 1926 to 1930 were estimated by extrapolating the labor force figures of 1931 to 1952. The wage rates used were those estimated by the Dominion Bureau of Statistics as of May 15 of each year. The value of labor input in current dollars was deflated by the index of wage rates to obtain the value in terms of constant dollars. Thus the value of labor input was obtained by assuming that all persons in the agricultural labor force, 14 years or over, perform the equivalent work of hired laborers This assumption gives less emphasis to the conon farms. tribution of farm enterpreneurs and managers, but this is counterbalanced on the other side, by the fact that some family labor produces an output less than the equivalent of the going wage rate in agriculture.

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<sup>&</sup>lt;sup>1</sup> Canada, Dominion Bureau of Statistics, Reference Paper No. 23, <u>Canadian Labor Force Estimates, 1931-1950</u>, 1950, p.15.

Canada, Dominion Bureau of Statistics, Special Surveys Division, <u>The Labor Force Quarterly Surveys</u>, IX, 7; XIII, 15; VII, 16.

 $<sup>^2</sup>$  The figures for 1930 to 1926 were found by extrapolating labor force estimates of 1952 to 1930, and allowing for constant rate of growth in the farm population.

Land - The annual input represented by land was calculated by multiplying the going rate of interest on farm mortgages by the deflated value of land used. The values of land were obtained from Dominion Bureau of Statistics estimates, and include the values of buildings and The values so obtained were deflated by the improvements. indexes of the average value per acre of agricultural land in Canada in order to obtain land input in constant dol-This value was multiplied by the prevailing intlars. erest rate on farm loan, and then deflated by the index of interest rates in order to express land as an annual physical input. The interest rates used were 7 percent for the years 1926 to 1936 inclusive, 6 percent for 1936 to 1945 inclusive and 5 percent for 1945 to 1952.

<sup>1</sup> The annual input of land may be calculated in either of two ways. One is to apply rental rates to land used in agriculture. The other (as has been stated above) is to multiply going interest rates on farm mortgages by land value. Because no series of rental rates were available, the latter method was used.

<sup>2</sup> Canada, D.B.S., "Gross Agricultural Wealth of Canada by Provinces," <u>Monthly Bulletin of Agricultural Statistics</u>, March, 1923, 1929-1931 and 1935.

Canada, D.B.S., "Current Values of Farm Capital in Canada by Provinces and Items," <u>Quarterly Bulletin of Agri-</u> <u>cultural Statistics</u>, January-March, 1941 and April-June, 1945, 1947-1951.

Canada, D.B.S., "Current Values of Farm Capital in Canada, by Provinces and Items," <u>Monthly Bulletin of Agri-</u> <u>cultural Statistics</u>, March 1937-1940.

<sup>3</sup> Appendix A.

<u>Non-Land Capital</u> - This input was calculated in a manner similar to that outlined above for land. The items included in the non-land capital were machinery and equipment and livestock. The deflators used to obtain their value in constant dollars were the indexes of prices of machinery and the indexes of prices of animal products respectively. The interest rates were the same as the ones used in determining land input.

<u>Cost of Operating Farm Machinery</u> - The value of this input was arrived at by taking the total yearly expense (reported by the Dominion Bureau of Statistics) incurred by Canadian farmers in operating tractors, trucks, automobiles, engines and combines. The deflator used was a combined index of the prices of the items constituting the operating expenses of machinery, i.e., gasoline, oil and grease.

<u>Depreciation and Maintenance</u> - The figures used to calculate this input were the sum of the Dominion Bureau of 3Statistics estimates of depreciation on buildings and machinery, plus the repair expenses of farm buildings and machinery. These estimates were deflated by an index constructed

<sup>3</sup> Canada, D.B.S. Reference Paper No. 25, <u>loc. cit</u>.

<sup>&</sup>lt;sup>1</sup> Canada, D.B.S. Reference Paper No. 25 (Part II), <u>Farm</u> <u>Income</u>, February, 1952, pp. 56-57.

 $<sup>^2</sup>$  Appendix D.

from the indexes of prices of farm machinery and building materials. The weights used in combining these two indexes were (as given by Dominion Bureau of Statistics, Department of Trade and Commerce) 9.9 and 3.8 respectively.

<u>Taxes</u> - This input represents rural-municipal 2taxation figures on owner-operated farms. It was deflated by an index of tax and interest rates.

 $\frac{\text{Fertilizers}}{4} - \text{"Estimates were calculated and based}$ on official statistics of production and sales." The deflator was the index of fertilizer prices.

<u>Miscellaneous Items</u> - This includes all other 6 inputs (mainly such items as hardware and small tools) that were not included in any of the categories enumerated above. To deflate this value, the index of prices of hardware was 7 used.

<sup>1</sup> Canada, Department of Trade and Commerce, Prices Branch, <u>Price Index Numbers of Commodities and Services Used by Far-</u> mers, 1913-1948, July 21, 1948, pp.8 and 15.

<sup>2</sup> D.B.S. Reference Paper No. 25, <u>loc. cit</u>.

<sup>3</sup> <u>Price Index Numbers of Commodities and Services used by</u> Farmers, <u>loc. cit.</u>

<sup>4</sup> D.B.S. Reference Paper No. 25, <u>loc</u>. <u>cit</u>.

<sup>5</sup> <u>Price Index Numbers of Commodities and Services used by</u> <u>Farmers, loc. cit</u>.

<sup>6</sup> D.B.S Reference Paper No. 25, <u>loc. cit.</u>

<sup>7</sup> <u>Price Index Numbers of Commodities and Services used by</u> <u>Farmers, loc. cit.</u>

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#### Results and Interpretations

### Changes in the amounts of the various inputs -

The measures of the changes in the amounts of the various inputs described above are presented in Table 3. The most striking fact that this table shows is that the total of all inputs has changed little from year to year and during the whole period of 1926 to 1952. Except for the years during the second World War, the index of total inputs changed only by 2 or 3 points from one year to the next. Over the whole 27 year period, the index varied by less than 10 points above or below 100. Thus the net effect of economic progress has been to leave total inputs in Canadian agriculture relatively unchanged. That is to say that any increase or decrease in any one of the individual inputs has been offset by a corresponding increase or decrease in one or more of the others. A preliminary examination of the table indicates that there has occurred: (1) a relatively large increase in the amounts of the inputs of non-land capital, the cost of operating farm machinery, taxes, fertilizers and miscellaneous items; (2) relatively slight changes in the amounts of land (real estate) and depreciation; (3) a relatively great decline in the amount of labor input.

<sup>&</sup>lt;sup>1</sup> The relatively large decline in the index for the war years is largely attributable to the fall in the agricultural labor force caused by the War's increased demand for manpower.

# TABLE 3

# INDEX NUMBERS OF AGRICULTURAL INPUTS, CANADA, 1926-1952

(1935-1939 = 100)

	1	2	3	4	5
			Non-Land	Cost of Oper-	Depreciation
Year	Labor	Land	Capital	ating Farm	and
				<u>Machinery</u>	<u>Maintenance</u>
1000		00 <b>0</b>	107 5		110 1
1926	86.3	90.2	107.5	63.5	118.1
1927	87.2	93.8	117.0	75.8	129.8
1928	88.1	97.4	119.9	90.7	133.6
1929	89.0	90.5	121.0	100.7	138.2
1930	90.0	104.7	115.8	99.8	135.0
1931	90.9	103.1	114.7	95.9	123.7
1932	92.4	103.6	114.4	84.9	116.1
1933	93.9	101.7	116.6	82.9	110.8
1934	95.4	107.5	101.4	87.9	106.5
1935	97.0	108.8	102.3	89.7	108.2
1936	98.5	105.6	103.5	94.3	100.0
1937	100.0	107.9	98.3	100.6	97.8
1938	101.5	97.1	94.4	104.4	96.7
1939	103.0	96.0	101.5	112.5	97.3
<b>194</b> 0	100.6	98.6	100.7	120.3	93.4
1941	85.8	86.3	96.7	126.0	90.8
1942	97.4	89.2	100.9	126.5	96.7
1943	76.2	88.0	116.8	131.6	101.6
1944	85.6	88.0	111.8	144.4	103.7
1945	85.7	89.6	111:9	154.7	111.4
1946	96.9	88.5	119.5	176.5	122.7
1947	88.6	88.5	116.6	185.2	124.4
1948	89.8	90.0	105.8	194.4	122.8
1949	85.1	89.9	110.1	228.8	119.6
<b>195</b> 0	79.0	89.8	118.8	229.6	124.4
1951	75.6	91.1	127.8	267.4	113.5
1952	69.7	91.1	127.8	285.6	116.6
		· — •	· · · · •	-	-

