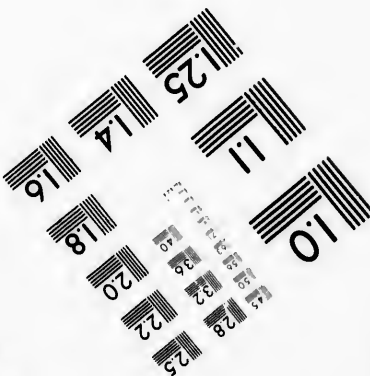
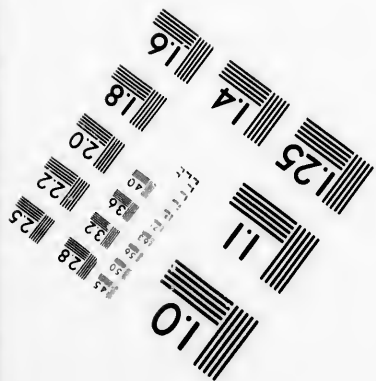
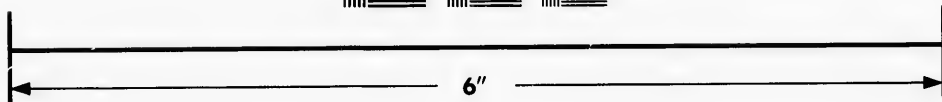
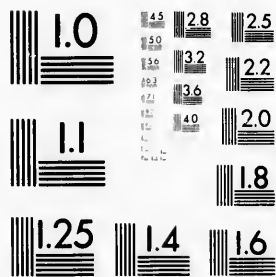


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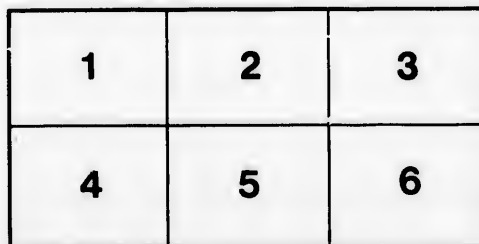
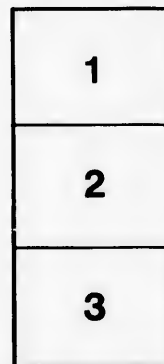
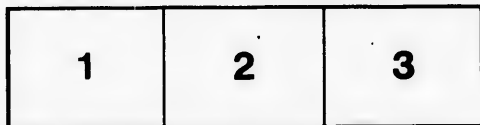
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CANADIAN LANDS  
AND THEIR DEVELOPMENT.

BY

HENRY F. MOORE, Esq.

A PAPER READ BEFORE

The Royal Colonial Institute

ON APRIL 9TH, 1889.

SIR FREDERICK YOUNG, K.C.M.G.

IN THE CHAIR.

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## CANADIAN LANDS AND THEIR DEVELOPMENT

### I.—DEVELOPING A PEOPLE.

BOTH for the extent of its territory, and also for the unique position which it holds with regard to a great Empire, the Dominion of Canada must possess a great and increasing interest to the people of the civilised world, and that interest is intensified in the British Isles—the head and brain of the great Empire, of which Canada is the trunk and its railway the backbone. Over an area of something like 3,600,000 square miles of land and inland waters this territory extends—a larger civilised area than any other country can boast of possessing in undivided sway. From east to west it has a range of no less than 3,500 miles, and from south to north of 1,400 miles. The latitudes covered by it range from that of Madrid to that of the undiscovered lands of the North Pole, this range covering the latitudes of Spain, Italy, France, the British Isles, as well as those further north. This is a fact not usually recognised in connection with Canada, but it is one that was brought home to myself during my visit last autumn. One day I was standing on the great glacier on the summit of the Selkirks, where ice and snow are perpetual, and ten days later I was in Southern Ontario, picking peaches and grapes, which were growing in luxuriant profusion in the open air. Canada is a country of which but a small portion has long been the haunt of civilised men, and even now we are but dreaming of what its development is likely to open up. Its mineral wealth; its agricultural capabilities; its future manufactures and commerce; its rich sea, lake, and river fisheries; the uses to which its vast timber areas will be put—in a word, its future, are but matters of speculative dreaming, the realisation of which will not be disappointing. The country is not only one in which future prosperity may be looked for in a commercial sense, but much of it is still the happy hunting ground for the sportsman, and provides a scenic surfeit



for the tourist. Such a country would be of interest independent of any other consideration, especially at a time soon after it had been made easy of access to the rest of the world, and when the civilising influence of the railway was slowly but surely "making" the future country. But when that country cements together the finest Empire the sun has ever shone upon, when it is the link of commerce between two hemispheres, when "its uses in war and in peace, for attack and for defence," as well as "for mutual trade intercourse, are as obvious as they are invaluable"\*—then it has a double claim on our attention and an extra fascination for our minds.

