TECHNOLOGICAL UNEMPLOYMENT

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IN

CANADIAN AGRICULTURE

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By

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PREFACE

In the past, several writers have expressed, with a great deal of undue pessimism, their ideas on "Technological Unemployment"; too many believe that eventually the world will evolve into a system of robots. The specific aspect of "Technological Unemployment", dealt with in this thesis, is that found in connection with Canadian agriculture. An attempt has been made to study the effects of the introduction of machinery, first, on the economy as a whole, and then on agriculture in the provinces of Canada and to demonstrate that the evils of the machine have largely been over-emphasized.

I would like to thank Professor H. Michell for his valuable suggestions and constructive oriticisms.

A. H. Ostershek.

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CHAPTER I

"Day by day the machines are gaining ground upon us; day by day we are growing more subservient to them."

Samuel Butler.

Our age is truly the age of the machine. The results of discovery and invention have completely revolutionized the organization of production. Man's power over natural resources has increased, and his strength multiplied many times. The machine, with its speed, regularity, precision and exhaustless power, has become the centre of civiliza-The rapid progress of mechanization during this cention. tury and the last is constantly compared with the results of science and invention at the end of the eighteenth century, a period better known as the Industrial Revolution. The classic development at this time in machinery for spinning and weaving, the invention of the steam engine and advances in communication were parallel with enormous increases in the population and a general rise in the standard Even in the nineteenth century, however, the of living. machine was not new, for improvements in tools have been more or less continuous in the history of modern civiliza-The development of electric power, the internal tion. combustion engine, new processes and new machines since

1900, has given men the power to develop huge stocks of material wealth but not without problems in the dislocation of labour. Actually, the speeding up of the mechanical means of production and communication during the past four or five decades was not as drastic as the immediate consequences of the Industrial Revolution.

Our main concern is not so much with the technology or history of machines but with their impact upon the world. The great inventions were responsible for the ultimate separation of labourers and employers. Before 1760, there existed what was known as the "domestic system" whereby a middleman provided the raw materials, took all the risks and received all the profits, the worker accepting such wages as the middleman was willing to pay. The "domestic system" owed its downfall to the factory system with the coming of heavy machines. These required water or steam power, making them impossible to utilize in the home, with the result that home production was abandonned and industry became concentrated in a unit or factory. England did not suddenly turn into a nation of factories, with all the characteristics of a later decade. The process was cumulative. At first the new factories absorbed only those unemployed as a result of the Enclosure Acts, whereby the common-field system began to be eliminated through government legislation. The inability of the "domestic system" to compete with the

economies of large-scale production quickened the rate of employment. At first these economies were passed on to the worker in the form of fairly good wages and a greater variety of commodities: but as more and more of the population became absorbed into factories the intense competition for labour among the masses brought wages down to the starvation level. This in turn demanded the employment of women and children in factories and mines, which previous to this time had not existed. Long hours, monotonies and unhealthy surroundings culminated in disease, deformities and premature The writings of the times by such notable authors as death. Samuel Butler, Charles Dickens and Elizabeth Barrett Browning reflect only too well the conditions of that period. It was not so much the introduction of machinery which caused the problem, but the rapid rate at which it was installed with hardly any planning or regard for the results.

It was discovered that the system of laissez-faire, whereby the government did not interfere with industry and let the economic laws of supply and demand determine the conditions and wages of labour, led to the exploitation of the masses. It was no wonder that Samuel Butler wrote of the increasing dominance of the machine. "Nobody could argue that a peasant or a journeyman before 1750 was a freeman, but he was infinitely more free, and infinitely more of a human being than his grandchildren in the mills and mines of 1830."¹ By

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1850, after much agitation on the part of humane reformers, a few major reforms were effected. Three factors brought about the lessening of the dominance of the machine and "laissez-faire" in industry. They were, first, legislation which abolished to a large extent the evils of factory employment which had sprung up: secondly, the provision for factory inspection and enforced government legislation on such things as safety and sanitation and the limitations of working hours and ages; and finally the trade-unions which taught the worker to organize for his own benefit and protection. Had these reforms been initiated at an earlier date it would have saved a great deal of maladjustment. These reforms neither threatened nor affected England's Industrial supremacy as was feared, for it was discovered that the higher wages and better working conditions were more then compensated by the increase in efficiency. Thus the problem in the middle of the nineteenth century was essentially one of the rapid rate of introduction of machines into factories, rather than the machines themselves, for as has been previously pointed out, inventions have been going on since the beginning of the history of man. The reforms which occurred in England, though they abolished the evils of the factory system, have by no means solved the problem of the machine. Whether it is a curse or a benefit is debatable.

It is an accepted fact that the machine brings with it certain dangers and certain benefits. Whether the former outweigh the latter can only be decided by considering each of these in turn. A great deal has been written right. ly or wrongly on the evils of the "machine age" - the growth of impersonal relations in the work-shop, the exploitation of human and natural resources, the monotonous repetition through minute specialization, the loss of economic independence of the worker and the displacement of skill and "manhours". (This letter factor will be dealt with in greater detail presently.) Despite these disadventages, few of us would wish to retrace our steps to an age with no factories, modern means of transportation and communication or great mechanical inventions. Machinery does most of the roughest and hardest work and a higher living standard has been secured for a larger proportion of the total population. By saving human labour it is possible to shorten the working day, thereby allowing more time to be devoted to educational functions. Modern industrialism has thus multiplied the necessities, comforts end luxuries of life.

The increasing use of the machine as a supplement or alternative to human labour is credited with a large share in the growth of unemployment. Speaking generally about industry, it is true that the introduction of a machine

displaces man-power - but this does not necessarily mean that the demand for <u>total</u> employment is less. New machines are not only introduced into existing industries but also create new ones to satisfy new demands. For example, when the "talking" motion picture made its appearance, many theatrical musiciens were displaced. However technical progress effected not only their re-employment in radio stations but also opened up an entirely new field of activity which absorbed a great many more. But this is only one instance. It is quite impossible to calculate the exact number of persons who are displaced by technical innovations and how many are actually reabsorbed into other industries.

Displacements caused by the introduction of new machines and new methods have been regarded by the worker himself, as one of the major causes of unemployment and has been called "technological unemployment". The conclusion is that if one man can do work formerly requiring the services of two, only one of the two can continue to be employed. This problem is basic, for if increased output per worker persists then it points to permanent technological unemployment. Because, as we have stated, it is impossible to compute the number of persons who are displaced by machines, then we must look to economic history for the answer as to whether industrial change really operates to bring a constant increase in the

number permanently unemployed. The enswer is in the negative for there has not been a continual trend downward in the volume of employment. It is true that during certain periods the volume has been diminished, but there are also times of prosperity as well as depression when employment is at its peak and technological advance is only one of the many reasons offered to explain cyclical fluctu-There is of course little comfort for the worker ations. who has been immediately displaced to be told that it is only temporary and that given time the lower prices through increased economies of machine production will result in a greater or diversified demand and eventually will lead to the re-employment of those displaced. A worker cannot regard a machine that is depriving him of his position or his still, with anything but resentment and opposition and economic history is full of instances where machines have been destroy-But these efforts proved useless for the machine is here eđ. to stay. Even the trade-unions see the futility of opposing them and the controversy now is not so much over their introduction, but over the conditions of their introduction.

On the whole and over long periods, the demand for the services of human beings in industry has kept page with the growth of population. The pessimistic predictions of Malthus have not been realized. Yet the transitional period of unemployment, where there is a time-lag between the introduction

of labour saving methods and the demand for goods. is likely to be one of serious meladjustment for meny workers. We may console ourselves with the idea that the problem is essentially short-run. Human progress depends on the creation of material resources and this we have already achieved. It also depends on the regulation of the factors which produce these resources, for if we fail in this respect, some part of the population will suffer and the purpose of science and invention to benefit mankind will be defeated. The passing of the Factory Acts in England was a step in the right direction, but they made right only the wrongs which should never have grown up had there been careful planning. This regulation is a continuous process for there is an everwidening gap between the progress of science and invention and our ability to adapt ourselves to it. Management plays and important part in this connection. In this age of costly equipment and large factories, technical changes are not introduced overnight: they are known by management long before they occur. If a policy of gradual introduction is adopted where the workers have time to adjust themselves to new machines and new taks, and new workers are not added. it would do a great deal to offset the immediate effects of technological change. These policies are within some measure of attainment by all, although some firms could carry them out much more easily than others. If as we have seen, the problem is one of regulation and adjustment of men to machines

then a slower rate of mechanization may be desirable, for technology is merely a means to an end - the goal being the welfare of man.

Up to this point we have been dealing primarily with technological development in industry as a whole and its effects. The purpose of this study is to note the significance of mechanization in the field of agriculture specifically Canadian agriculture.

Mechanization of farming is relatively novel. There was a time when to speak of farming in Canada was to speak of practically the whole economy. Manufacturing was merely a by-product of agriculture, which was then on a self-sufficient and non-commercial basis. Even as late as 1891 more than half of the population gainfully occupied were employed in farming. Although it was in England that the Industrial Revolution originated, it was not long before it began to spread to the civilized world. In North America. the industrial processes gradually began to take hold. The development of capital, of steam-power and iron in the world soon became apparent in Canada, although at a somewhat later date than in Europe and the United States. The capital was supplied by the English and American investors who had already accumulated fortunes in commerce or industry. Communications and transportation, essentials to Canadian development, stimulated the growth of trade, and the opening up of inaccessible

areas for production and settlement. A money economy replaced the old system of barter and banks began to finance the expending commercial operations. Thus, with effective transportation, and expital investment in enterprises, a new Canada was created. The Industrial Revolution here, has made constant progress in the conquering of the frontier. The railroad linked up areas inaccessible by rivers or lakes. The result was first the opening up of Ontario, then the famous wheat-growing Prairies and finally the lumber, fruit and minerals of the Pacific coast.

The two causes of the change in Canadian agriculture are in essence the distinguishing features of the machine age - modern mechanical transport and machine production. The rapid and relatively cheap transportation by rail enables the farmer to send away his surplus product receiving in return manufactured goods. This surplus is made possible by machine methods whose economies and mass production have been demonstrated in industry.