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# TABLE 3 (Continued)

6	7	8	9
Taxes	Fertilizer	Miscellaneous	Total
89.1	50.8	140.1	92.3
89.5	47.7	149.1	96.5
95.5	60.3	148.0	99.4
97.8	78.8	134.8	99.4
103.1	112.3	136.9	102.6
102.6	98.9	102.5	100.0
98.6	64.3	81.5	98.1
98.1	59.1	81.6	97.8
120.3	69.4	91.9	99.8
99.2	76.6	92.6	100.4
102.0	83.3	93.3	100.1
100.9	106.5	101.1	98.1
99.3	115.2	102.6	99.8
98.7	118.3	110.5	101.6
95.7	125.8	113.0	100.9
97.5	115.2	109.6	90.9
97.9	142.2	130.9	90.5
101.0	167.0	123.5	90.9
101.1	177.2	145.3	96.6
103.7	206.7	152.5	99.1
113.2	220.5	161.4	107.9
117.7	250.5	189.0	106.4
132.3	252.0	180.0	106.6
146.7	280.7	171.0	106.8
136.2	290.6	172.1	104.7
144.0	300.2	175.5	105.4
145.5	295.1	161.9	103.6
Within these three categories there appear certain short run aberrations in the movement of the indexes of each These aberrations are mostly attributable to the input. effects of the great depression and the Second World War upon the agricultural economy. Thus, for example, in examining the index of labor input (Table 3), the following significant changes may be noted. Between 1926 and 1952, the index decreased from 86.3 to 69.7 or about 19 percent. Within this period labor input was highest in the years 1930 to 1939, averaging 97.0. This was probably due to unemployment in industry which tended not only to restrict the movement of labor out of agriculture, but even to cause some movement of people into agriculture. During the war years 1940 to 1945 the figure declined to 88.6. At the end of the War, the index jumped sharply from 85.7 in 1945 to 96.9 in 1946, probably as a result of the back-to-the-farm movement of the returning veterans. But the next year this figure declined to 88.6 and since 1949 has gone down each year. However, for the whole period, the downward trend in agricultural labor force is apparent.

On the other hand, during the same period of time, there appears to be no secular trend for land (real estate) input. Between 1926 and 1952, land input increased only slightly from an index of 90.2 to 91.1. During this period, the index was somewhat higher in the thirties than in the forties. The decline since the thirties in this index may be explained in terms of the changes in farm building require-

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ments for there has been a gradual increase in the acreage of improved land. Thus, the decline in the index since 1939 may have been caused by the fact that farm building requirements have been reduced by the transfer from horse power to tractor power which has lessened the need for barns and feed storage space. The slight rise in the index for land input in the last few years may be the result of the increase in the number of farm buildings, particularly dwellings, in Canada.

In contrast to labor and land, the non-land capital inputs (machinery and livestock) have increased by 19 percent between 1926 and 1952. However, this figure does not appear to be as high as one might expect in view of the large machinery sales and the improvements that have taken place in the quality of machinery and livestock during the period 1926 to 1952. Part of the reason for the smaller than expected increase is the fact that the method of measuring the changes has the shortcoming that significant quality changes which have come about in both machinery and livestock are not fully reflected in their selling prices. While this criticism applies also to the measurements of some of the other inputs, its effect is probably more pronounced in the case of nonland capital. For example, it is a fact that a tractor of 1926 is quite inferior to a 1952 model; yet its price, after taking account of changes in the value of money, is not very

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different in the two years. In the case of livestock, the aggregate figure used to measure changes in the input of livestock does not show which class of livestock caused the change. Table 4 below gives a breakdown by type of the changes in livestock numbers. It may be seen from the table that any increase in the importance of livestock since 1926 has been due to an increase in the number of swine and cattle, which have offset the considerable decrease in the number of horses.

In the case of non-land capital, moreover, the movement of the index is more erratic than for the other inputs. These erratic movements are caused, aside from the effects of the depression and World War II, by the effect on the index of hog and cattle production cycles. However, when these short run changes in the index are taken into account, it appears that the secular trend for non-land capital inputs is slightly upward.

The trend is also upward for the rest of the inputs except depreciation which has remained fairly constant. The greatest expansion has occurred in the case of fertilizer inputs and the cost of operating farm machinery. Between 1926 and 1952, the increases were 482 percent for fertilizers and 350 percent for the cost of operating farm machinery. Taxes increased by 63 percent during the same period, with most of the increase taking place since 1945.

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### INDEX NUMBERS OF ANIMALS ON FARMS IN CANADA,

### SELECTED YEARS, 1925-1949

(1935 - 1939 = 100)

Year	Horses	Milk Cows	Other Cattle	A11 Cattle	Sheeps and Lambs	Swine
1005	110 0	00.0	05.0	01 5		101 0
1925	118.2	80.0	95.3	9T•9	82.3	101.0
1930	112.7	85.5	90.2	88.2	111.5	94.8
1935	102.8	101.6	104.0	102.9	104.6	92.7
1940	98.1	96.5	95.8	96.1	93.6	152.4
1945	91.2	105.8	137.0	123.4	117.5	153.0
1949	63.4	95.8	110.6	104.2	67.3	131.1

Source: The Canada Year Book, 1947-1948 and 1951.

In summary, it seems that, although there have been some erratic movements in the indexes of individual inputs, chiefly attributable to the impact of World War II and of the depression in the thirties, the total of inputs has remained quite constant. The total of labor input has declined markedly and it has been replaced by other types of input.

Changes in the relative importance of the various

<u>inputs</u> - The above analysis indicates that the use of some factors of production has increased much faster than that of others, and in the case of labor, there has been an actual reduction in total input. It is obvious, therefore, that the relative importance of the various inputs has changed. The purpose of this section is to examine this shift. The measures of changes in the relative importance of input factors, calculated in the manner described above, are presented in Table 5.

Before examining changes in the relative importance of individual inputs, however, the following salient points may be observed. The table reveals that throughout the whole period under study, labor input has remained the most important single factor of production in Canadian agriculture. having varied from 30 to 48 percent of the total input. The second most important factor has been land, which has constituted about 20 percent of all input. Non-land capital has been about 7 to 8 percent of the total input. The three together comprised from 60 to 70 percent of the total input. The range of change for most of the others has been so large that it would be inappropriate to quote average figures. In 1952, however, the other inputs were, in order of importance, the cost of operating farm machinery (16 percent), depreciation and maintenance (13 percent), taxes (6 percent), miscellaneous items (5 percent) and fertilizers (3 percent).

Nevertheless, the significance of the findings as shown in Table 5 lies not in how much each factor contributed to total inputs in a given year (or on the average over the whole period); rather, it lies on the changes that have taken place in the importance of the individual inputs. For, as has been shown above, the effect of economic progress on

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## CHANGES IN THE RELATIVE IMPORTANCE OF AGRICULTURAL

INPUTS, CANADA, 1926 to 1952.\*

(1935 - 1939 = 100)

	1	2	3	4	5
			Non-Land	Cost of Oper-	Depreciation
Year	Labor	Land	Capita1	ating Farm	and
				Machinery	Maintenance
		_			
1926	44.10	20.56	7.88	3.87	14.43
1927	42.66	20.47	8.21	4.42	15.19
1928	41.81	20.64	8.16	5.13	15.16
1929	42.26	19.16	8.24	5.69	15.69
1930	41.35	21.47	7.64	5.44	14.85
1931	42.88	21.72	7.77	5.39	13.98
1932	44.41	22.23	7.89	4.86	13.35
1933	45.27	21.89	8.07	4.77	12.78
1934	45.09	22.68	6.88	4.92	12.05
1935	45.56	22.80	6.90	5.02	12.15
1936	46.42	22.20	7.01	5.30	11.28
1937	46.52	22.42	6.57	5.50	10.88
1938	47.99	20.49	6.41	5.88	10.94
1939	47.87	19.91	6.77	6.23	10.82
1940	47.04	20.57	6.76	6.70	10.44
1941	44.49	19.99	7.20	7.79	11.27
1942	41.41	20.76	7.56	7.87	12.06
1943	39.54	20.57	8.70	8.14	12.62
1944	41.83	19.17	7.84	8.41	12.12
1945	42.82	19.06	7.65	8.79	12.71
1946	42.38	17.27	7.50	9.20	12.84
1947	39.30	18.10	7.42	9.79	13.19
1948	39.75	17.78	6.72	10.26	13.01
1949	37.63	17.73	6.98	12.05	12.63
1950	35.58	18.06	7.68	12.33	13.40
1951	33.83	18.20	8.21	14.26	12.15
1952	31.75	18.52	8.35	15.50	12.70

\* Individual inputs expressed as a percentage of total inputs.