In making a tour of Canada during the past autumn, it was in no wise my intention to touch upon the Imperial matters with which Canada is indissolubly mixed up; neither did I intend to touch upon the scenic beauties which so constantly attract the eye in passing over the vast country between the two oceans. "Travellers' tales" are plentiful, and on no country so much as Canada. I prefer rather to deal with what I saw in a more philosophic spirit; to note how the nation is being made; and to suggest how best its future development can be usefully guided.

No country affords greater interest to the student than does Canada. As a nation and a people it is still in the throes of "making." When on board the *Parisian*, the magnificent steamer of the Allan Line, its large living freight—men, women, and children all about to become incorporated in the new people of a new world—afforded much food for thought.

What Englishmen are to-day has come from the fact that many nationalities have contributed to their "making,"—that, and the well-known tendency of the survival of the fittest. We are watching in Canada an admixture of nationalities, very similar to that out of which the English race has been evolved, but an admixture brought together voluntarily, and, in many cases, selected for hardiness, and for their love of a soil and home of their own. Out of these elements the true Canadian will have to be evolved. It is no part of my duty to deal with such abstruse sciences as stirpiculture, philology, or ethnology. At the same time, it is necessary to realise at the outset the material which has to be developed into a people, and also that those who are pouring into Canada must have a great influence on the nation and people of the future.

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\* *The Times*, October 25, 1886.

In Canada to-day are many distinct races to which I need do no more than briefly refer. The original inhabitant of the North American Continent—the noble red man—is gradually adapting himself to the European civilisation first introduced by the French, and then by the English and Scotch; and already in the half-breeds we are finding the process of admixture going on very favourably. In Manitoba, the Premier for many years—a man of great talent—was of this class. But to these natives must be added the yearly quota of immigrants who are each year being sent out from other countries. How many and varied these are may well be shown from the following figures of the arrivals at Quebec during the past two years :—

Nationalities.	1887.	1888.
English .....	16,034	13,211
Irish .....	3,128	1,809
Scotch .....	3,094	3,752
Newfoundlanders.....	60	—
Germans .....	570	403
Scandinavians .....	7,659	8,038
French and Belgians .....	147	255
Austrians .....	—	162
Hungarians .....	—	14
Bohemians .....	—	7
Russians .....	234	169
Roumanians.....	14	9
Icelanders .....	1,766	686
Total ..	32,740	28,530

These facts are quoted as showing in some slight degree the peoples who are gradually forming the Canadian nation. They are of importance, inasmuch as it must not be forgotten that they should as much as possible be brought together so as to merge into one people. In many places this has been forgotten to some extent, and distinct Colonies of different nationalities have been formed, but now on some of the lands of North-west Manitoba mixed settlements are being established with the best results. I cannot help thinking that the truest kindness to those who are finding a home in Canada is not to help them in perpetuating distinctions of race and language, but to merge them as quickly as possible into one Canadian people. They would not then feel like "strangers in a strange land," but that they were part and parcel of a great nation.

This admixture of peoples is brought very forcibly to the observant mind on a visit to the country, not only in connection with

the manners and customs of the different peoples visited, but with regard to live stock and agriculture generally. Over the whole of Eastern Canada, for instance, the horses are more of the French style, and the cattle are quite of the stamp seen in Normandy, and smaller than the dairy cattle of this country; whilst in Southern Ontario, which may be described as a Scotch quarter, the tendency at the present time is towards Scotch breeds, both of horses and cattle. So far as agriculture is concerned, these settlers bring with them their customs, their systems, and their preferences; but there can be no doubt that the agriculture of the future will be so modified and perfected as to include everything that is best in the agricultural processes of the various nations from which the people have been drawn.

## II.—IMMIGRATION.

The first point necessary to the development of this great country is that it shall be peopled and its lands settled, and this must be done either by the slow process of the natural increase of its people, or by offering facilities for immigrants to leave the old countries to find a home in the new. No country presents a greater and more suitable field for colonisation than does Canada, and the extent to which this fact has been recognised is shown by the largeness of the numbers of immigrants who have landed on her shores either for settlement or in transit to the United States during the past ten years.

In the year 1879 there were	61,052
"    "    1880    "	85,050
"    "    1881    "	117,016
"    "    1882    "	193,159
"    "    1883    "	206,898
"    "    1884    "	166,596
"    "    1885    "	105,096
"    "    1886    "	122,581
"    "    1887    "	175,579
"    "    1888    "	174,474
Total for ten years	<u>1,407,501</u>

It may be stated that during ten years about three quarters of a million of people have found a home in Canada.