It has been stated that many factors in Canada combine to effect a large displacement of agricultural labour by mechanization; that the character of the land leads to specialization in one grop; that the industrial development and inelastic character of the world's demand for grain facilitates mechanization and much displacement of labour.

It is our purpose to prove that this is not generally true for the whole of Canada. With respect to the inelastic character of the world's demand for grain it may be stated that during the depression of the 1930's agriculture suffered particularly severely due to the depressed prices and huge volumes of surpluses. When mechanization is applied to agriculture it is not identical with mechanization in industry. In the latter there is uniformity of both action and material while in farming there is uniformity of neither. In some cases in industry, adjustments do not even require the use of human intelligence. In raising a crop this is not the case. While a farmer may specialize in a certain crop, his machinery there, is by no means specialized. Let us take wheat growing as an example. Here he must be able to operate not only a plough but also a harrow, a cultivator, a seca-drill, a binder or combine and many other machines besides these. These operations are not performed simultaneously but successively, as each machine is adapted to a special seasonal purpose and cannot , like manufacturing machinery, be used for the balance of the year. Even in dairy farming the machines can only be used for a period of a few hours a day.

Thus we see that the so-called specialization in one crop involves a diverse number of machines. In Canada it is only in the Prairie Provinces that specialization has

been carried on to any great extent. This is because land prices were low enough to induce large-scale specialized farming; but even here there has been a tendency toward more diversification than is popularly believed. This tendency is magnified in the rest of Canada, as we shall see in later chapters, for the former has discovered two advantages in growing different crops first as a safeguard against fluctuations in the price of one commodity and secondly to absorbe labour during slack periods.

The man purpose behind the adoption of mechanical equipment is the desire to increase production efficiency; but the extent to which this can be effected in agriculture is limited. Manufacturing and other commercial enterprises are becoming larger, fewer and more centrally owned, with large scale production and specialization increasing. where specialization is possible, it heightens revenue - but in agriculture, and available market and the distribution of natural resources are limiting factors. In Western Canada, as has been pointed out, railroads and mechanization have made the profitable penetration of the Prairies, with a more or less specialized economy, practicable. Yet, farmers are continually realizing the safety and economy of varying their crops. In Eastern Canada, this together

with differences in the soil, climate, topography and distance to markets leads to greater diversity in far-Improvements in farm techniques have increased mind. the efficiency of the individual worker on the farm and the intensity of work per acre. Perhaps large-scale operations, such as having and grain growing now require less labour, but this is offset by the growth in importance of such types of farming as dairying and vegetable gardening. Thus, contrary to the popular conviction, it appears that mechanization in Canadian agriculture has not effected large displacements of labour and complete specialization in one product. This is true in some measure even when we consider farming in the Prairie Provinces where wheat is emphacized and machinery reduces the number of "manhours." Although wheat growing is stressed, other crops are also raised and mechanization, well suited to the extensive character of the economy only displaces labour in that it eliminates the seasonal need for it. Speaking generally of Eastern Canada, while one product may predominate in regions geographically suited for its growth, it is not cultivated to the point of excluding all others.

We shall see that the consequence of mechanization here, has been diversified, more intensive and efficient farming rather than a displacement of farm labourers.

CHAPTER II

THE EVOLUTION OF AGRICULTURAL MACHINERY

To trace, the crude hand methods of ancient agriculture as they evolved through history up to our present "power-farming", is to describe the evolution of agriculture from a small primarily self-sufficing economy to large-scale methods of production.

Ancient and Medieval Agriculture

In ancient times, hand methods in agriculture were very orude when compared with the mechanized farming of the present day. The grain was sown by hand, out with a sickle and threshed with a flail. The plough, even in its erudest form, substituted animal power for hand labour by means of the primitive hoe. For four thousand years there were gradual changes, and just before the Christian era, the forked stock of ancient times was replaced by iron for the plough points. Thus the plough of the Middle Ages had a wooden beam with iron share and coulter, handles, wheel or foot irons.

In harvesting equipment there was no great transformation. Since the beginning of history, almost, there

was first a sickle; during Roman times, a scythe. Some attempts were made to reduce the arduous labour of harvesting by hand by the invention of machines but they were forgotten during the centuries. Herein arises en interesting point - the fact that the ancients were capable of inventing machines, comparable in efficiency to some of our modern implements. If this was the case, then why did they persist in employing hand labour instead of substituting machine methods? The answer to this is that in ancient times, the existing social order, where a great proportion of the society was in the slave class, did not call for capital in the form of agricultural machinery. Labour was plentiful and low in price. The main advance from ancient times to the Middle Ages was in the more efficient use of animal power supplementing man's labour. Progress was negligible as implements had changed little and agricultural organization had not greatly developed up to the fourteenth century even in most advanced countries.

Seventeenth to Twentieth Centuries

Agriculture at the beginning of the seventeenth century was only slightly changed from ancient times and was a self-sufficing economy. There were a few crude

"bull" ploughs and the peg-tooth harrow which had a wooden frame and spikes for teeth. The grain was sown by hand, harrowed in or trodden in by animals, cut with a hand sickle or scythe, threshed with a hand flail or animals treading over it and winnowed in the wind or by a fan. We see, therefore, many hand tools but the plough, the harrow and wagon were the only other agricultural implements. In the eighteenth century there was a conscious and organized attempt to improve agricultural machinery. Efforts were made by the Society of Arts in England, to encourage its use and so to better cultivation through new implements.

A quick survey of population increase in England from the seventeenth to the nineteenth century would be useful at this point. The 1,200,000 increase in the seventeenth century was the result of a greater production of foodstuffs due to the extension of arable farming and more efficient methods of agriculture in England during this time. However from 1700 to 1750 there was only an increase of 400,000. This degrease in the rate can only be explained by the fact that population had outrum subsistence, while the current methods in agriculture had reached their eptimum in efficiency and could not support a much larger population.

However, from 1750 to 1801 the figures show a phenomenal increase of 2,265,000. With this enormous rise in population, increased production by means of more extensive cultivation and improved methods became imperative.

Men like Jethro Tull, Lord Townshend, Thomas Coke and Robert Bakewell tried to introduce scientific farming into England in the eighteenth century but it was the period of the Napoleonic Wars that complied British agriculture to make the transformation from the old methods to the more mechanized scientific processes. The climex during the Napoleonic era, as far as British trade was concerned, was in 1806 when the "Continental System" was inaugurated by Napoleon which aimed at outting her off completely from commerce with the continent. There is no question that the industrial population of England suffered severely under the system. Raw materials rose tremendously in price and in 1812 the British people were hard pressed through the searcity of food. Thus in England, at the end of the eighteenth and beginning of the nineteenth century, the increase in population and the Napoleonic wars demanded advanced techniques in agriculture along all lines. For example, Jethro Tull's seed-drill, invented in 1730 was not practical to own until hervesting mechinery had advanced more, for then.

all the grain that could be harvested in a season could be sown by hand in one day. The Rev. Patrick Bell (1799 - 1869) in 1827 turned his attention to the construction of a machine which might lessen the labour of harvesting. He was considered to be the original inventor and not Cyrus McCormick but it has been ascertained with tolerable certainty that John Common of Denwick was the first to produce a machine having the essential principles of a modern reaper in 1812. Many attempted to construct a reaper but Common and Bell were the only two who brought out successful ones. They never took out a patent for it and were, consequently, forgotten as the eriginal inventors when Cyrus McCormick patented his machine.

In America, about this same time, there was a public land policy aimed at the opening up of western lands. This meant an extensive economy where the problem was one of a labour shortage. Therefore, the machinery required was not particularly land-saving but was laboursaving. We shall see later, however that with the end of the last frontier (about 1890) also came the end of the extensive agricultural period and with the reversion to an intensive economy, the trend was toward land-saving as well as labour-saving devices. With the growing

importance of cotton in the south, Eli Whitney's cotton gin, invented in 1793 was very important as it provided for the automatic removal of the seed from the cotton. In 1797 Newbold demonstrated his cast-iron plough. An iron plough had been used in England before this for the transfer to iron and steel was made quickly, as metal was abundant in England and wood relatively scarse. However Newbold's plough broke and wooden ploughs were still used in America for with no renewable parts the inro plough was costly to maintain. It was not until about 1820 when Wood introduced removable parts to ploughs that their use became widespread.

The threshing machine worked by animal or water power was invented by Andrew Meikle, a Scottish millwright, in 1784. Although a labour-saver as well as a better performer, it spread very slowly to the wheat-growing countries of England where it did not come into general use until about 1830. The large forms of Northumberland and Scottish Lethians used steam engines for driving the threshing machine as early as the 1820's but not until the 1850's did an individual farmer own a portable one.

In American in the decade between 1820 and 1830, a "outting box" to cut up joughage for feed, a cultivator for row crops, a horse rake and the Bailey mower appeared.

In 1825 the "chaff-piler" or "ground-hog" threshers were used but their use did not become general until later. These are mentioned here to show that as farming moved westward, genuine attempts were made in the evolution of machinery to overcome the shortage of labour.

The decades from 1830 to 1860 are known as a transitory period in American agriculture. The Repeal of the Corn Laws in England, the potato famine in Ireland and the German Revolution which led to large immigration into the country, all were factors to induce greater production. During the two decades following 1833, improvements were made to the steel plough in the way of greater durability and improving the scouring qualities. The evolution of the reapers continued after Common and Bell, when Cyrus Mc-Cormick constructed one and patented it in 1834. In the meantime, Hussey developed his reaper in 1833 which led to a great controversy. Eventually, however, Hussey's machine evolved into the modern mower and MoCormick's into the binder. Cyrus McCormick became a manufacturer along this line, putting the reaper on the market in 1845 with the result that 1,000 reapers were sold in 1851. The power of horses and oxen was used to drive the rotating parts of such stationary machines as threshers. In 1834 Pitts combined a "ground-hog" thresher and a fanning mill

and thus started the development of the modern grain separator which threshes, cleans, weighs and bags the grain. By 1850 factories were established for the manufacture of ploughs, harrows, grain drills, reapers, mowers, threshers, strippers and power sweeps. This date marks the close of the hand era and the beginning of the machine age in American agriculture. Improvements continued on all classes of implements and especially in mowers, threshers and reapers. In 1858 the Marsh harvester which was originally designed to facilitate hand binding, became the foundation for later machines to facilitate automatic binding.