## TABLE 5 (Continued)

6	7	8	9
Taxes	Fertilizer	Miscellaneous	_ Tota1
3.87	.51	4.78	100.00
3.72	.45	4.88	100.00
3.85	.56	4.69	100.00
3.94	.73	4.28	100.00
4.03	1.01	4.21	100.00
4.12	•91	3.23	100.00
4.03	<b>.</b> 60	2.62	100.00
4.03	.56	2.63	100.00
4.84	<b>.</b> 64	2.90	100.00
3.96	.70	2.91	100.00
4.09	.76	2.94	100.00
3.99	.97	3.15	100.00
3.99	1.06	3.24	100.00
3.90	1.07	3.43	100.00
3,80	1.16	3.53	100.00
4.30	1.16	3.80	100.00
4.34	1.44	4.56	100.00
4.46	1.69	4.28	100.00
4.20	1.69	4.74	100.00
4.20	1.89	4.86	100.00
4.21	1.88	4.72	100.00
4.44	2.16	5.60	100.00
4.98	2.17	5.33	100.00
5.51	2.42	5.05	100.00
5.22	2.55	5.18	100.00
5.48	2.62	5.25	100.00
5.63	2.62	4.93	100.00

agriculture has been to increase the amount used of some inputs relative to others. The main offsetting factor to those inputs which have increased has been the decline in the input of labor. This is as might be expected in view of the labor-saving nature of many of the advances made in agricultural technology. As will be seen later in the discussion of the overall efficiency of Canadian agriculture, this shift in importance has been associated with an increase in the economic efficiency of agriculture. Today, Canadian agricultural production is higher than at any other period of its history, and this in the face of the smallest number of people engaged in the industry.

The change in the relative importance of labor in agriculture was as follows: labor in agriculture contributed 44 percent of all agricultural inputs in Canada in 1926. The figure declined to 34 percent in 1952, a drop of 21.4 percent in importance in the 27 year period. The drop is even greater for a shorter period. In 1931 labor was 42.19 percent of all inputs. The decline over the 13 year period between 1939 and 1952 was 35 percent. In the post-war period of 1946 to 1952, the index declined 24.9 percent. How long this decline will continue will be determined, according to Schultz, by:

1. The rate at which labor saving practices and techniques are introduced and capital is substituted for labor--the lower this rate, the fewer the people that will find it necessary to leave farming; 2. The rate of growth of demand for farm products (fuller employment, larger exports, more industrial uses of farm products, better diets, larger population), the higher this rate, the smaller the necessary movement of people out of farming;

3. The rate at which farm people reduce the number of hours they work per year...the greater the rate at which free time and leisure are introduced the fewer the persons migrating from farms; and

4. The rate of the natural increase of farm people--the lower this rate of increase the less the necessary movement off farms.<sup>1</sup>

On an "a priori" basis, therefore, it would seem that the net result (as far as Canada is concerned) of the four conditions mentioned above would be a continuation of the downward trend in the relative importance of labor in agriculture for the foreseeable future.

Land input has also shown a significant decline in relative importance (Table 5). Land (real estate) declined in relative importance by about 10 percent. Throughout the period 1926 to 1930, land input constituted, on the average, 20 percent of all production inputs in Canadian agriculture. This figure rose to an average of 22.3 percent in the depression period of 1930 to 1935; it declined to about 20.6 percent in the prewar period of 1936-1939. During the war period (1939-1945) land input comprised on the average 20 percent of total inputs and

<sup>&</sup>lt;sup>1</sup> T. W. Schultz, "Changes in Economic Structure Affecting Agriculture," <u>Journal of Farm Economics</u>, XXVIII (February, 1946) 19.

declined to 18 percent for the post-war period. These figures indicate a declining relative importance of land as an input of production as Canadian agriculture has advanced technologically. The figures also suggest that events which hinder technological development increase the relative importance of land. Thus, in the thirties when the returns of farmers were reduced, and the addition to and the replacement of machinery and building capital were curtailed, the relative importance of land was increased. Conversely, during and after the second World War, when the rate of adoption of better techniques was relatively more rapid, land became less important as an agent of production.

The technological changes which caused this decline in the importance of land are: (1) those which have resulted in increased output per acre (improved crops and better cultural practices), (2) the replacement of horses by tractors which has released farm land from the growing of feed for power to the production of food for human use. Moreover, the effect of technology has been not only to decrease the importance of land, but also to increase the size of farm. This fact is indicated by the increase in acres per farm over the years since 1921 which has occurred to accommodate the adoption of equipment which enable a man to handle more acres.

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The conclusion that may be drawn from the empirical evidence is that any scarcity of additional good land has been offset by the development and adoption of "land-saving" techniques. This appears to be in line with Schultz's findings for the United States for he states that technological development "...has reduced the income claims of this factor (land) to an even smaller fraction of the national income; and it has given rise to profound changes in the existing forms of income-producing property. The underlying economic development has modified in an important way and relaxed substantially the earlier iron grip of the niggardliness of nature."

Thus the two most important factors of production in agriculture, labor and land, have declined in relative importance by about 30 and 10 percent respectively, between the years 1926 to 1952. Miscellaneous items and depreciation have remained almost unchanged in their relative importance. Hence, the declines in the relative size of the labor and land inputs have been offset by an increase of 6 percent in the relative importance of non-land capital, 300 percent in the cost of operating farm machinery, 400 percent in fertilizers and 45 percent in taxes. These and previous figures

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<sup>&</sup>lt;sup>1</sup> T. W. Schultz, <u>The Economic Organization of Agriculture</u>, Toronto: McGraw-Hill Book Company, Inc., 1953, pp. 125-126.

therefore give the numerical estimates of the extent of substitution of factors of production in Canadian agriculture. The way in which this substitution of inputs has been associated with agricultural production and efficiency is discussed below.

#### CHAPTER V

# CHANGES IN THE ABSOLUTE AND RELATIVE IMPORTANCE OF VARIOUS CLASSES OF OUTPUT OF CANADIAN AGRICULTURE

### Method

The following is an attempt to measure the changes in output of Canadian agriculture that have come about during the period 1926 to 1952, and that have accompanied the structural changes discussed in the preceding chapter. Agricultural output has been computed as the total cash value of sales of crops, livestock, livestock products and forest products, together with the value of the amount of these products consumed on farms, and the value of house rent. Changes in inventory and income transfers to agriculture by government have not been taken into account. Year to year inventory changes have little significance when dealing with a period of years since their value eventually appears as farm income. Income transfers can legitimately be excluded since they are not truly a part of the product of the industry. Thus the measure of Canadian agricultural output used in this study is the sum of: (1) the value of total cash income and income in kind from crops (including fruit, vegetable and maple products); (2) cash income and income in kind from livestock and livestock products (including dairy products, poultry and eggs), less the value of feed sold off farms; (3) cash income and income in kind from forest products grown on farms (including lumber and firewood) and (4) an inputed value of farm house rent.

The deflators used in the case of crops, livestock and forest products were the indexes of wholesale prices of field products, animal products, and lumber and timber products respectively. An index with which to deflate rural house rent was constructed by taking the average of 50 percent of the index of the costs of building materials and 50 percent of the index of tax and interest rates, under the assumption that house rent is directly proportional to the costs included in such an index.

### Results and Interpretations

Total agricultural output, measured in constant dollars increased from an index (1935-1939 = 100) of 106 in 1926 to 153 in 1952, an increase of 44 percent. The significance of a comparison between any two years may be doubtful

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<sup>&</sup>lt;sup>1</sup> This is to avoid the double counting of feed sold first as a crop and then as a livestock product.

in view of the great variation from year to year. For example, in 1937, due to widespread drought the index stood at 88.2; while in 1944 total production was almost double with an index of 164.7. Nevertheless, the data certainly does have a distinct upward secular trend which shows up quite clearly in the five-year moving average (Table 8).