It is frequently said that "two heads are better than one." On my recent visit to Canada I was accompanied by Dr. Fream, and what we saw, and its bearing on this question of immigration,

was the subject of frequent observation and discussion between us. He has since put the conclusions at which he arrived in very admirable language; I agree with it fully, and quote it here, adopting his conclusions and his facts as my own. Dr. Fream says:\*

"Probably no country in the world offers so wide a choice to the settler as does the Dominion of Canada. Stretching from ocean to ocean, and forming the greater part of a large continent, it affords an endless variety of soil and scenery, of climate and capabilities. Its agriculture is of every type, from the exclusively arable to the purely pastoral. It has a place and a position for every man who is willing to work, from the humble ploughman with a few shillings in his pocket to the old country farmer with a bag of sovereigns, from the man who milks the cow to his smarter fellow-man whose keen eye and sound judgment will build up a prime herd of cattle, from the poor lad whose early life has been one long struggle with poverty to the gilded youth who has been nursed in the lap of luxury. It equally offers place and position to women; and, sorry as we are to lose them, there is no doubt that many a bonny lass—English, Scotch, and Irish—will find in the young country beyond the Atlantic opportunities such as they would sigh for in vain at home. But, as I have intimated, there is one fundamental condition of success in Canada, without which there cannot be much prospect of ultimate prosperity; and that condition is, willingness to work. We hear sometimes what appear to be rather far-fetched stories as to the amount of work a man will do on a prairie farm. They are, however, not so difficult to believe if one significant circumstance is borne in mind, and that is, that the man is working for himself. It is really surprising how this solitary condition sweetens toil, but it may often be seen in operation at home. In rural districts one may see farm labourers at work during the day on their employer's land; they have got accustomed to what may be termed one steady stroke, and they adhere to it. But the evening comes, and the labourer trudges home along the country road, and gets his tea. Then during the remaining hour or two of daylight he goes to work in his patch of garden ground, which he is wisely permitted to till. But how he works! He is not waiting now for the time to leave off; he is rather grudging the lapse of each minute, and endeavouring to perform all the work he can before approaching night summons him to his couch. The secret of this display of energy is that the man is working for himself; and though a moralist might be tempted to expatiate upon the contrast between the two pictures, the average individual will probably feel satisfied with the observation, 'It is only human nature.' In a newly-settled country this phase of human nature is, as might be expected, exemplified on a tolerably large scale.

"To people who propose emigrating to Canada, the journey out is a subject of continual interest and inquiry, particularly that part of it which lies across the sea. To those who can afford saloon passages by sea and first class by rail I need not here address myself, as they are sure to be well provided for. But for the information of the far greater number to whom money is a very vital object, and who wish to get to their new abode with as little outlay as

\* "Agricultural Canada: A Record of Progress." 1889.

possible, I may briefly record what I know. I have crossed the Atlantic several times in the steamers of the Allan Line, and on the outward voyages I have inquired fully into the lodging and treatment of the steerage passengers. Last August I left Liverpool in the Allan steamer *Parisian*, which carried four or five hundred emigrants. On this occasion I got permission to go all over the intermediate and steerage quarters, and I not only inspected these thoroughly, but I had many conversations with emigrants. The meals, the cost of which is included in the passage-moneys, are excellent in quality and unlimited in quantity. The sleeping quarters are well-aired and comfortable, though, of course, no one can expect aboard ship the same amount of room, or anything approaching thereto, as is available in a house. By the exercise of a little mutual kindness, and by the practice of the admirable virtue of self-help, the passengers get along very pleasantly together; and it is obviously to everybody's interest to make the voyage, short though it is, as enjoyable as possible. There is one specially praiseworthy feature about the Allan Line, and that is the complete separation of the sexes in the steerage sleeping arrangements; men and boys have one portion of the steerage to themselves, and women, girls, and children, another and quite an independent portion. During the daytime, of course, they can all associate together. Such arrangements undoubtedly conduce to the morals, the comfort, and the well-being of all concerned, and among philanthropists who are interested in emigration this subject is worthy of special attention.

"Arrived at Quebec, the emigrants disembark, and there they are met and arranged in parties by my good friend Mr. L. Stafford, the Dominion Government agent, and his officers. In a comfortable range of buildings specially erected for the purpose, a night's rest may be obtained if the steamer arrives in the evening, and a substantial meal may be had for a shilling. The immigrant's through ticket shows where he is going, and the immigration officers see him and his baggage—and his wife and little ones, too, if he is blessed in that way—into the proper train, and away he speeds to his destination in the new land. If he is going to the prairie the journey will occupy three or four days, and in these circumstances he will appreciate the colonist cars, to the use of which he is entitled. These are so fitted inside that a complete wooden couch is available to the passenger, so that, wrapping himself up in a rug or blanket, he can stretch himself out and go to sleep. This, of course, is a great boon; and for a couple or three shillings the traveller may buy at the railway station a straw mattress, which he takes away with him when he leaves the train."