Between 1860 and 1887 we note a great expansion in American agriculture. During the Civil War there was increased production, even with one-tenth of the man-power in the services, because agricultural machinery was adopted in farming. Homestead Acts also called for greater expansion. As originally passed in 1862, they enabled the landless farmer to obtain title, practically without financial consideration, to a farm of 160 acres or less, on condition that he live thereon and cultivate it for a minimum period of five years. This period was reduced for ex-soldiers by the time spent in military service. The Act was the natural corollary of the Preemption Act of

1841 when the national policy of settling population on public lands was finally put into statute form. It was but one of the several acts designed to give land almost gratuitously to settlers, instead of distributing it through grants of large size to companies or corporations. As the desirable lands of the Middle West were taken up, changes were made to extend the public land policy. Thus by this method the territory was rapidly settled and brought under cultivation.

In the U. S. A., by 1887 there was a near exhaustion of public lends. The more intensive cultivation which followed, led to an improvement of farms which in turn induced a rise in land values. (The same took place in Canada 10 - 20 years later.) Ingrease in land values demands greater return per acre and agricultural machinery is only profitable to employ where the return is large enough to warrant its use . During this period ceme the perfection of the twine-binder which was more efficient than the one using wire. The introduction of the rollerprocess for flour manufacture also took place in this Before this, millers were employing millstones period. to perform the whole of the grinding operation. This one passage through the millstone required intense friction and even when the wheats used were soft or mellow, and

therefore relatively resistant to disintegration, some of the husk of wheat was reduced to powder. In most of Europe and eastern United States, soft wheat was grown and it was not necessary to have gentle grinding, but in some sections of Europe where the grain was hard and the skin easily crushed, they began to use iron roller mills, as described hereafter. When the north-west territories of the United States and the western provinces of Canada were developed, it was discovered that the hard wheat was the most suitable type to be grown. Thus the American and later the British millers began to adopt the new European methods because the consumers were unwilling to accept flour containing a large proportion of powdered husk. Therefore, the gradual reduction by roller mills replaced the grinding of wheat by millstones in one operation.

The wheat is gradually broken down as it passes through the roller mills, known as the breaks, by successive stages. These now number three, four or five although in some parts of the world six are used occasionally. Some flour is made on the breaks but usually millers attempt to make a minimum amount there. The bran is separated from the stock as it leaves the last break. At this point, from 8 to 18 percent of the original cleaned wheat may be flour end from 10 to 15 percent is bran. The remainder, at this

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stage, is known as granular products. Further grinding by rolls known as reduction rolls is required to transform these intermediate products into finished flour and husk. The principle of gradual reduction is also employed at this final stage.

This process was a great step forward in the development of agricultural machinery for it was instrumental in the development of the Canadian west. Prairie wheat is hard wheat - it is planted in the spring and harvested in late summer, chiefly in the early part of September. The softer variety of Eastern Canadian wheat is planted in It then begins its growth, lies dormant during the autumn. the winter, to revive again in the spring and produce a crop of relatively soft wheat. The reason why winter wheat cennot be grown on the Prairies, or sections with similar climatic conditions, is that no thick mantle of snow protects the sprouted grain during the severe winter and because the sudden heavy frost breaks up the ground ex-In North America, bread is made from posing the wheat. hard wheat alone, but in Europe, hard Canadian wheat is mixed with the softer European product. Although this gives a lower quality loaf in Europe, it is infinitely better than one made from soft wheat alone.

Displacement of much labour in haying was a result

of the use of the mower and horse rake and thus the production of hay was mechanized by 1872 except for the loader which came into use by 1885. The grain binder was the result of forty years struggle not by one man but by many, for in 1870 the Locke machine abolished the tedious process of binding sheaves by hand. Five years later the combine came into use although it had existed as early as 1826. It was drawn by 12 to 30 horses, cutting a swath of grain 16 to 24 feet wide end threshing, cleaning end sacking in one trip over the field. We note that the forerunner of the modern tractor in the form of the self-propelled steam traction engine made its appearance in 1880.

The use of steam stimulated the invention of machinery. In the 1830's steam was applied extensively to agriculture and by 1850 there was an established system of steam ploughing. However since the invention of the internal combustion engine agricultural machinery owes little to steam as it is easier to use oil fuel and not have coal thus making for greater speed and efficiency. By 1920 the internal combustion engine made headway as a source of power for field operations and agricultural treetors followed. In 1884 the prototype of the modern riding plough, used so much in the United States and Canada, evolved. A year later a combination machine for husking

corn and shredding the stalk was introduced.

In the last decade of the 19th century, most of the agricultural machinery was established except for a few minor improvements. In the early 1890's the two-row cultivators began to appear. Between 1896 and 1902 a gesoline engine was mounted on a truck and the great modern tractor industry began, which inaugurated the period of "power-farming" in the twentieth century. These tractors with thirty and forty horse-power engines called for larger ploughs, heavier disc harrows and wider grain drills. Actually, they were too large and costly for small farms to operate but by this time mechanization had become such a vital part of agriculture that in 1916 light tractors and light ploughs with 8 to 16 and 10 to 20 horse-power were manufactured. Later, small sizes of grain threshers, ensilage outters and feed grinders brought "power-farming" to many small farms. The mechanical corn-picker wasm built and used in the decade following 1910, although the idee of such a machine had existed for some time. During the next few years rotary hoes for rapid corn cultivation became popular.

In the twentieth century, the fundamental principles involved in many of the modern farm implements and machines are the same as those employed many years ago. A great deal of progress has been made however, in the adaptability and

construction of such equipment. Modern farm implements and machinery are made of better material, are stronger, more durable, lighter in weight and will do better work than their predecessors.

Thus, from this brief historical sketch it is clear, that through the introduction of agricultural machinery and implements, the muscular exertion of farm work was slowly shifted first from man to bests of burden, which in turn were largely displaced by mechanical power. We have seen how steam was a stimulus to the invention of farm machinery in the middle of the nineteenth century and how later the invention of the internal combustion engine provided speedier and more efficient production. The use of mechanical power is responsible for much of the progress which has been made. Tractor-drawn and motordriven implements and machines are capable of working under heavier load and at a greater speed than those operated by work animals. Tractors are now powerful enough to plough many furrows, harrow them, and sow the seed all in one operation or at hervest, to reap, thresh, clean and sack wheat at one passage across the field. The trend at present is toward electricity. The majority of farm houses have electrical appliances but, as yet, this recent innovation involves serious expense to transmit the current to all parts of the farm in spite of its efficiency. In the

future, electricity will probably assume greater im-

The economic use of machinery in agriculture is dependent on a variety of factors which change from country to country, from district to district and even from farm to farm. But the one principle which is common to all cases is that the machine must do sufficient work to repay its capital outlay and working costs over a reasonable period. If it does not, then it would not be profitable to adopt a machine and manual labour would be employed. For example, the cost of using tractors is greatly influenced by the size of the farm. The minimum-sized farm for the economical use of a tractor is from 320 to 480 acres in the Prairies. At any acreage less then this, horses would be used because the interest depreciation and repairs required, are spread over too small an area. Another factor which may influence the adoption of machine-methods is the speed with which the work can be done and therefore the ability of taking advantage of favourable weather The combine which cuts off the heads of grain conditions. and threshes them at once on the field, can get the harvesting operations completed before the frosts occur during havest time. Nevertheless it must still repay its capital outlay. We have seen how the large 40 horse-power drawn tractor was not profitable to own by the smaller farms.

But when the smaller size was manufactured, the capital outlay was not too great for an average sized unit to absorb and hence their adoption enabled improved methods of farming.

It has sometimes been supposed that the introduction of machinery has led to rural depopulation and will intensify it in the future, with the adoption of more mechanical devices. But it has been shown even in older countries that machinery has been introduced usually because a labour supply of a particular kind has failed; for example the falling off of casual and migrant labour at harvest time due to a number of social causes has encouraged the widespread adoption of the self-binder. In newer countries the introduction of machinery has had the effect of populating waste areas, for the vast tracts of new land in the United States, Australia and Canada could not be farmed in the present circumstances without the aid of machinery; the alternative would be timber production or stock raising.

The use of machinery also requires skilled workers, and the more widespread the use of machinery becomes in agriculture the more highly skilled will be the workers. The mechanization of agriculture also means that a higher wage can be paid because the unit of production is en-

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larged. The alternative is a system of peasent holdings with primitive methods but it is obvious with the present system of "power-farming" that the Western World is steadily moving away from the social conditions that made such a system possible. It is certain that with the cheap fertile lands of United States and Canada largely utilized, and with the increasing population, more intensive agriculture is bound to come. In this connection, the farmer in order to maintain his standard of living must pay adequate attention to machinery as it evolves in its many phases.

The great saving in man hours, resulting from the introduction of agricultural machinery, can easily be demonstrated by statistics.¹ on the production of a few of the staple grain crops. The production of 50 bushels of wheat in 1829-30 required 160.6 man-hours. In 1895-6 this figure dropped to 7.4 with the introduction of machinery and finally to 2.5 in 1929-30. To produce 160 bushels of oats in 1830, 265 man-hours were necessary. A century later this number dwindled to 4.8. A similar reduction took place in the production of barley. In 1829-30, 211.9 man-hours yielded 100 bushels of barley. With machine-power supplementing man-power, the same output called for only 9.0 man-hours in 1895-6. By 1929-30, improvements in technology reduced this number to 3.5.

^LMichell H. - "ELEMENTARY ECONOMICS"-Page 34-35

CHAPTER III

MECHANIZATION IN CANADIAN AGRICULTURE

Economic conditions have mainly been responsible for the continuous and dynamic growth of mechanization in agriculture. During periods of depression and unemployment, the demand for mechanization is small. On the other hand, periods of labour shortage such as have been experienced during the war years together with the need to increase farm production, result in an increased demand for equipment.