In Table 6, the index numbers of the changes in the total amounts of the four categories of output are presented; while in Table 7, five-year moving averages of these indexes are shown. From the two tables it may be seen that the growth in output of crops has been highly erratic, while that of livestock has been fairly steady. On the other hand, there appears no tendency to increase in the case of forest products and house rent, which in fact shows a small decline.

The changes in relative importance of the four categories are presented in Table 7. There appears to be no general tendency of increase or decrease in importance of either crops or livestock between 1926 to 1952. The two categories have remained fairly equal in relative importance, and any change in any given year has been mainly due to the fluctuations in crop production attributable to weather conditions. Thus, for example, the range in the relative importance of crops in any particular year has been as low as 34 percent (1937) to as high as 57 percent (1952). Over the whole period, however, crops and livestock have each

## INDEX NUMBERS OF CANADIAN AGRICULTURAL

## OUTPUTS, BY CATEGORIES, 1926 to 1952

(1935 - 1939 = 100)

	1	2	3	4	5
Year	Crops	Livestock	Forest	House	Total
		and	Products	Rent	
		Livestock			
		Products	يعاده ومعدولة فرقتهم والمحدولي		
1076	118 8	03 3	123 8	00 3	106 0
1020	118 2	97 3	120.0	107 1	108 3
1921	152 6	8 30	110 /	111 3	122 5
1920	119 /	93 /	116 1	113 6	107 1
1030	09 G	80.4	127 9	112 1	01 7
1931	97.6	95 1	134 4	113.8	99.7
1932	107 7	93 0	109.9	105 0	101 7
1933	98.4	99 4	110.5	104.6	100 0
1934	101.5	93.0	102.1	103.8	97.9
1935	97.6	93.7	107.6	109.0	97.3
1936	88.3	103.5	100.5	101.9	96.9
1937	71.6	100.9	98.5	97.2	88.2
1938	101.5	97.4	97.5	97.3	99.2
1939	140.9	104.5	95.5	110.6	99.2
1940	123.5	115.6	100.6	87.5	118.5
1941	128.1	100.6	88.4	82.6	121.8
1942	117.2	142.9	92.5	81.5	124.5
1943	144.1	146.6	110.4	85.9	138.7
1944	197.1	155.1	114.4	83.8	164.7
1945	142.5	155.0	115.9	83.8	141.9
1946	140.8	143.7	130.0	87.5	137.2
1947	160.8	131.1	126.9	91.6	140.1
1948	176.8	135.9	111.5	90.4	148.0
1949	192.8	132.2	111.0	90.1	148.0
1950	140.2	125.8	95.5	86.5	127.0
1951	187.3	123.2	88.1	86.5	145.2
1952	206.7	122.7	90.8	85.5	153.1

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## FIVE YEAR MOVING AVERAGES OF INDEX NUMBERS OF CANADIAN

AGRICULTURAL OUTPUTS, BY CATEGORIES, 1928-1950

	1	2	3	4	5
Year	Crops	Livestock	Forest	House	Total
		and	Products	Rent	
		Livestock			
		Products			
		o ( <b>-</b>			
1928	120.3	94.7	122.4	108.7	107.1
1929	110.1	93.1	124.5	111.6	105.9
1930	114.0	92.2	124.1	111.2	104.5
1931	103.1	92.8	122.4	109.8	100.0
1932	99.6	92.7	119.6	107.9	98.2
1933	100.6	94.8	115.5	107.2	99.3
1934	98.7	96.5	108.7	104.9	88.8
1935	91.5	98.1	103.8	103.3	96.1
1936	92.1	97.7	101.2	101.8	95.9
1937	100.2	100.0	99.9	103.2	96.2
1938	105.2	104.4	98.5	98.9	100.4
1939	113.1	103.8	96.1	95.0	105.4
1940	122.2	112.2	94.9	91.9	112.6
1941	130.8	122.0	97.5	89.6	120.5
1942	142.0	132.2	101.3	84.3	133.6
1943	145.8	140.0	104.3	83.5	138.3
1944	148.3	148.7	112.6	84.5	141.4
1945	157.1	146.3	119.5	86.5	144.5
1946	163.6	144.2	119.7	87.4	146.4
1947	162.7	139.6	119.1	88.7	143.0
1948	162.3	133.7	115.0	89.2	140.1
1949	171.6	129.6	106.6	89.0	141.7
1950	180.8	128.0	99.4	87.8	144.3

contributed on the average between 40 and 50 percent of total output. On the other hand, forest products and house rent have declined in relative importance in the period 1926 to 1952. They have both declined by about 30 to 40 percent between the early and latter years of the period.

### CHANGES IN THE RELATIVE IMPORTANCE OF THE

## VARIOUS CATEGORIES OF OUTPUT

IN CANADA, 1926 to 1952

	1	2	3	4	5
Year	Crops	Livestock	Forest	House	Total
		and	Products	Rent	
		Livestock			
		Products			
1926	16 8	30 /	<sup>7</sup> 6 1	77	100
1920	45.7	40 2	6 0	8 1	100
1928	52 1	35 4	5 1	$7^{1}$	100
1929	A6 7	39 0	5 6	87	100
1930	42 3	40.5	7 2	10 0	100
1931	41 0	40.0	7 0	93	100
1932	41.0	40.9	6.3	8.5	100
1933	44.0	40.5	5 7	8.6	100
1934	43 1	42.5	5 4	87	100
1935	42 0	43 1	5 7	9.2	100
1936	38 1	40.1	5 4	8 6	100
1937	34.0	51.2	5.8	9.0	100
1938	42.9	44.0	5 1	8 0	100
1939	49.8	39.5	4.2	6.5	100
1940	44.6	44.7	4.5	6.2	100
1941	44.0	46.7	3.8	5.5	100
1942	39.4	51.4	3.8	5.4	100
1943	43.5	47.3	4.1	5.1	100
1944	50.1	42.1	3.6	4.2	100
1945	42.0	48.9	4.2	4.9	100
1946	42.9	46.9	4.9	5.3	100
1947	48.1	41.9	4.7	5.3	100
1948	50.0	41.1	3.9	5.0	100
1949	52.7	38.7	3.8	4.8	100
1950	46.2	44.3	3.9	5.6	100
1951	54.0	38.0	3.2	4.8	100
1952	56.5	35.9	3.1	4.5	100
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 $\ensuremath{^{\diamond}}$  Component parts expressed as a percentage of total of outputs.

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### CHAPTER VI

## CHANGES IN THE OVERALL ECONOMIC EFFICIENCY OF CANADIAN AGRICULTURE

The overall economic efficiency of Canadian agriculture was calculated by multiplying the ratio of the indexes of total output and total inputs by 100. The efficiency so calculated is presented in Table 9. The index of economic efficiency shows an increase of 44 percent from 1926 to 1952. A comparison of any two years may be doubtful for the same reason that a comparison of output of any two years may not be significant since year to year effects of weather and other variables distort the secular trend. Nevertheless, it appears that Canadian agriculture was most efficient during the five year period of 1940 to 1945, and least efficient between 1930 to 1935. The table below gives a summary of the changes in output, input and efficiency in five year periods.

The low index of output (hence low efficiency in 1931-1935 was caused by the general drought which seriously affected yields in the prairie areas. The low input (and high efficiency) in 1941-1945, was caused mainly by the reduction in the farm labor force to meet the war demand for manpower. These two periods represent extremes of low and high efficiency in the agricultural sector of the economy.

CANADA--INDEX NUMBERS OF AVERAGE OUTPUT, INPUT AND EFFICIENCY BY FIVE YEAR PERIODS, 1926 to 1950

Period	Output	Input	Efficiency
1926-1930	107.1	98.0	109.4
1931-1935	99.3	99.2	100.1
1936-1940	100.4	100.1	100.3
1941-1945	138.3	93.1	147.6
1946-1950	140.1	106.5	131.5

In general, however, the main fact which emerges from the study of the ratio of output to input in the twenty-seven year period under study is that technological progress has resulted in about 40 percent more agricultural output with a comparatively slight increase in input. This means that the increase in output has come about not through an increase in total input but rather through an increase in the productivity of factors of production via new techniques and improvements in the factors themselves. This has resulted in the substitution of certain inputs for others with results as shown in the above analysis of input structure. This fact is even more apparent for the years 1930 to 1945 when production increased greatly along with a slight decrease in total inputs. Moreover, the years of highest efficiency have indicated that production might be maintained or even increased along with a further reduction of certain factors of production such as labor.

