

great war of 1812-14 caused a European demand for grain at high prices which the greater extent of cleared area enabled Canadian farmers to supply, and the period from 1812 to 1837 was characterized by the growth of an export trade in wheat. During the period between 1837 and 1867 there was a great rush of immigration from the Old Country. The new settlers imported improved varieties of live-stock and wheat farming began to give place to mixed farming. The raising of stock took a more prominent place in farm industry and the basis was then laid for the great development of the trade in live stock which has resulted in the ownership by Ontario farmers on July 1st, 1896, of live stock to the value of \$96,857,566, sales to the amount of \$28,750,000 having been made during the year ending at that date.

The fourth period, covering the years 1867-97, claims as a special characteristic the establishment of the co-operative cheese factory and creamery. The first cheese factory run on this principle in Ontario was started in 1864. The idea spread rapidly until in 1883 there were over six hundred in operation. In 1896 the number was 1,147, with 57,635 patrons producing 104,000,000. The co-operative creamery which has followed promises to be equally successful.

Mr. James specifies four causes as having notably aided the development of our agricultural resources. These are the increased use of machinery, the improvements in the means of transportation and communication, the applications of scientific discoveries, and the changes in methods of work and the introduction of co-operative associations. While farm machinery has resulted in greatly augmenting the total production it has enabled the work to be performed by fewer hands. During the decade 1881-91 the area of improved land in the Dominion was increased from 21,899,180 to 28,537,242 acres, but the number of farmers and farmers' sons diminished from 656,712 to 649,506. The number of people engaged in farm work in Ontario is fewer than ten years ago but the product is much larger. According to the statistics of the Provincial Department of Agriculture the development since 1883 has been as follows:

	1883.	1896.
Total farm lands.....	21,458,067	23,172,408
Acres of field crops.....	7,542,623	8,511,444
Value of farm lands.....	\$654,793,025	\$557,468,270
Value of implements.....	\$43,522,530	\$50,730,358

When the great reduction in the price of machinery is borne in mind, the extent of the increase in its use on the farm will be fully appreciated.

The writer notes with satisfaction the progress of the movement to establish cold-storage warehouses and shipment facilities, which, by placing perishable farm products in a fresh and attractive form on the European market, is calculated greatly to increase the demand for such produce. The movement for improved highways, and the extension of electric railroads into the rural districts, are referred to as present day developments, likely to introduce new social and financial conditions of agriculture of a beneficial character. One of the most hopeful signs of the times, in his opinion, is that agricultural scientific investigation is attracting more and more attention on the part of our governments. The improvement of varieties of grain and other vegetable products, owing to the researches and experiments of botanists, have been of great practical utility to the agricultural interest. An increase of 25 per cent. in the value of the Ontario grain crop, now amounting to \$50,000,000, by means of selection and cross-fertilizing, is regarded as within the range of possibility. On this point the president of the Agricultural College states, in his report for 1897, that some excellent foreign varieties have been introduced and distributed, which yield six or eight bushels to the acre more than those previously grown. In oats and barley alone the varieties introduced and distributed by the experiment stations have, within four or five years, paid to the province a good deal more than the entire cost of the college for the past ten years. Another department of science which is rendering a most important

service to agriculture is that of entomology, which is battling against the swarms of destructive insects that inflict such damage upon crops. The losses of the United States from insect ravages were estimated at \$400,000,000 during 1884, and \$300,000,000 in 1891. When the extent of these losses is considered it is difficult to over-estimate the practical importance of the study of entomology, from an economic point of view.

Agricultural co-operation has advanced from the primitive logging-bee and barn-raising of the early settlers to the methods of the cheese factory and creamery. Another form of associated effort is the formation of societies of all kinds for the improvement of agricultural conditions. It was not until 1830 that agricultural societies received legislative recognition; but since that time they have been liberally aided, and have greatly increased and prospered. In 1897 there were Farmers' Institutes in every riding or district, twelve live stock associations, two dairy associations, a beekeepers' association, and the entomological society.

The expenditure of provincial money in aid of agriculture has largely increased. Appropriations under this head in the three years 1868-69-70 amounted to \$195,969, while the outlay for similar purposes for the three years 1895-96-97 amounted to \$718,156. For the thirty years, 1868-97, inclusive, the total expenditures by the Legislature on behalf of agriculture aggregate \$4,509,090.

The Clover Question

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It is surprising how thoughtlessly writers and lecturers on farm topics advocate practices without considering the why and wherefore of the matter.

When it was thoroughly established that clovers, and in fact all the legumes, had the power of converting atmospheric nitrogen into plant food free, immediately writers and lecturers sprang up in all parts preaching that clover growing in the grain stubble for plowing down was the secret of soil fertility. Some said clover and barnyard manure were the only manures needed. Even our better informed agriculturists fell into the error in many cases. Farmers should remember that growing clovers for a plowing down manure crop (it is often immaterial whether you plow it down or feed it off and utilize the animal manure) is not a new practice, but that until recently science had not discovered the exact nature of the benefit derived from such a method.

Professor Paul Wagner, Ph.D., the able director of the Agricultural Research Station at Darmstadt, who makes thousands of manurial experiments every year in both field and pots, carried on for several years a series of tests to discover if possible the needs of clover. He found that clovers do not bring us any important benefit, unless they are well supplied with phosphate and potash. He laid particular stress on the phosphate, partly because lands generally have a comparatively small amount of it, and what is contained is in such an unavailable form, being in great forcible combination with the bases of soil; and partly because the growing of animals and people on the farm, and in the cities, saps the soil of its phosphate, which is utilized by the bony structure and not returned by the farm manures. The potash, on the other hand, is largely returned in the manures of the farm, as, entering into the soft parts of the animal only, it is carried off daily by the ordinary waste of the system.

We are told that barnyard manure contains phosphoric acid, but particularly only from the undigested food expelled by the animal, and from the straw litter, which has a small quantity. An animal during its lifetime on a farm returns in manure nearly all the potash and nitrogen it consumes, but only about such portion of the phosphate as it fails to assimilate. Some will confidently assert that the analysis of a clover crop shows a certain percentage of phosphoric acid, but never stop to consider that it only repre-