In Ganada, farm mechanization took place in two stages corresponding with the available motive power, first when internal combustion engines were mounted on a tractor and secondly when the self-propelled unit, operated by one man, emerged through the use of the mechanical power plant. In the 1840's practical mechanics were still striving to produce a workable mowing machine and the principle of applying steem power which would reap, thresh and propel itself simultaneously was in the minds of many inventors. Half a century later we have the adoption of animal drawn

machinery to steam tractors but when the internal combustion engine made its appearance mechanical alterations were necessary. One outstanding advance took place with the invention of the mechanical twine knotter making possible the Self-Binder and another occurred when the Thresher-Harvester or Combine came into existence.

Through in use in California by 1870, the "Combine" did not make any headway in Canada's own wheat fields until after the First World War, in spite of the fact that they were developed and manufactured in Canada. The reason for this was that Western Canadian Farmers believed that northern grain would not ripen eady enough to permit combined harvesting operations. During the First World War with the acute man-power shortage, the search for labour-saving devices was accelerated and, as a result, important advances in both the design and capacity of tillage and cultivating machinery took place.

During the 1920's Canada became the world's largest wheat-exporting country and this period witnessed the second great revolutionary change in agriculture - the replacement of animals by the internal-combustion tractor aiding in the further displacement of farm labour. The first stage in mechanization, the transition from human to animal power took half a century. The second stage, due to
advences in World War I took a little more than a decade. By 1928 the ferm tractor, though still mounted on iron wheels, replaced the horse in large-scale ferming. However, late in 1929, the world-wide collapse of purchasing power initiated the period of the depression whose disastrous effects were universal. Prices fell in all commodities including agricultural returns which were still more depressed due to the existence of large agricultural surpluses. In many areas, subsistence farming was again adopted; countries raised import barriers, adopted subsidies and in some cases even burned food and destroyed animals. This disaster was intensified in the United States and Canada by drought and dust storms.

During the depression years, the desire to lower production costs due to low prices on the part of the farmer conditioned advances in the combine which enabled the engine both to pull the implements and to operate the machinery. Previous to this the internal-combustion engine was first used to replace animals in drawing the machine and then to provide the power to operate the mechanism itself. The small "power-take-off" units which were manufactured in the 30^{*}s were very well suited to the smaller farms of both Eastern and Western Canada. It has been shown that cost reductions as high as 40 percent may be gained with the combine as compared with the binder

method of harvesting. Increased yield will run as high as 15 to 20 percent due to savings in grain handling, stooking and hauling to the thresher. The latest development in harvesting machinery has been the perfection of the self-propelled combine. It was manufactured in Canada in 1939, and the evolution from the cradle, through reapers, self-binders and thresher-harvesters to the modern combine was complete. The smaller more economical model was designed to enable the farmer with one helper to haul away any kind of threshed grain or gereal at unbelievably low costs. With the onset of the Second World War agricultural techniques again enabled food production to reach a maximum despite the great man-power shortage.

Mechanization is not available to all types of farming uniformly. For example, in the Western Provinces with an extensive economy, farms require mechanization of approximately 10 dollars per acre while in the Eastern Provinces it amounts to about four times as much. A very important consequence of the progress in agriculture is land improvement. In Canada, this is the result of the era of modern mechanization. It is advisable to concentrate on the improvement of presently accessible lands rather than the development of mew and as yet untried areas. The Western Prairies, with variations in climate, topography

and vegetation have not only extensive soil problems but also a few of the intensive of Eastern Canada. Equipment for everything from heavy brush removal and dirt moving to spreaders, tillage, seeding and spraying machines has been introduced. When penetration of the Prairies was beyond its primary stages and the most easily eccessible lends were used up, the crawler tractor greatly aided in land clearance and made possible the utilization of semi or mon-productive land. In Eastern Canada heavy machinery such as bull graders and giant ploughs are used to advantage in the improvement of farms.

Seil conservation is included in land improvement. In its broadest sense, this embodies all those factors which contribute to the preservation and improvement of the production capacity of the soil. Thus it is necessary to utilize the great contribution of farm machinery in such a way as not to destroy those factors so vital to soil conservation but within the past 50 years mechanization has developed with slight consideration for this factor. Within the past 15 years however, the introduction of the one-way disk and the combine harvester together with strip farming, has largely checked soil movement. In the future a proper relationship in the design and operation of tillage machines and tractors is required for the conservation of soil.

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In Western Canada, one of the chief considerations in farming is the conservation of moisture. To achieve it. the practice of summer fallowing has been adopted for one complete year out of every two. The less of moisture is due to excessive pulverization of soils and the use of certain farm implements. Irrigation, a method by which dry regions are able to obtain meisture, has developed through mechanization and effected the utili zation of submarginal areas. Wind erosion is characteristic of only the drier regions of the Prairies while water erosion is more universal. A solution to this problem is to secure vegetative protection such as trees or perhaps grass, grain and cultivated grops where it is possible to adopt machinery. Contour farming has been successfully attempted in several areas with standard farm equipment but should this method of combatting the erosion of soil become more important, specialized machinery could be manufactured. Dams are built in more serious situations.

Farm drainage, another essential to successful crop production, converts swamps and marsh areas to fortild regions and also permits harvesting in those regions where the soil remains wet too long in the spring. Development of the power ditcher has given great impetus to drainage work leading to a further appreciation of land value.

The effect of mechanization on grain production is the same in Eastern Canada as in the West. An increase in farm productivity is due to better equipment, increased knowledge of cultural practices, improved variety of grains and the effective control of pests. When animal power was predominant much land was cultivated for animal food. To-day it is utilized for human consumption. Mechanization of the fruit industry has progressed to a high degree of perfection along two limes - plant protection and crop handling. However very little advance has been made in specialized or improved machinery as standard types are quite adequate. The cultivating, spraying and harvesting of petatees have kept pace with advances in machinery in other farm production.

- Mechanization, the key to a high standard of liwing through higher output per worker, will continue to evolve in the future just as it has developed in the past. Existing machines will be improved and no machines developed, all designed to increase the productivity of the farm and ease the work of the labourer. Monotony and inefficiency has been lessened.

CHAPTER IV

A PROVINCIAL SURVEY OF FARM POPULATION

During the past five decades there have been decided changes in the rural population of Canada. How far mechanization has been responsible for these shifts, will be demonstrated by a survey of each of our provinces.

The Maritime Provinces

Development in the Maritimes taken as a whole, has been uniform with respect to rural growth. As early as 1861 the population, both foreign born and native, has been emigrating to some degree primarily from rural areas. In Prince Edward Island the rural population reached a maximum in 1891 followed by a degrease of 46.3 percent by 1931. Nova Scotia attained its maximum a decade earlier only to decline 38.2 percent in the next forty years. A slightly different situation existed, however, in New Brunswick. Here the rural population advanced until 1881, dropped slightly during the following decades to increase again until 1931. Nevertheless, in all three of the provinces, the land that was easily accessible and

capable of being exploited profitably was settled first. Gradually the adjacent areas were populated, but by 1891 the Maritimes showed definite signs of rural emigration. Now, the only districts still in the process of growth are suburban areas around large cities, or counties with unused arable land.

In the past fifty years with the technological advances in farm machinery, one man is capable of operating greater area of land than he could previously. with the result that the average size of farms is larger and the number diminished. Thus corresponding to the period of maximum rural population, the number of farms also reached a peak in 1891 but in the following four decades figures shrank by 11.6 percent in Prince Edward Island, 33.4 percent in Nova Scotia and 11.8 percent in New Brunswick. Lately the trend in Nova Scotia has been toward apple growing which requires smaller farm units, yet on the whole the average size of farms is increasing, for with the growing importance of mechanization in agriculture it is more economical to operate a larger unit. For several decades the trend of occupied acreage in the Maritimes has been downward as land with either low productivity or from which the owner derives only a part of his income has been abandoned. Lack of markets and the absorption of much of the farm population in urban centres

has caused the area of improved land to decline since 1911.

It appears that if agriculture was more profitable in the Maritimes, there would be less emigration and more development but instead, opportunities in the cities have caused rural depopulation. The industrialization which has taken place for the past fifty years. requires large-scale production in urban centres with the result that the artisan class, which manufactured on a smaller scale in decentralized locations and kept small sized farms for their own livelihood, was eliminated. In order to subsist they migrated to the city where opportunities for employment existed. The total number of these people in the Maritime Provinces to migrate to urban centres was estimated to be 34,000 in the single decade between 1891 and 1901, and since then, the attraction of cities has become even greater. All these factors have led to emigration from rural areas and few point to mechanization as a cause of the displacement of farm population. The topography and nature of the Maritime Provinces is such that the mechanization which did take place allowed the farmer to improve his work with less effort and to add to the area of his farm. Thus mechanization did make it possible to have a larger farm and with the growth of transportation and communication

subsistence ferming has been gradually disappearing and the commercial type emerging. In the future, no considerable expansion of agriculture is anticipated in the Maritimes unless more markets become available or unless the farm population is willing to accept a lower standard of living - an unlikely possibility.

The Central Provinces - Quebec and Ontario

In general, the manner of rural growth in Quebec and Ontario has been similar to that of the Maritime Provinces. The suburbs of larger cities and the newer countries are still in the process of growth. When they have almost reached saturation, stabilization in the newer countries tends to take place at a figure slightly lower (82 percent) than the maximum.

In the province of Onterio, farm population reached a peak in 1891 and in the following four decades declined 38 percent. In Quebee the maximum in 1911 diminished 5 percent by 1931. The trend of farm population has been downward and is continuing downward in the process of urban expansion. Despite this fact agricultural production is on the upward trend. Again as in the Maritimes the number of farms has lessned since 1911 with an increase in their average size. However the 5 to 10 acre suburban market garden type of farming is not only remaining stable but is actually growing in importance. This is due to the

advances which have been made in transportation, mainly motor vehicles.

Since the beginning of the century the number of persons gainfully occupied in agriculture, the area in farms and improved farm acreage are at about the same level in Onterio while in Quebec there has been a 20 percent increase in improved and occupied acreage and a 17 percent increase in persons. In both these provinces the causes for rural migration are similar to those of the Maritime Provinces. Mechanization has caused no serious displacement of labour in Central Canada. The numbers employed in agriculture in Onteric and the improved acreage have not greatly changed while occupied acreage shows a slight increment. The point may be raised here that even though there was no significant drop in numbers, the propertion of those engaged in agriculture has dwindled. However the chief effect of mechanization seems to enable the farmer to do his work better, in shorter time and with less effort. Different types of farming grew out of mechanization, and except where part-time farming is carried on by the urban worker due to improved transportation, commercialized farming has replaced subsistence farming.