# INDEX NUMBERS OF TOTALS OF OUTPUTS, INPUTS

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## AND EFFICIENCY IN CANADIAN AGRICULTURE, 1926 TO 1952

			والمتعادية والمترجات بتكريك فكالفا المترج
	1	2	3
			Index of
Year	Index of	Index of	Efficiency
	Total	Total	(Col. 1 ÷
	Output	<u>Inputs</u>	<u> </u>
1926	106.0	92.3	114.8
1927	108.3	96.5	112.2
1928	122.5	99.4	123.2
1929	107.1	99.4	107.8
1930	91.7	102.6	88.9
1931	99.7	100.0	99.7
1932	101.7	98.1	103.7
1933	100.0	97.8	102.2
1934	97.9	99.8	98.1
1935	97.3	100.4	96.9
1936	96.9	100.1	96.9
1937	88.2	98.1	89.0
1938	99.2	99.8	99.3
1939	99.2	101.6	97.6
<b>194</b> 0	118.5	100.9	117.4
1941	121.8	90.9	134.0
1942	124.5	90.5	137.6
1943	138.7	90.9	152.6
1944	164.7	96.6	170.5
1945	141.9	99.1	143.2
1946	137.2	107.9	127.2
1947	140.1	106.4	131.7
1948	148.0	106.6	138.8
1949	148.0	106.8	138.6
1950	127.0	104.7	121.3
1951	145.2	105.4	137.8
1952	153.1	103.6	147.7
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(1935 - 1939 = 100)

# FIVE-YEAR MOVING AVERAGES OF INDEX NUMBERS OF TOTALS OF OUTPUTS, INPUTS AND EFFICIENCY OF CANADIAN AGRICULTURE

19	28	-1	95	0
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	1	2	3
Year	Outputs	Inputs	Efficiency
1928	107.1	98.0	109.4
1929	105.9	99.6	106.4
1930	104.5	99.9	104.7
1931	100.0	99.6	100.5
1932	98.2	99.7	98.5
1933	99.3	99.2	100.1
1934	88.8	99.2	99.6
1935	96.1	99.2	97.1
1936	95.9	99.6	96.2
1937	96.2	100.0	95.9
1938	100.4	100.1	100.0
1939	105.4	98.3	107.5
1940	112.6	96.7	117.2
1941	120.5	95.0	127.8
1942	133.6	94.0	142.4
1943	138.3	93.6	147.6
1944	141.4	97.0	146.2
1945	144.5	100.0	145.0
1946	146.4	103.3	142.3
1947	143.0	105.3	135.9
1948	140.1	106.5	131.5
1949	141.7	106.0	133.6
1950	144.3	105.4	136.8

#### CHAPTER VII

### CONCLUSION

The study has attempted to determine the change in efficiency and the associated changes in the amount of inputs which have occurred in Canadian agriculture over the past 27 years. The results indicate that the effect of economic progress over the period has been to increase the economic efficiency of Canadian agriculture by about 40 percent. Economic progress, however, is not achieved without adjustments because the increase in productivity of various inputs obviously goes forward at different rates. This fact, plus changes in the relative prices of factors, necessitates substituting one factor for another. It is noteworthy that the whole process has involved comparatively little increase in total agricultural input, as indicated by the fact that the aggregate of all inputs increased by only about 10 percent in the period under study. But substitution has had a marked effect upon the relative and absolute importance of different factors. Thus labor in agriculture has decreased in favor of capital inputs, and the input of land (and attached capital) has declined in relative importance although real estate input has remained almost constant in total amount. These results seem to

support the theoretical analysis of the hypothesis advanced in this thesis (Chapter III).

The value of a study such as this lies in the fact that it points out something of the kind and rate of adjustment imposed on agriculture by economic progress. It is wellto recognize these changes since the benefits of progress are associated with special problems in agriculture which must be taken into account in any long run policy for the industry. The empirical study brings out some evidence to show what direction such long run policies may follow. Thus, for instance, it may be seen that any policy which is aimed at maintaining or extending the economic efficiency of agriculture, must facilitate the movement of certain factors of production into the industry and others out of the industry. The present direction of development calls for an increased amount of capital and an outward movement of labor for, as was shown earlier, the substitution of capital for labor will depend on the rate at which labor saving and capital using production techniques are developed. However, the dependence of agriculture upon overall economic policy such as that of full employment is clear, because capital will not be substituted for labor unless the displaced agricultural population finds alternative employment elsewhere. This fact suggests that the efficiency of labor in agriculture is dependent upon the ease with which agricultural labor can be

replaced with various forms of capital. It may be that this process will have to be facilitated in the interest of agricultural efficiency and welfare. The effect of the outward transfer of labor upon the efficiency of agriculture was made more evident in Canada and the United States, when during the second World War, the agricultural labor force declined with no reduction in the volume of output. This resulted in the improvement of both efficiency and income The implication is that, prior to this of agriculture. time, labor and capital in agriculture were combined in a manner that fell far short of optimum efficiency. Depression. lack of facilities for supplying capital and difficulties involved in changing occupations are forces which restrict the transfer of labor out of and the movement of capital into agriculture.

It is evident then that economic progress brings agriculture into closer relationship with the other sectors of the economy. For example, Canadian agriculture is dependent more and more upon other industries for the supply of various inputs and as an outlet for its products. As a consequence agriculture has come to share not only the fruits of progress in other industries but also some of their pro-

<sup>&</sup>lt;sup>1</sup> T. W. Schultz, <u>Agriculture in an Unstable Economy</u>, New York, MacGraw Hill Book Company, 1945, pp. 95-98.

blems, since any adverse changes in the economic well being of other industries tend to be shared by agriculture. Thus, for example, agriculture has become increasingly vulnerable to depressions and their attendant consequences.

The study too would seem to have implications which might enable presently underdeveloped countries to predict the course of their own development. The entire economy of most of these countries is based on agriculture. Therefore. the possibility of economic development lies in improving the low productivity of the agricultural labor force. This low productivity stems from a number of reasons, among them being a scarcity of resources per man, difficulties associated with securing capital, lack of alternative employment possibilities and beliefs and customs that are not conducive to change. Undoubtedly programs will be developed to aid in overcoming these obstacles. In developing these programs, the rate and direction of economic growth of these countries might well be aided by the Canadian experience which has been analysed in this thesis.

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## APPENDIX

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### APPENDIX A

### FARM MORTGAGE INTEREST RATES

The interest rates used to calculate the annual input of land and non-land capital (pp.24-25) were Canadian Farm Loan Board interest rates graded slightly upward to conform more closely to actual market rates of interest. The Canadian Farm Loan Board rates were as follows:

The rates used in this study were as follows: 1926 to 1936 inclusive . . . . . . . . . . . . . . 7 percent 1937 to 1945 inclusive . . . . . . . . . . . . 6 percent 1946 to 1952 inclusive . . . . . . . . . . . . . . . . 5 percent

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### APPENDIX B

## LAND AND NON-LAND CAPITAL INPUT IN AGRICULTURE,

## CANADA, 1926-1952 (see pp. 24-25)

## TABLE 12

# VALUES OF LAND AND NON-LAND CAPITAL INPUTS IN AGRICULTURE, CANADA, 1926-1952\*

## (in thousands of current dollars)

		Machinery &	
Year	Land	Implements	Livestock
	(a)	(b)	(c)
1926	4683637	547247	785626
1927	4999459	577165	863104
1928	5193629	608267	933080
1929	4696998	638122	947498
1930	4698745	665172	758224
1931	4053282	650664	516714
1932	3489400	610658	<b>415</b> 886
1933	3425200	573867	444092
<b>1</b> 934	3467808	538685	457654
1935	3662234	511163	538994
1936	3554474	494197	577490
1937	3634981	478454	607316
1938	3271970	474990	594132
1939	3371018	469287	656363
1940	3321328	462120	69826 <b>7</b>
1941	3029846	596046	623486
1942	3253535	605154	816353
1943	3490997	611592	1202960
1944	3703418	592058	1179423
1945	3773606	605268	1168184
1946	3969014	784260	1148731
1947	4363312	810131	1242197
1948	4923146	883295	1342202
1949	5040534	1008683	1475912
1950	5417828	1179005	1626438
1951	6004892	1334613	2254085
1952	6004892	1334613	2254085

\* The values for land and machinery for the years 1926 to 1929 were found by interpolating values of 1922 and 1930 as follows: First the values for 1922 and 1930 were deflated by their respective price indexes. Then the difference between the two values was apportioned for the eight years, 1922 to 1930. These values were then inflated to give values in terms of current dollars. These operations are presented below:

1. Method of Adjustment for Values of Land, 1926 to 1930 (thousands of dollars).

Value of 1	and, 1930 ", 1922	=	: 4 : 4	,698,745 ,232,588
Deflated V	alué			
of 1	and, 1930		: 3	,532,891
Deflated V	alue			
of 1	and, 1922	-	2	,549,752
Diff Year Apportione	erence ly Increm	ent = 1926 =	3	983,139 122,892
Apportione	u varues,	1927	: 3	.287.107
		1928 -	: 3	,164,215
		1929 =	: 3	,041,323
Inflated V	alues,	1926 = 1927 = 1928 = 1929 =	4 5 4 4	,696,998 ,193,629 ,999,459 .683.637

2. Method of Adjustment for Value of Machinery, 1926 to 1930 (thousands of dollars)

Value of Machinery,	1930 <b>=</b> 1922 <b>=</b>	665,172 391,660
Deflated Value	1020 4	,
of Machinery,	1930 <b>=</b>	685,744
Deflated Value		
of Machinery,	1922 =	435,662
Difference	=	250,082
Yearly Increm	ent =	31,260
Apportioned Values,	1926 =	560,704
	1927 =	591,964
	1928 <b>=</b>	623,224
	1929 =	654,484
Inflated Values,	<b>1926 =</b>	547,247
	1927 =	577,165
	1928 <b>=</b>	608,267
	1929 =	638,122

Source: Canada, D.B.S., "Gross Agricultural Wealth of Canada, by Provinces," <u>Monthly Bulletin of Agri-</u> <u>cultural Statistics</u>, March, 1923, 1929-1931 and 1935.

> Canada, D.B.S., "Current Values of Farm Capital in Canada, by Provinces," <u>Quarterly Bulletin of Agri-</u> <u>cultural Statistics</u>, January-March, 1941 and April-June, 1945, 1947-1951.

Canada, D.B.S., "Current Values of Farm Capital in Canada, by Provinces and Items," <u>Monthly Bulletin</u> of Agricultural Statistics, March, 1937-1940.

The current values of land and non-land capital were deflated by the following price indexes:

### TABLE 13

## INDEX NUMBERS OF PRICES OF LAND AND NON-LAND CAPITAL INPUTS IN AGRICULTURE, CANADA, 1926-1952

(1935-1939 = 100)

Year	Land	Machinery	Animal Products
	(a)	(b)	(c)
1926	154.2	97.6	130.2
1927	158.3	97.5	127.8
1928	158.3	97.6	138.2
1929	154.2	97.5	144.4
1930	133.3	97.0	133.3
1931	116.7	94.9	92.7
1932	100.0	94.1	70.5
1933	100.0	92.1	69.2
1934	95.8	94.6	86.5
1935	100.0	95.5	94.1
1936	100.0	97.8	93.7
1937	100.0	97.2	106.0
1938	100.0	104.1	104.8
1939	104.2	103.6	101.5
1940	100.0	105.8	106.7
1941	104.2	109.1	124.4
1942	108.3	114.4	144.6
1943	116.7	117.1	161.8
1944	125.0	118.2	166.1
1945	125.0	115.1	170.2
1946	133.3	118.8	181.2
1947	145.8	126.3	200.2
1948	162.5	138.8	263.7
1949	166.6	158.6	265.4
1950	179.2	166.4	281.4
1951	195.8	186.8	336.9
1952	200.0	196.0	277.5

Source:

(a) Calculated from average values per acre of occupied farm lands in Canada as given in the D.B.S., <u>Quarterly Bulletin of Agricultural Statistics, XLVI</u>, <u>1953, 18 and XL</u>, 1952, 31.
(b) Canada, D.B.S. Department of Trade and Commerce, Prices Branch, <u>Price Index Numbers of Commodities</u> <u>and Services used by Farmers, 1913 to 1948</u>, Rev. 1948, July 21, 1948, p. 8, April 1951, p. 3 and January 1952, p. 3.
(c) Canada, D.B.S. Prices Section, <u>Prices and Price</u>

Indexes, XXÍI, 1948, 53. Canada, D.B.S., Department of Trade and Commerce, Prices and Price Indexes, XXXI, 1948, 10.

# TABLE 14

### DEFLATED VALUES OF LAND AND NON-LAND CAPITAL INPUTS

### IN AGRICULTURE, CANADA, 1926-1952

(thousands of dollars)

 Year	Land	Machinery and Implements	Livestock	Total
1926	3037378	560704	603399 -	4201481
1927	3158217	591964	675355	4425536
1928	3280877	623224	675166	4579267
1929	3046043	654484	656162	4356689
1930	3524940	685744	568810	4779494
1931	3473249	685631	557406	4716286
1932	3489400	648946	589909	4728255
1933	3425200	623091	640306	4688597
1934	3619841	569434	529311	4718586
1935	3662234	535289	572789	4770312
1936	3554474	505314	616318	4676106
1937	3634981	492237	572940	4700158
1938	3271970	456282	<b>5</b> 66 <b>92</b> 0	4295172
1939	3235142	452910	646663	4334715
1940	3321328	436786	654421	4412535
1941	2907722	546330	501195	3955247
1942	3004187	528981	564559	4097727
1943	2991428	522282	743486	4257186
1944	2962734	500895	710008	4173697
1945	3018885	525863	686360	4231108
1946	2977505	660152	633958	4271615
1947	2978952	641434	620478	4240864
1948	3029628	636380	508988	4174996
1949	3025531	635992	556109	4217632
1950	3023342	708564	577981	4309887
1951	3066850	714461	669066	4309887

The deflated values were expressed on an annual basis by multiplying them by interest rates on farm mortgages (see Appendix A) and are presented in columns 6 and 7 of Table 16.

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### APPENDIX C

### LABOR INPUT IN AGRICULTURE, CANADA,

## 1926 to 1952 (see p.23)

### TABLE 15

LABOR INPUT IN AGRICULTURE, CANADA, 1926-1952

	Labor	Average Monthly	Annua1	Labor
Year	Force	Wages	Wages	Input
	(a)	(b)	(c)	(d)
1926	1143	\$49.99	\$599.88	\$685 <b>,</b> 662
1927	1155	51.51	618.12	713,929
1928	1167	51.14	613.68	716,166
1929	1179	49.78	597.36	704,287
1930	1191	44.25	531.00	632,421
1931	1203	33.64	403.68	485,627
1932	1223	25.35	304.20	372,037
1933	1243	23.61	283.32	352,167
1934	1263	25.01	300.12	379,052
1935	1284	26.62	319.44	410,161
1936	1304	28.78	345.36	450,349
1937	1324	31.18	374.16	495,388
1938	1344	31.91	382.92	514,644
1939	1364	33.52	402.36	548,819
1940	1329	40.14	481.68	640,153
1941	1210	46.62	559.44	676,922
1942	1127	60.01	720.12	811,575
1943	1107	74.17	890.04	985,274
1944	1126	84.25	1011.00	1,138,386
1945	1134	90.60	1087.20	1,232,885
1946	1274	96.27	1155.24	1,471,776
1947	1163	103.96	1247.52	1,450,866
1948	1186	113.07	1356.84	1,609,212
1949	1123	113.89	1366.68	1,534,782
1950	1066	114.00	1368.00	1,458,288
1951	998	127.00	1524.00	1,520,952
1952	926	135.00	1620.00	1,500,120

(a) Thousands of persons, 14 years or over, with jobs in agriculture as of June of each year.

(b) Average wage rates without board, as of May 15 of each year. The figures for 1926 to 1940 were calculated by con-

verting index numbers of wages by taking average wage rates for 1935-1939 = \$30.4. This latter figure was calculated from 1951-1952 figures of wage rates and index numbers of wage rates for the two years. (c) column (b) x 12. (d) column (a) x column (c).