Prairie Provinces

Economic factors have greatly influenced the settlement of the Frairies. Among these were the building of railroads, the availability of markets for surpluses and the cost of transport. From 1876 to 1882 the building of the Canadian Pacific Railway caused annual entries to jump from 350 to 7000, 1883 to 1895 marks a period of recession only to be followed by a great influx up to 1913. Between the years 1914 to 1920 this great influx was modified slightly and extended settlement took place. The post-war slump then began and lasted until 1925 when another era of expansion revived conditions. This period however lasted but four years when the climax occurred to initiate the decade of the depression of the 1930's.

The population grew rapidly as long as new areas which were physically and economically accessible, were available, but once these districts were settled then extension into the poorer sections of land was slower and the surplus migrated. This factor retarded the settlement of the Prairies and is one reason for the diminishing rate of population growth. The other is that little industrial development occurred in urban centres as they are merely distributing posts rather than industrial cities which absorb population surpluses as in the Central and Maritime Provinces.

In contrast with Eastern Canada, the Prairie Provinces owe a great deal of their development to the use of farm mechinery. Land was plentiful and labour scarce. The penetration of the Prairie Provinces, which followed the development of the United States section of this region. greatly benefitted from the experience and techniques which had already been introduced there. While free land in the United States was not altogether exhausted by the end of the nineteenth century, the remaining areas were relatively small. The beginning of the rapid settlement of the Prairie Provinces began about the turn of the century, for the similarity of their economy to the United States made it possible to develop this new area of land. The soils were favourable to wheat growing and the topography to machinery; the technique of combining scarce labour with extensive mechanical equipment and large areas of cheap land had already been attempted. Thus as the cheaper lands in the United States were nearing exhaustion. the new lands of the Canadian West became attractive for settlement and the techniques, already successful in the north-western states, stimulated expansion into the Prairies.

By 1910, mechanization had advanced greatly. Ploughs, horse-drawn discs and binders and occasional steam tractors were fairly common. Stooking was done by hand, then

carried away by a horse-drawn wagon to be threshed. Because the emount of land which could be seeded was greatly in excess of that which could be harvested, many additional workers were needed during harvest time. By 1929. the gasoline tractor and the "combine" had advanced mechanization to the extent that the "harvester excursions" from Eastern Canada were discontinued for there was no longer a need for seasonal labour. The introduction of the "combine" and tractor not only effected the saving of"men-hours" during harvest time, but also brought about adjustments in the farm area. The increased size of farms to over 200 agres is another outcome of mechanization, for in the two decades following 1911, the average size of the farm increased 40 percent, the area of improved land per farm 100 percent and the number of persons geinfully employed 9 percent. The "combine" was an important costreducing technicue. It saved the expense of cutting. binding and stocking the grain and then hauling it to the separator to be threshed. These developments enabled many farmers to survive the period of exceptionally low wheat prices from 1928 to 1940 more easily than they could have otherwise had their costs been higher. Continuous progress in machinery has reduced disadvantages in low rainfall, a short growing season and comparatively high costs of transporting to a world market to a minimum.

In some cases, low costs of wheat production in Canada have intensified competition abroad and foreign countries have raised tariff barriers against imports. However, trade was not seriously restricted by the agricultural tariffs of continental Europe and in the last decade of the nineteenth century, the rapid industrialization of western Europe tended to increase imports of agricultural products. Improved efficiency and lowered transportation costs reduced wheat production in these industrialized and densely populated sections of the world and brought under cultivation more remote regions to produce wheat for the world. Prairie settlement coincided with this shift from the more settled regions where land costs were high, to the pioneer regions where lands costs were a relatively minor expense. The largest international market for wheat has been in the United Kingdom. The percentage of its imports from Canada has increased from 3 percent in 1890 to a peak of 41 percent in 1928. In the period prior to 1928, the steady increase in production and exports of wheat were interrelated in spreading settlement in the Frairie Provinces.

Settlement of the Canadian plains has largely been in conformity with economic trends. The price of wheat and transportation costs have been major factors in this connection. The first period of settlement began in 1876

to 1882. When the Canadian Pacific Railway was being constructed, immigrants under the Homestead Act increased from 350 in 1876 to over 7.000 in 1882. This however turned out to be an unnatural rate of entry and a recession set in until 1895. Figures for wheat prices show a downward trend from 1873 to 1895 and so world markets at that time were not favourable to prairie settlement and the rate of influx could not be maintained. The great expansion of the early eighties was quickly checked. Depressed wheat prices; especially after 1882, are responsible for a decline in settlement. Although the trend in transportation prices was downward from 1885 to 1895. it did not offset the low prices for wheat. This was an advantage, however, when transportation costs continued on the downward slope and wheat prices advanced from 1895 These conditions were favourable to settlement. to 1920. as may be expected, and a great influx occurred. During the war years (1914 - 1920) although the huge influx of settlers was reduced settlement was extended. Population increased on the Prairies from 420,000 in 1901 to 1,900,000 in 1921. Transportation costs were a great burden with the low wheat prices from 1921 to 1924, but the recovery in 1925 brought with it high profits until 1929. Gradual recovery began in 1933 again when the trend has been toward higher wheat prices. The fact that wheat is re-

For the relationship between wheat prices & transportation costs see - Appendix "D"

latively imperishable is both an asset and a disadvantage an asset in the sense that no costs are incurred for refrigeration as it is not highly perishable and yet, because it can be stored quite cheaply without fear of spoiling, a surplus is created, perhaps bringing prices down in the following year.

Subsistence or part-time farming is not carried on to any appreciable extent in Western as it is in Eastern Canada. This is due to the lack of industrialized urban centres which could absorb some of these farmers, and also to the comparatively limited amount of the market-gardening type of agriculture within motor transport of the city. More care is necessary for vegetables here than in the eastern provinces due to differences in soil, climate and topography. In the neighbourhood of large cities, particularly on the dark soils near Winnipeg, truck gardening is significant but throughout most of the region, vegetables are of minor importance.

The immediate problem which concerns the individual farmer is not a long trend of prices, which was an important factor in the settlement of the Prairies, but the fluctuations in price, which occur from year to year. It is not only the fluctuations in price which give the farmer a variable income, but also fluctuations in the yield of his crop which depend on climatic conditions. A relatively

small change in the amount of rainfall will influence the output for that year to a great extent. For these reasons, diversified types of farming such as dairying, ranching and mixed farming, besides wheat growing, have Dairying and ranching are especially well suited emerged. to some areas of the Prairies where climatic conditions are favourable for the growth of forage grops - more rainfall fewer drying winds and en adequate supply of drinking water. Machinery has been effective in encouraging diversified farming to the extent that it exists in the Prairies. Standard types of equipment have been used for cultivation such as ploughs and tractors but in dairying specialized equipment is being adopted more gradually. Thus, althoug wheat will continue to be emphasized in the future, other types of farming are being developed, even if only to satisfy the farmer's own needs as a protection against fluctuations in price and yield.

The constant inward and outward movement makes the population of the Prairies a very transient one. For example in the decade 1921 - 1931 there was a net inward movement of 101,000 persons and an exodus of 93,000. This phenomenon is going on continually. If the population remained stable (i.e. no exodus) then the natural increase in population of the inhabitants could settle the west in a decade. To prove this statement let us examine a few

figures in the years between 1931 and 1914. Natural increase during this period was estimated at about 315,000 and yet the population increase of the Prairie Provinces only amount to 45,000. Therefore a net excdus of 270,000 must have occurred. It is quite certain that the mechanization of agriculture had nothing to do with this. On the contrary without such mechanization the settlement of the Freiries would have been much more difficult if not impossible. The exodus can be attributed almost wholly to the period of drought when large numbers were driven away especially from Saskatchewan. Undoubtedly settlement had gone on unsystematically and areas had been occupied which should never have been allowed. Sub-marginal land was abandoned and the drought stricken areas lot most of all of their population.

Mechanization has greatly aided in the settlement of the Western Prairies and in the conquering of the many hardships encountered in the process. The continued exodus seems to suggest that there are more people available to the region than it can absorb for between 1931 and 1941 w even with the absence of immigration, a surplus of 270,000 people left the region. It appears that either opportunities are lacking for an increased number, or that addition to the population intensifies the distress there. Whatever the answer, people continually tend to leave the region making it unstabilized.

British Columbia

British Columbia differs from the Prairies in that about 57 persent of the population is urban. What farming exists, is on a small scale and of the market gardening and small fruit farming type. As the agriculture is mainly intensive, mechanization follows along this line and has not advanced as rapidly as in the Frairies where farming is almost entirely dependent on machinery. In British Columbie the farm population is dropping in numbers while in the sities it is advancing. However, this latter phenomenon is largely the result of immigration which in British Columbia was primarily directed toward the sities,

OHAPTER V

OCCUPATIONAL TRENDS IN CANADAL

A study of occupational trends in Ganada as a whole for the past 50 years discloses pronounced shifts in the distribution of persons gainfully employed. Technological change has rendered production more and more inaccessible to the independent worker. Livelihood is more dependent than every on the opportunity to be hired for employments in association with others rather than self-direction in a self-sufficient economy. Thus we note a significant change occurring in the relative importance of agriculture to other industries.

Employment in Agriculture - Males

1901		1941	
Percent	Number	Percent	Number
	- 1921复数经第	10 A A A A A	*****

Between 1901 and 1941 the percentage of all males gainfully employed, these in agriculture dropped from 45.82 to 31.66 percent. Although there was an absolute increase of 356,923 in these four decades, the significant factor is the decline in the proportionate number. If we were to assume the percentage engaged in agriculture to have remained constant in 1941 as in 1901, and calculate on this

¹For figures see - Appendix "A"

hypethetical basis the number of persons "displaced" during that period, the total would be 475,458 males and 12,346 females. Under the same theory it may be observed that other revealing figures are the displacement of females employed in the personal service by 62,393 and in manufacturing by 98,589.

In contrast with this, employment in clerical occupations in trade and finance has developed considerably and more women have been absorbed in these fields. This factor may be largely due to the introduction of such machines as typewriters and other office equipment, enabling females to be employed with pleasanter surroundings, higher salaries and more opportunities for advancement. Educational facilities in business colleges and commercial schools are also preparing young women for these positions which are more attractive and have much more to offer. than personal service or factory employment. This perhaps, accounts for the number of females in gainful occupations increasing more rapidly than the number of males. In 1891 there were 144 females to every 1,000 meles employed but by 1931 this number increased to 204 which is characteristic of recent occupational trends. However the progressive importance of the professional service industries is shown in the more than proportional total increment of 40,424 persons since 1901.

In comparing two industries such as agriculture. a primarily extractive one and the service industry, a point to consider is that in both cases with their growing importance leading to greater expansion, the number employed in each does not increase at the same In the service industries few machines can do rate. the work of the individual. Consequently, when such an industry progresses as this one has since the turn of the century, the number of those employed will also increase. Agriculture, still of fundemental importance, shows a displacement of workers which is a result of the greater productivity. Non one can say how much agricultural efficiency will increase in the future but the record of the past is one of progressively greater productivity per worker. So far as the domestic market is concerned, the demand for man-power in agriculture is essentially a demand for food products. To produce beyond this stage is to overproduce, which leads to acute problems of agricultural surpluses experienced during the last depression of the 1930's. A possibility for an increased demand for man-power on farms lies in the field of foreign trade.

Manufacturing has become more and more vital to our modern economy and yet the rise in employment of about 2 percent among the males in this industry in 1941, in

comparison with the 1901 figures, has not even remotely paralled the huge increase in output, while an actual decrease of 12 percent occurred in the number of women engaged. It is thus possible with technological advance to reduce the number of working hours and labourers and yet to multiply the output decreasing the cost per unit and raising the quality of the product. This serves to point out that industry is not dependent upon man as a sole force in production but that it relies upon him to guide the technological forces which are always advancing.

The 1941 census figures show an addition of 3.5% since 1901 in the gainfully occupied males in transportation. From the beginning of the century improvements in water, air and automobile transport have continued to absorb skilled and often highly trained personnel, contributing to the mobility of the population. The logging, mining and quarrying industries have all expanded to some extent and technological advance in the construction industries is finding its greatest realization in public works such as modern highways and waterworks. New and much more speedy construction methods have diminished both cost per unit and need for human labour.

The number of unskilled labourers which have been "displaced" since 1901, again assuming the percentage to

remain constant in 1941, is 23,886. This in all probability is the result of the extension of technodel advances and the specialization, characteristic of our modern economy.

CHAPTER VI

WHEAT PRODUCTION IN CANADA (1861-1944)1

Wheat has held a major position in agricultural economy throughout the history of Canada. A statistical survey discloses that production has progressively ingreased since 1851. with a marked advance during the present century. The decade between 1851 and 1861 was one of progress in Canada's history due to the growth of population, with only limited emigration to the United States, and the expansion of industry, Trade flourished with the help of the Reciprocity Treaty (1854) which provided several privileges, among them free trade in raw products. In 1861 the 10.5 percent of the population engaged in agriculture produced 8.9 bushels of wheat The decade which followed was not as prosperous per caput. as the preceding one. It was characterized by economic stress brought on by the American Civil War and the adoption of tariff barriers by United States against Canadian goods. There was a general impression in the United States that Canada profited most by the Reciprocity Treaty of 1854,

For figures see - Appendices "B" and "C"

When during the Civil War the Canadian Government allowed its territory to be made a base of operations by the Confederacy, the United States gave notice of the termination of the agreement. These unfavourable conditions led to a considerable number of settlers emigrating to the United States. In the 1871 census, the proportion of the total population engaged in agriculture advanced to 13.75 percent but the number of bushels of wheat produced per caput was only 4.8. This sharp decline. as compared with the preceding census year. was, in all probability, due to a poor crop of that particular year and is not typical of the output for the whole decade, because the average production of the years 1861. 1868-1870 amounted to 22,331,000 bushels, an increase of 1,815,000 bushels over the average for the years 1952 and 1860.

A growing export trade, particularly with Great Britain, revived conditions to some extent, but this promising situation of the early 1870's was short-lived because the depression, which was well under way in Great Britain and the United States, soon spread to Canada and an economic slump occurred. This abrupt collapse, largely a result of speculation in land and railread stocks, though more intense, was not of such long duration as the depression years which followed

in the 1880's. Trade was restricted to a small local market. agricultural prices fell and the rate of population growth declined. Even the completion of the Canadian Pacific Railway in 1885 failed to alleviate the distress. This inactivity continued until 1895 or 6 when rising prices and expanding trade marked the beginning of another interval of preperity. We note that during this period census figures reveal a progressive increase in the proportion of the total population employed in farming, from 9.4 percent in 1851 to a peak of 15.3 percent in 1881. In the following decade this figure dropped slightly to 15.2 percent. Since then, there has been a continuous decline until 1941, when the census figures indicated that the proportion was 9.4 percent - the seme as that in 1851.

The increase in the output of wheat of the last century corresponded roughly with the increase in the rural population, but since 1901 we observe that the expansion in the production of wheat is much greater and that there is a marked decline in the agricultural population.

The turn of the century brought with it an era of phenomenal railway expansion, together with the mass agricultural settlement of the Prairie Provinces. The rapid colonization of the Prairies added greatly to

Canada's wheat production, because, prior to this time, agriculture in Western Canada was confined mostly to Manitoba. It was also the beginning of a period of advanced technology, associated with better techniques which began to increase the productivity of land, livestock and labour.

About the time of Confederation when Canada was approximately 80 percent rural, the farm was a selfsupporting unit producting, with a few exceptions, all the necessities of its inhebitants. The stoady growth of trade and manufacture led to greater occupational apecialization, which in turn shifted the scene of production from farm to factory. Within the past fifty years, agriculture has been transformed by what we may call a new industrial revolution. Where previously equipped with hand tools and relying upon horse or ox for his helb he produced his bare necessities, now he produces not merely his necessities but a surplus which he sells to buy what he does not make himself. Equipped with the combine. treator and other mechanical devices he has reduced the manual labour of the farm and increased production to a degree never dreamed of before. Canadian farms have as much power available today as ony other branch of industry.

Very often the idea exists that the decision to

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displace man power by machine power is voluntary. This is not usually the case, for mechanization of prairie agriculture is primarily the result of a labour short-Low wage competition from abroad is also an im-BAG. portant factor. In many foreign countries lebour is much cheaper than machinery. However with a relatively high wage scale in Consda. it would be unprofitable to employ the emount of manual labour required to farm the Preirie Provinces. Machine power has helped to solve this problem at the same time reducing the high cost of production and making possible the profitable use of marginal lend. Throughout the short history of the west. lend values have remained low enough to encourage extensive methods of farming with the aid of mechanization. As a result. an outstanding increase has taken place in wheat production during this century. A decennial average for the period 1901 - 1910 reveals that the production of 108,449,000 bushels of wheat is more than double the average of the preceding decade, while the average for 1941 - 1944 advanced to 397,739,000 bushels. At the same time, figures for the census years show that the proportion of the total population engaged in agriculture has declined from 13.4 percent in 1901 to 9.4 percent in 1941.

However, wheat is a bulky commodity, of low value in proportion to its weight, and without the development which took place in transportation, it would have been impossible

to utilize the productive capacity of the Preiries. The building of the Cenadian Pacific Reilway, which began in 1882 - 1883 and was hindered somewhat by financial difficulties, was completed to the coast in 1885. It connected the southern plains in eastern Canada, which were easily adapted to wheat production. The development of this period was not as great nor as prolonged as that which began early in the present contury. The main line of the Canadian Pacific Reilway and its few branch lines served the settled portion of the west until the oncoming of accellerated immigration in 1908. The great inrush of immigration in 1903 showed a fairly steady increase to a peak in 1913. Manitobe continued to fill up and settlement extended northward into the parklands of Saskatahawan and More railway accommodation became necessary and Alberta. new lines were built in the north and central regions of the West. The building of the Grand Trunk Pacific also began about 1903. With progressive sottlement and extended reilway lines, bulk hendling made relatively lower freight rates on grain possible. The outbreak of the First World War in 1914, ended the rapid development in settlement and transportation of the previous decede, but the domands of the war for an increased wheat supply, gaused the northern sections of the Prairie Provinces to be developed, particularly in the Peece River District. The wheat coreage continued to expand until in 1921 the output of wheat per caput was

25.8 bushels, compared with the 18.3 disclosed by the 1911 census and the decennial average of 238,367,000 bushels for 1911 - 1912 was more than double the 108,449,000 bushels of the previous decade. At the same time the percent of the population engaged in farming dropped from 12.9 in 1911 to 11.8 in 1921. Lend settlement and railway construction continued as important factors in wheat production. for after the slump in 1928 and 1923 immigration revived only slightly until the arrival of the depression in 1929. The period was one during which agriculture suffered particularly severely due to accumulating surpluses, falling prices and restricted markets. The government began its control of the Canadian Northern and Grand Trunk Pacific Reilway and the Nudson Bey Reilway was completed,

Thus, during the present century the movement has been toward greater wheat production with a decline in the rural population. There is no doubt that the upward trend in mechanization and wheat production will continue but it seems that the rate of increase in Ganada is declining. This factor is established by a study of recent agricultural statistics which disclose that between 1901 and 1931 there is a tremendous expansion in wheat production from 51,322,000 bushels (a decennial average for the period 1891 - 1900) to 397.799.000 bushels (the average for 1921 - 1930.) This

we have shown, was associated with the settlement of the west, where conditions favoured long-scale mechanized farming and where the investment in machinery per farm is much higher than elsewhere in Ganada and extremely specialized. We are now in an age of specialization. Industry has been brought to its present high state of efficiency by concentrating its efforts on one or a few products, making possible mass production with all of its economies. These principles also apply to forming. Proper equipment in every line of agriculture is impossible and therefore the trend in farming has also been toward specialization as in the case of wheat production on the Prairies.