Source: (a) Canada, D.B.S., <u>Reference Paper No. 23</u>, p. 15. Canada, D.B.S., <u>Special Surveys Division</u>, <u>The</u> <u>Labor Force, Quarterly Surveys</u>, IX (No. 6), VII (No. 2), VII (No. 2).

> (b) Canada, D.B.S., "Farm wages," <u>Quarterly Bulle-</u> <u>tin of Agricultural Statistics</u>, XLIV, Nos. 1, 2 and 3.

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#### APPENDIX D

### VARIOUS INPUTS IN AGRICULTURE, CANADA

### 1926-1952

## TABLE 16

# VALUES OF VARIOUS INPUTS IN AGRICULTURE, 1926-1952

(thousands of current dollars, except where specified)

	1	2	3	4	5
ند نسبت و خد د			Non-Land	Cost of	
Year	Labor	Land	Capital	Operat-	Depre-
		(Deflated)	(Deflated)	ing Farm	ciation
				Machinery*	
1926	685662	212616	81487	46647	139368
1927	713929	221078	88712	51606	150713
1928	716165	222661	90887	58890	158043
1929	704287	213223	91745	65760	164463
1930	632421	246146	87819	64935	153422
1931	485627	243127	87013	57997	132866
1932	372037	249258	86720	53108	120946
1933	<b>352167</b>	239764	88438	50361	115671
1934	379052	253389	76912	<b>544</b> 06	113948
1935	410161	256356	77565	54232	116327
1936	450349	248813	78514	55287	112770
1937	495388	218099	63910	56917	113411
1938	514644	196318	61392	58500	114572
1939	548819	194109	65974	62309	117918
1940	640153	199250	65472	67500	117227
1941	676992	174463	62852	76137	119963
1942	811575	180251	65612	83377	138536
1943	985274	179486	75946	86886	150039
1944	1138386	177764	72658	95327	160012
1945	1232885	181133	72733	101924	169783
1946	1471776	148875	64706	<b>1181</b> 76	190964
1947	1450866	148948	63096	129294	208887
1948	1609212	151481	57268	153147	233677
1949	1534782	151278	59605	173361	249278
1950	1458288	151167	64327	191766	271994
1951	1520952	153343	69176	226419	285111
1952	1500120	153343	69176	246399	303929

# Source: Col. 1, Appendix C.

2-3, Appendix B.

4-8, Farm operating and depreciation expenses taken from: Canada, D.B.S., Reference Paper No. 25, <u>Farm Income</u>, Part II, February, 1952 and <u>Quarterly Bulletin of Agri-</u> <u>cultural Statistics</u>, XLVI, (January-March, 1953), No. 1.

# TABLE 16 (Continued)

6	7	8
Taxes	Fertilizer	x Miscellaneous
49536	6182	47032
49000	5798	49290
51285	6849	50168
53462	8878	44265
54347	12050	44174
50346	9936	330.09
45833	5657	26255
41442	5309	24735
50531	6410	28145
41122	6989	28802
41529	7695	29112
40667	10157	32968
41009	11189	34530
40953	11141	36223
40111	12574	39784
41194	12348	40165
41916	16305	50712
44063	17728	48107
46172	18815	56507
48276	21622	58929
54463	23608	62913
60680	28379	78890
69392	31157	89267
76972	37288	90750
80662	40168	93512
89704	45015	106151
96393	50296	106632

\* Total expenses in operating tractor, truck, automobile for business, engine and combine.

\*\* Includes machinery and building repair expenses.

<sup>x</sup> Includes fruit and vegetable supplies, veterinary expenses, binder twine, irrigation charges, fence repairs, harness repairs, salt, hardware and small tools.

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#### PRICE INDEX NUMBERS OF COMMODITIES AND SERVICES USED

#### BY FARMERS, CANADA, 1926-1952.

(1935 - 1939 = 100)

	1	2 & 3	4	5	6	7	8
	Wage	Int-	Opera-	Depre-	Tax	Ferti-	Miscel-
Year	Rates	erest	tion of	ciation	Rates	1izer	1aneous
		Rates	Machin-				
			ery				
1926	164 5	109 /	197 7	102 2	135 5	120 /	104 0
1927	169.5	109.4	118.1	100 5	134 7	120 A	104.0 102 A
1928	168.3	109.4	112.8	102.4	130.8	120.7	105.0
1929	163.8	109.4	113.5	103.0	130.3	119.8	101.7
1930	145.6	109.4	113.6	98.4	128.4	114.1	100.0
1931	110.7	109.4	105.1	93.0	119.5	106.9	99.8
1932	83.4	109.4	108.7	90.2	113.2	93.5	99.8
1933	77.7	109.4	105.5	90.4	102.9	95.5	93.9
1934	82.3	109.4	108.2	92.6	102.3	98.2	94.9
1935	87.6	109.4	105.1	93.1	101.0	97.0	96.4
1936	94.7	109.4	101.9	97.6	99.2	98.2	96.7
1937	102.6	93.8	99.7	100.4	98.2	101.4	101.0
1938	105.0	93.8	97.4	102.6	100.6	103.3	104.3
1939	110.3	93.8	96.2	104.9	101.1	100.2	101.6
<b>194</b> 0	131.8	93.8	97.5	108.7	102.1	106.3	109.1
1941	163.5	93.8	105.0	114.4	102.9	114.0	113.5
1942	211.7	93.8	114.5	124.0	104.3	121.9	120.0
1943	267.8	93.8	114.7	127.8	106.3	112.9	120.7
1944	275.3	93.8	114.7	133.6	111.2	112.9	120.5
1945	298.1	93.8	114.3	131.9	113.4	112.9	119.7
1946	314.6	78.1	116.3	134.7	117.2	113.9	120.8
1947	341.4	78.1	121.3	145.4	125.6	120.5	129.3
1948	371.2	78.1	136.9	164.7	127.8	131.5	153.6
1949	373.3	78.1	139.2	180.5	127.8	141.3	164.4
1950	382.4	78.1	145.1	189.4	144.3	147.0	168.3
1951	416.6	78.1	147.1	217.4	151.8	159.5	187.4
1952	445.5	78,1	149.9	225.7	161.4	181.3	204.1

Source: Canada, D.B.S., Prices Branch, <u>Price Index Numbers</u> of <u>Commodities and Services used by Farmers, 1913-1948, July 21, 1948, pp. 5 and 8, April 1951, p. 3 and January 1952, p. 3. Canada, D.B.S., <u>Quarterly Bulletin of Agricultural</u> <u>Statistics</u>, XLIV, 1948, No. 1 p.23 and No. 2, p.119.</u>

# DEFLATED VALUES OF PRODUCTION INPUTS

# IN AGRICULTURE, CANADA, 1926-1952

# (in thousands of dollars)

	1	2	3	4
Year	Labor	Land	Non-Land Capital	Cost of Oper- ating Farm Machinery
1926	416816	194347	74485	36529
1927	421197	202091	81090	<b>43647</b>
1928	425529	209927	83078	52207
1929	429968	194902	83862	57930
1930	434355	225545	80273	57161
1931	438687	222237	79537	55182
1932	446088	223271	80269	48857
1933	453239	219163	80839	47736
1934	460574	231617	70303	50283
1935	468220	234322	70900	51600
1936	475553	227436	71768	54256
1937	482737	232586	68134	57088
1938	490137	209294	65449	60062
1939	497569	206939	70334	64770
1940	485700	212452	69800	69231
1941	414020	185995	67006	72511
1942	383361	192165	69949	72818
1943	367914	<b>1913</b> 50	80965	75750
1944	413507	189514	77461	83110
1945	413581	193106	77541	89072
1946	467825	190621	82850	101613
1947	427905	190714	80789	106590
1948	433516	193957	73327	111868
1949	411139	193698	76319	131725
<b>19</b> 50	481351	193556	82365	132161
1951	365087	196342	88574	153922
1952	336727	196342	88574	164376