However, a great deal of the available farm lands in Western Ganada have already been appropriated so that an expansion in the output of wheat, comparable to that which occurred between 1900 and 1930, is not likely to take place in the future. The similarity of the average wheat production for 1921 - 1930 at 397, 799,000 bushels and that of 1941 - 1944 at 397,739,000 bushels confirms this statement. This does not mean that mechanization is becoming less effective. It merely means that now that the initial stage of settlement in the Prairries has ended, and immigration slowed down, it is not necessary for completely new techniques to be introduced into a new economy but that the

existing machinery need only be supplemented as advanced techniques evolve.

The following figures 1 show the significance of power machinery in modern wheat ferming.

Method of Farming	Acres of Wheat per 1000 men Hours	
Man power	1 - 8	
One horse	10	
Two horses	25	
Four horses	66	
Five horses	121	
Power machinery	333	

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CHAPTER VII

AURICULTURE OF WESTERN AND BASTERN CANADA

We have seen in our study of the Preirie Provinces that toward the close of the nineteenth century a new era of settlement in Canada began. By 1918 the number of annual immigrant arrivals was 402.432, more then ten times the 29,633 of 1893. Other favourable sirchmatences, such as railway expansion and greater world trade, which the revolution in mechanical transport had promoted, were conductive to this are of settlement. We have seen how the inhebitent and the whole agriculturel system depends on the railroad and with the exception of a few of the older settlements, the towns and villages are more railway points. The low cost of trensport, a result of the extended lines, together with rising prices around 1896 made the exploitetion of the Canadian Freiries profitable. At first the hardness of the spring wheat of the northern plains was a drawback but the invention of the roller-milling process in 1878 was a solution to the problem.

Successful settlement in the Preiries could only have been schieved if the income was adequate and this in turn

depended on the productivity of the available land. In general, the topography of the western provinces is favourable to settlement. Rough land is a barrier in only a few areas, and even these would produce a good grop if there was enough time in which to cultivate it. The time element is an important factor for a short growing season concentrates agricultural effort during seeding and harvest. Machinery allows the farmer to economize on his expensive and scarce factor, labour, and to make use of the extensive areas of land at his disposal. It is readily seen that the specialization of wheat is adapted to the type of economy - cheap land, a short growing season, scanty rainfall, relatively expensive 1 bour and a high degree of mechanization - which exists in the Freirie Provinces.

A very different situation is present in Eastern Canada. Dealing primarily with the Maritimes, agricultural development is restricted to some extent by the climate and soil. The climate, with its great temperature ranges, limits the number and quality of products which may be grown and the fertile soils occur only in small patches. In the pockets of fertilize land which do exist, diversified farming is carried on. Although the growth of apples is the most important agricultural crop, the output being one-third to one-half of the total Canadian supply. But it is by no

means the only orop. There are two reasons for this the first is that suitable orchard sites are limited, and secondly the fluctuations which persist in the selling price. Another of the few "specialized" grops of the Maritimes is a high quality and well known poteto, although the farmer grows neither apples nor potatoes to the exclusion of all other crops. A great deal of area is devoted to the growth of hay, cats and to wood and pasture, which is partly for consumption, in one form or enother, and partly for sale. In Prince Edward Island much emphasis is laid on dairying and for farming but the total area of lend in all these districts devoted to specialized agriculture is not large. Thus, areas with considerable coonomic and geographical advantages, as in the case of apples, potatoes, dairying and for furs, lend themselves to specialization along these lines. Elsewhere on poorer soils agriculture is subsidiary to some other occupation like lumbering or fishing. The output here is smell and used mainly for consumption. On this basis we see that mechanization has had only a limited influence on Maritime agriculture.

On the non-specialized land, the greatest percentage of the area, the methods of farming used are comparatively orude and have little influence in displacing labour. In the "specialized" areas there is a limit to the number of
mechanical devices a farmer is able to adopt, in the production of apples for example. Equipment for spraying the orchards is possible but it is unlikely that a mechanical apple-picker will be evolved. Likewise, it would be unprofitable to be highly mechanized on a small dairy farm, such as it exists in the Maritimes due to its small size. Thus, machine power to the extent that we find it in the Maritimes, is not an important factor in the displacement of farm population. The farmer, in adopting mechanical devices, merely lightens and improves his task.

Farms in Quebec and Ontario are mixed in the sense that a variety of products are produced, but specialized in that major importance may be attached to one of these. Agriculture is diversified in this area for almost every fermer reises a number of different articles ~ various grains, dairy products, fruits, vegetebles and livestock either for sale or for his own use. One of these products may predominate in one section or another but as a rule a variety of grops is grown in every area and on almost every The reason for this diversification is due again farm. in part to the climate and in part to the soils. However by reising different articles, the farmer does not specialize his equipment in one particular height. Total costs of preduction of a crop, very with the number of acres sown rather than with the number of bushels reaped and the cost

per bushel is arrived at by dividing the cost per acre by the average number of bushels per acre. It is obvious therefore that grain farming in Eastern Canada does not warrant the use of highly specialized machinery for the cost of production per acre would be too high. Rather than this, a more general type of farm equipment is adopted which lends itself to a diverse number of tasks. This, we have seen, is not the case in Prairie farming where mechanization is well adopted to a specialized product and extensive agricultural techniques.

One of the advantages of the diversified farming of Eastern Canada, in contrast to the Western Ppovinces, is that if a farmer produces only one crop he is subject to all the fluctuations in the selling price of that article. Should the price be depressed, he would suffer severely. For example, in the Niagara district the climate and topography are well suited to fruit growing. Yet, rarely do any of the farmers rely on any one fruit to yield them their total profits for that year. A favourable peach crop, together with a high price, may bring the farmer unusually high profits at one time, but the following year a combination of poor weather with an unfavourable price may deprive him of any profit whatsoever. For this reason, the majority of farmers grow a variety of fruits. If one crop fails or the price is depressed, the next one may be

more profitable. Another factor which causes fruit growers to diversify their crops, is the desire to spread the work over the entire season. In this way the work is done more efficiently. Thus, if he produces many crops, he has protected himself against the drastic decline in the price of any one of them. Even in the Niagara district despite the emphasis on fruit growing, agriculture is mixed to yet another degree for many of the farmers grow vegetables, berries and raise livestock even if only for their own use.

Thus in the Prairies specialization in wheat production and therefore in mechanization has made the farmer vulnerable to fluctuations in the world price for grain. The heavy dependence on one grop and the steadily increasing use of specialized machinery is profitable when prices are high but disastrous in years of depression. In Eastern Ganada where the fermer raises a considerable propertion of his own requirements, he is able to survive a period of low prices. Machine power in the Prairies has led to encermous savings in "man+hours", the abolition of seasonal labour, increasing efficiency and production. In the rest of Canada this is not the case. It is true that machine power in the eastern provinces has resulted in greater efficiency and production but with respect to the savings in men-power, there is no parallel. He the trend has been toward diversified farming rather than the displacement of labour.

CHAPTER VIII

CONCLUSIONS

1.

"Technological Unemployment", by which is meant the displacement of manual labourers by machinery, is a constantly recurring phenomenon over short terms. Men and women do lose their occupations thereby but as a permenent factor in labour conditions it may be said not to Otherwise we should be confronted with a paraexist. dex, especially, during the nineteenth century of a constantly increasing population with an equally constant decrease in the demand for manual labour through displacement of workers by machiney. As a long term phenomenon technological unemployment may be disregarded and we may even go so far as to assert that it does not exist. If it did, then the implication is that as more machines are adopted and the productivity and efficiency of the worker advances, then the proportion of those employed should decline accordingly. Since the Industrial Revolution, the steady flow of capital into industrial improvement end expansion has increased the productivity and efficiency per worker; yet for many

generations now industry has succeeded in furnishing employment to a constantly growing population. To-day. there are more persons of working age than there were eighty years ago. Such developments as the telephone, the typewriter and other office guipment have attracted young women into ecoupations, whereas even at the beginning of this century, comparatively few office or clerical positions were available. Another cause for the increase in the proportion of the working population is the progressive concentration of people in the older age groups. The perfection of automatic machinery, shorter hours, better working conditions and a higher standard of living make it possible for workers in the older age groups to prolong their period of activity, without the disabilities of advancing years enforcing idleness upon them. In 1941, almost one-third of the population in Canada was over 45 years of age.

These factors would tend to aggravate the unemployment situation if displacement of men by machines was permanent. There has been no growth in the percentage of unemployment since the Industrial Revolution. Fluctuations have occurred where not only men, but also productive resources have remained idle, but evidence of a downward trend of employment does not exist. The population of the

world increased more during the last century then in all previous history, and science and technology have made it possible for a greater number to find livelihood than over before. Thus we arrive at the conclusion that it is not the machine which is at fault tut our failure to adjust ourselves to it which has created the problem, commonly called "technological unemployment".

There must be a certain amount of technical progress. for it is one of the essential features of our economic system and there is scarcely one aspect of modern life that is not affected in some manner by it. The net result of introducing machinery is to transfer labour rather than to displace it. This transfer may be within the same industry where expansion is taking place due to an increased demand for the product. If the shift is to an entirely different industry, then the problem is one of the period which elapses between the time a worker is "displaced" in one industry and reabsorbed into another. We cannot dismiss disturbanges which extend over a few years lightly. Even if dislocation is temporary, it is significant, for human life is also only temporary. The role of management in reducing the length of this transitional period cannot be over-emphasized. The introduction of technological change according to a plan or schedule would minimize

displacements end losses through temporary unemployment. Public employment offices could be useful in aiding "displaced" workers to be reinstated more quickly in an industry where similar training may be required. It is quite true that machines have in many cases rendered absolete a skill which took many years to acquire. The older worker thus displaced is in most, if not all cases, unable to adjust himself to altered conditions and becomes in many cases a liability to society. For younger men who are still adaptable the problem is simply one of retraining in new skills.

II.

One of the main reasons why machines are introduced is to reduced high costs. Competition, one of the main features of our economy, demends efficiency and low costs. A firm which does not take advantage of cost-reducing methods will soon be 4 undersold by rivals. The purpose of machines is not only to cut production costs and therefore selling price, but also to improve the quality of the product or to create an entirely new product. In the latter case the demand for labour increases. New industries like the manufacture of plastic products are constently creating new occupations which add employment

oppertunities to those already existing. Even where machines are adopted to reduce production costs, employment is likely to increase rather than decline for the resulting lower cost per unit tends to expand the marks t for gods and when more goods are sold more workers are hired to satisfy demand. This leads to greater expansion end efficiency, and modern industry is thus able to produce more commodities, at less expense and with more workers employed to respond to the greater demand for goods and services.