5	6	7	8	9
Depreciation	Taxes	Fertilizer	Miscellaneous	Tota1
136368	36558	4777	45223	945103
149963	36742	4481	48135	987346
154339	39210	5674	47779	1017743
159673	40130	7411	43525	1017401
155917	42326	10561	44174	1050314
142866	42131	9295	33075	1023010
134086	40489	6050	263()8	1004418
127954	40274	5559	26342	1001406
123054	49395	6527	29658	1021411
124948	40715	7205	29878	1027795
115543	41864	7836	30105	1024361
112959	41412	10016	32642	1037575
111669	40764	10832	<b>331</b> 06	1021313
112409	40503	11119	35653	1039296
107844	39284	11829	36466	1032606
104863	40033	10832	35388	930648
111722	40188	13376	42260	925829
117401	41452	15702	39857	930383
119769	41522	16665	46894	988442
128721	42571	19151	49231	1012974
141770	46470	20727	52080	1103956
143664	48312	23551	61013	1088838
141880	54297	23694	58117	1090656
138104	60228	26389	55201	1092600
143648	55899	27325	55563	1071868
131146	59117	28222	56644	1079082
134661	59723	27741	52244	1060398

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### APPENDIX E

## AGRICULTURAL OUTPUT IN CANADA BY CATEGORIES,

## 1926-1952 (see Chapter V)

## TABLE 19

## CANADA--TOTAL FARM CASH INCOME AND INCOME IN

### KIND, 1926-1952

## (in thousands of current dollars)

	1	2	3	4	5	6
	Cash	Income in	Co1.1	Cash in-	Feed	Co1.4
Year	Income	Kind from	plus	come from	Expenses	minus
	from	Crops	Co1.2	livestock		Co1.5
	Crops					
1926	555794	44204	600178	388146	59047	329099
1927	523866	38927	562753	399167	61243	337924
1928	618486	34822	653308	427526	62132	365394
1929	484255	38109	522334	429459	60093	369366
1930	271188	41182	312370	353973	52300	301673
1931	177777	24529	202306	281713	35614	246099
1932	186163	21263	207426	213223	29269	183954
1933	190738	<b>28065</b>	218803	219648	26374	193274
1934	231702	28804	260506	260343	34606	225737
1935	234530	28157	262687	286032	36897	249135
1936	255877	31704	287581	318212	42984	275228
1937	262479	31774	294253	362171	57368	304803
1938	296589	29976	326565	339714	52261	287453
1939	343985	32081	376066	354626	52310	302316
1940	303020	33201	336221	408277	53872	354405
1941	328504	34511	363015	531675	70017	461458
1942	365862	44038	409900	701431	96719	.604460
1943	539102	53355	592457	830897	133118	697779
1944	852922	54998	907920	932761	173673	759088
1945	681510	56628	738138	970077	197113	772964
1946	736167	62086	798253	950740	193093	757647
1947	877129	66693	943822	1017128	280392	736736
1948	1060102	70279	1130381	1330350	292887	1037463
1949	1104213	64902	1179115	1314473	280512	1033961
1950	795552	62271	857823	1346062	287388	1058674
1951	1129484	67272	1196756	1538600	295966	1242634
1952	1338154	91050	1429204	1296541	281444	1015097

Source: Canada, D.B.S., Reference Paper No. 25, Farm Income, <u>Part II</u>, February 1952, pp.32, 33 and 46 and <u>Quar-</u> <u>terly Bulletin of Agricultural Statistics</u>, XLVI (1953) No. 1, pp.23 ff.

# TABLE 19 (Continued)

	· <u>·</u> ··································				
7	8	9	10	11	12
Income in	<b>Col.</b> 6	Cash Income	Income in	Co1. 9	House
Kind from	plus	from Forest	Kind from	plus	Rent
Livestock*	Col. 7	Products	Forest	<b>Col.</b> 10	
			<u>Products</u>		
85166	414265	21934	32948	54882	77263
86229	424153	22234	31698	53932	83506
90669	456063	23638	30516	54154	85271
90645	460011	23894	29344	53238	87706
74973	376646	21909	29113	51022	80487
54449	300548	16611	29495	46106	73742
39479	223433	12867	24578	37445	63346
41326	234600	12181	22332	34513	61229
48561	274198	14325	21246	35571	61415
51332	300467	15468	21635	37103	63974
55536	330764	1658 <b>1</b>	21834	38415	62501
59817	364620	17326	21990	39316	62745
60636	348089	16817	22166	38983	60492
59351	361667	17451	22335	39786	61701
66148	420553	23711	22452	46163	59533
77190	538648	25078	22189	47267	59523
99824	704284	31712	22808	54520	64225
111201	808980	36971	34644	71615	70036
119014	878102	43142	37659	80801	74296
126320	899284	44224	38232	82456	75588
130293	887940	55512	42675	98187	7980 <b>3</b>
158062	894798	70790	52406	123196	87577
184302	1221765	72696	60108	132804	97040
161870	1195831	76095	60529	136624	100315
148625	1207299	81908	64706	146614	107772
172462	1415276	85354	74023	159377	120796
<b>145668</b>	1160765	84097	73135	157232	123869

\* Includes dairy products, poultry and eggs.

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### WHOLESALE PRICE INDEX NUMBERS OF FARM PRODUCTS,

#### CANADA, 1926-1952

(1935 - 1939 = 100)

	1	2	3	4
	Field	Animal	Lumber &	House
Year	Products	Products	Timber	Rent
1926	158.5	130.2	112.1	124.8
1927	149.4	127.8	109.3	125.0
1928	134.3	138.2	114.7	122.8
1929	137.2	144.4	116.0	123.8
<b>193</b> 0	105.8	133.3	100.9	115.1
1931	65.0	92.7	86.8	103.9
1932	60.4	70.5	77.1	96.7
1933	69.3	69.2	79.0	93.9
1934	80.5	86.5	88.1	94.9
1935	84.4	94.1	87.2	94.1
1936	102.2	93.7	96.7	98.3
1937	128.9	106.0	101.0	103.5
1938	100.9	104.8	100.7	99.7
1939	83.7	101.5	105.4	104.6
1940	85.4	106.7	116.1	109.1
1941	88.9	124.4	135.2	115.5
1942	109.7	144.6	149.1	126.4
1943	129.0	161.8	164.1	130.7
1944	144.5	166.1	178.6	142.1
1945	162.5	170.2	179.9	144.6
1946	177.9	181.2	191.0	146.2
1947	184.1	200.2	245.6	153.3
1948	200.6	263.7	301.2	172.2
1949	191.6	265.4	311.4	178.5
1950	191.9	281.4	388.2	199.7
1951	200.4	336.9	457.3	224.0
1952	216.9	277.5	437.8	232.4
				هی است
Source:	Col. 1-2, C Col. 3, $\overline{C}$	anada, D.B.S., rice Index, XX	Prices Section II, 1948, p. 5	on, <u>Price &amp;</u> 33. 15 &

)1.	З,	Computed from above source, p. 15	ð.
		XXXI. Nos. 1 and 8.	
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- Col. 4, Canada, D.B.S., Prices Branch, Price Index Numbers of Commodities and Services used by Farmers, 1913-48, July 21, 1948.
- Col. 5, Index Constructed by taking the average of 50% of index of costs of building materials and 50% of index numbers of tax and interest rates.

# CANADA: DEFLATED VALUES OF FARM INCOME

# (in thousands of dollars)

	1	2	3	4	5
	Total In-	Total In-	Total In-	Total In-	
Year	come from	come from	come from	come from	Grand
	Crops	Livestock	Forest	House	Tota1
			Products	Rent	
	050001	010170	40050	C1000	0.077.04
1926	378661	318176	48958	61909	807704
1927	376675	331888	49343	60805	824711
1928	486454	330002	47214	69439	933109
1929	380709	318567	45895	70845	810016
1930	295246	282555	50567	69928	698296
1931	311240	324216	53118	70974	759548
1932	343420	316936	48567	65508	774431
1933	313733	339017	43687	65206	761643
1934	323610	316992	40376	64715	745693
1935	311241	319306	42549	67985	741081
1936	281390	353003	39726	63582	737701
1937	<b>2282</b> 80	343981	38927	60623	671811
1938	323652	332146	38712	60674	755184
1939	449302	356322	37748	58987	902359
1940	393701	394145	39761	54567	882174
1941	408340	432997	34961	51535	927833
1942	373655	487057	36566	50811	948089
1943	459268	499988	43641	53585	1056482
1944	628318	528659	45241	52284	1254502
1945	454238	528369	45834	52274	1080715
1946	447709	490033	51407	54585	1044734
1947	512668	446952	50161	57128	1066906
1948	563500	463316	44092	56353	1127261
1949	614442	450577	43874	56198	1165091
1950	446769	429033	37767	53966	967535
1951	597184	420088	34852	53927	1106051
1952	658923	418294	35914	53300	1166431
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