Mass production and mass consumption advance together. It becomes evident to manufacturers that profit would be greater if a little was realized on each unit of a large volume, instead of a large amount on a small number of units. The first automobiles, electrical devices and typewriters were made at a tremendous cost and were too expensive for more than a few to buy. Now with the full aid of technology these are all made to-day for a fraction of the former amount and are available to a greater proportion of the population. In the field of agriculture, the "combine" made great headway on prairie farms to reduce costs in the early years of the last decade, in order to elevate, to some extent, the distress brought on by depressed prices intensified by drought.

Machines are also introduced to relieve a labour shortage. Although the inventive capacity of the ancients was equal to that of our modern inventors, they did not turn their ingenuity in this direction. There was no need for it. At the height of the Golden Age of Pericles. a large proportion of the population of Greece consisted of human slaves. These could produce the wants of the free citizens more cheaply without the aid of machines. To-day, with the higher standard of living spreading, the demand for the volume of goods and services would be impossible to fulfil without relying on technical advance, for human labour slone, in our society, is inadequate and needs to be supplemented by machine power. For example, the spinning wheel employing the number of workers in the textile industry at the present time, could not possibly satisfy the current demand for textile goods.

III.

Within the past eighty years there has been a great change in the allocation of labour emong the different industries. Statistics on occupational trends in Canada, disclose that there is no decline in absolute numbers of these engaged in agriculture although the propertion has declined. The immediate conclusion would be that mechanization in farming has brought about a displacement

of farm workers who then had to migrate to urban centres in search of occupations. This was not the case. The effects of technology extend throughout the whole economic system; but they extend more quickly in some fields then in others. Mechanization of agriculture took place much later than that of industry. For example, the "combine" was not employed extensively in Canada's wheat fields until after the first World War, while industrialized urban centres were in existence long before this. English and American capitalists aided in the industrial development of Canada. When transportation and communication, the first essentials to Canadian development, were achieved, trade expanded and by the end of the last century corporations were financing productive activities such as electrical development, manufacturing, pulp and paper and mining. As mass production and diversion of labour are only possible with a relatively large population concentrated in one centre, urban centres expanded. Their attraction grew and the numbers of those employed in manufacturing, transport, trade and finance and clerical occupations increased. Gradually self-sufficiency in farming was abandoned. As industry expanded, those who remained on the farm produced more in order to supply the industrial workers in the city. The farmers in turn bought manufactured goods which previously had either been

made on the farm or done without for the most part.

Thus it was when a greater proportion of the population moved to urban centres that agriculture became mechanized and the commercial type of farming emerged. This conclusion does not apply to the Prairie Provinces whose urban centres were developed as a result of the settlement of the western plains.

IV.

The Canadian agricultural economy is more diversified then is popularly believed. The Prairies are well suited to wheat growing due to advantages in soil. climate and topography and low freight rates make it possible to transport the wheat to world markets. However, low prices in the depression years of the 1930's, together with draught, impressed upon the farmers the insecurity of the variation s in income, a direct outcome of specialization in one crop. Consequently, the Prairie farmer is devoting more time to dairying, ranching and the cultivation of other coarse grains and vegetables, even if only on a small scale, as a protection against fluctuations in price and yield. In the rest of Canada there is diversification to a much greater extent. There are a few areas which are climatically suited for the growth of certain products, as for example, fruit in the Niegara Peninsula. But even

here the farmer protects himself by growing a variety of fruits rather than one.

v.

In Canadian agriculture, evidence of "technological unemployment" or the displacement of farm workers by mechinery, is negligible. In the Maritimes, agriculture is not too profitable except in a few areas of fertils land. Orchard crops are grown in these fertile pockets which are scattered over the provinces but the degree of mechanization here is limited for standard types of farm machinery are adequate, except for a few specialized ones such as spraying machines. Livestock and animal products are raised. Part-time farming is carried on in the suburbs of larger urban centres and also as a subsidiary to the fishing and logging industries. On the whole, owing to the nature and topography of the Maritimes the net effect of mechanization has been to bring marginal lands under cultivation and therefore to increase the area of the farm to some extent with more efficiency and less effort on the part of the farmer.

In Quebes and Ontario, although agriculture is more important here, the effects of mechanization are somewhat similar. There is no evidence for serious displacement of the farm population by machinery. Because agricultural

techniques are particularly suited to the raising of field orops, the time saved in their cultivation has been devoted to more diversified types of farming. Even though there may be specialization of fruit-growing in the Niagara Peninsula one erop is not reised to the point of exclusion of all others. Generally speaking then, mechanization has produced the same effect in the Central Provinces as in the Maritimes - diversification, increased efficiency and less effort.

In contrast with Eastern Canada, machanization has greatly influenced the prairie Previnces. Machinery was directly responsible for the settlement of the Canadian West as it could be profitably adopted due to the extensive character of the economy. Therefore, it does not fellow that mechanization displaced labour here for it was due to the shortage of labour in this extensive economy that occasioned the adoption of machinery. The urban centres, distributing posts for agricultural products, flourished as settlement expanded and do not attract the farm population into industries as is the case in Eastern Canada. Unlike the rest of the Dominion, scarcely any part-time ferming is carried on.

In conclusion, we thus find that evidence of the displacement of man-power by machinery in Canadian agriculture is almost entirely lacking. Moreover, in industry

as a whole, the concept of "technological unemployment" has very often been over emphasized as a factor in unemployment. We have seen how permanent"technological unemployment" is impossible and therefore the solution to the temporary problem lies in the direction of reducing the losses which accrue to the individual worker during the transitional stage.

APPENDIX "A"

NUMBER & PERCENT GAINFULLY OCCUPIED 10 YEARS & OVER CLASSIFIED ACCORDING TO SEX, OCCUPATION GROUP FOR CANADA

	OCCUPATION GROUP	MALE RO.	1 9 0 <u>P.C.</u>	1 FRMALE NO.	P.C.	MALE NO.	1941 <u>P.C.</u>	FEMALE NO.	<u>P.C.</u>	ASSUMING % SAME AS IN IN NO. OF W PLOYED +	IN 1941 IS 1901 - CHANGE CRKERS EN/ OF -
1.	All Occupations	1,544,883	100.00	237,949		3,363,111	100.00	832,840	100,		
2.	Agriculture	707,924	45.82	8,936	3.76	1,064,847	31.66	18,969	2.28	-475,458	-12,346
3.	Fishing & Trapping	27,160	1.76	24	0.01	51,126	1.52	324	0.04	- 8,065	- 241
4.	Logging	16,055	1.04	-		80,248	2.39	•	-	+ 45,272	
5.	Mining, Quarrying	28,341	1.83		•	71,861	2.14	-	•	+ 10,316	
6.	Manufacturing	229,027	14.82	70, 508	29.63	561,001	16.68	148,180	17.7	+ 62,588	-98,589
7.	Construction	89,100	5.77	65	.03	212,716	6.32	777	0.09	+ 18,664	
8.	Transportation	81,161	5.25	1,322	0.56	294,800	8.77	16 ,8 45	2.02	+118,237	+12 ,18 2
9.	Trade & Finance	91,795	5.94	7,757	3.26	296,599	8.82	74,018	8.89	+ 96,830	-46,867
10.	Service	100,623	6.51	135,582	56.98	308,550	9.17	416,906	50.06	+ 89,611	-57,646
11.	- Professional	39,521	2.56	34,679	14.57	120,782	3.59	127,084	15.26	+ 34,685	+ 5,739
12.	- Personal	47,788	3.09	100,306	42.15	144,726	4.30	288,651	34.66	+ 40,806	-62,393
13.	Clerical	46,220	2.99	12,569	5.28	159,779	4.75	154,272	18.52	+ 59,332	+110,298
14.	Labourers	126,726	8.20	1,141	0.48	251,889	7.49	804	0.10	- 23,886	- 3,194
15.	Not Stated	751	0.05	41	0.62	9,695	0.29	1,718	0.21	4 8,013	+ 1,551

¹ Census of 1901 and 1941.

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APPENDIX "B"

FIGURES ON CANADIAN AGRICULTURE 1

TEAR	TO TAL POPULATION	MUMBER AND P TOTAL POPULA IN AGRICH NO.	ERCENT OF PION ENGAGED LTORE	PERCENT THAT AGRIC. IS OF GAINFULLY OCCUPIED	TOTAL WHEAT PRODUCTION IN BUSHELS	BUSHELS OF WHEAT PER CAPUT	
1851		215,279	9.4				
1861	3,105,221	324,704	10.5		27,866,635	8.9	
1871	3,476,497	479,512	13.75		16,723,873	4.8	
1881	3,470,392	662,630	15.32		32,350,269	9.3	
1891	4,833,239	735,207	15.2	51.19	42,144,779	8.7	
1901	5,344,096	716,860	13.4	45.82	55,572,368	10.4	
1911	7,191,624	933,735	12.9	38.91	132,077,547	18.3	
1921	8,775,164	1,041,544	11.8	38.15	226,508,411	25.8	
1931	10, 363, 240	1,131,845	10.9	33.97	370,027,014	35.7	
1941	11,489,713	1,083,816	9.4	31.66	299,401,000	26.5	

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APPENDIX "O"

WHEAT PRODUCTION IN CANADA

YEAR	TOTAL FRODUCTION OF WHEAT IN BUSHELS DECENNIAL AVERAGE
1851 - 1860	20, 516,000 2
1861 - 1870	22,331,000 3
1871 - 1880	26,660,000
1881 - 1890	38,795,000
1891 - 1900	51, 322,000
1901 - 1910	108,449,000
1911 - 1920	238, 367,000
1921 - 1930	397, 799, 000
1931 - 1940	350,431,000
1941 - 1944	397,739,000

Figures compiled from Canada Year Books 1851 - 1944
Average of years 1852 and 1860
Average of years 1861 and 1868-1870

APPENDIX "D"





YEAR

is graph compiled from figures in Statistical Contributions to Can. Sonomic History by Taylor & Michell & from publications of the Board Grain Commissioners of Canada.

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