To bring good men of the class that is wanted the best method is to show the people of this and other countries in the clearest way what are its capabilities. "Seeing is believing," we are told, and when the visitors to our English agricultural shows were able to see actual specimens of the agricultural productions and mineral wealth of Canada, they obtained a better insight into the country than could be obtained by any other means. Probably nothing has ever done so much to make Canada known in this country as the wonderful display at the Colonial and

Indian Exhibition—the apples and fruits from Nova Scotia, cheese and butter from Ontario and Quebec, and the golden grain from the vast prairies, telling the story of the fertility of its soil better than could any book. It is to be regretted, therefore, that at the great show of the Royal Agricultural Society at Windsor the popular stand of the Canadian Government will be absent—the first time for many years. As this will be the grandest exhibition of the kind the world has ever seen, and one over which our Empress Queen will preside, I cannot help thinking that the fruits and wealth of our nearest colony should be represented. It would have brought the value of the land home to a larger number of people than ever before, and in the most convincing manner.

### III.—EDUCATION.

Next to settlement, nothing will be of greater permanent value to the proper development of the agricultural lands of Canada than sound education in the practice and science, bound up in the proper working and management of the soil, the plant, and the animal. The agriculture of the United States, as well as that in some of the Southern portions of Canada, has been carried on without that knowledge, and the only result that is to be seen following the work of man is a decrease in the produce of the soil to an extent that is almost incredible. Ten years ago, for example, the wheat lands of the United States were yielding their sixteen bushels to the acre—(itself a small crop)—whereas to-day they are producing something like nine or ten bushels. Canada has been more fortunate, and I am delighted to see, from the last returns of the Minister of Agriculture, that the wheat lands of the whole Dominion show an average yield of twenty bushels to the acre; whilst in the older districts, such as Nova Scotia, the yields are fairly well maintained, owing to the extensive mixed farming which there prevails. Even in Ontario, about which we hear so much of exhausted lands, wheat shows an average yield over the last six years of no less than  $18\frac{1}{2}$  bushels to the acre, or nearly double that of the United States. When we go out, however, to the newer lands—the prairie soils—in Manitoba, all of which have been broken up within the last six years, we find, in the year 1887, that wheat averaged thirty bushels to the acre, barley thirty-six, and oats fifty. I was astonished, on visiting these lands, to notice to what an extent mixed farming had been adopted, the first object of every settler evidently being to get

one or two cows, and in some cases magnificent herds have been established. This point I shall deal with later on. All I wish to lead up to at the present moment is the fact that, scattered throughout Canada, are Government stations and experimental farms, from which the best information is disseminated amongst the settlers, both through the Dominion Ministry of Agriculture and the various departments of agriculture in the provinces. At Guelph, in Ontario, is also one of the best equipped agricultural colleges I have yet seen, with an experimental farm and dairy attached.

Before proceeding to deal with these, I should very much like to point out that the question of colonisation generally, and the settlement of the new lands of our Empire, has been recognised in our own country by the establishment at Hollesley Bay, in Suffolk, of the Colonial College and Training Farms; and I have been favoured with a list of the students who have already gone out from that Institution. They are scattered over every part of the world, in British Columbia, Wyoming, New South Wales, South Africa, New Zealand, Tasmania, Victoria, Ceylon, North-West Territories, Manitoba, the Argentine, Ontario, Queensland, Florida, and New Guinea. It is a curious fact, however, that by far the largest number of students have gone to Manitoba, the extent of the preference for this country not having been noticed even by the authorities of the College until the list for which I asked was made out. It is very evident that the instructions given at the Colonial College will have a very great influence on the future of Canada, and I therefore make no apology for giving the following extract from a letter sent to me by Mr. Robert Johnson, in answer to my inquiries as to what the College was doing:—

“Our system has now been well tested, for quite a number of fellows have gone out to the Colonies, and had their qualifications practically tried. The result so far has been most gratifying, for the young men sent out from us quickly appreciate the immense advantage which their knowledge gives them over those who have had no training, and of whom they write rather freely as ‘greenhorns.’ Another great advantage of a College of this kind has also been already abundantly proved, *i.e.*, the great facilities which it affords for the settlement of the young fellows. The College very wisely declines the responsibility of actually placing the lads, but it gives introductions to responsible people in the Colonies, who have expressed their willingness to further the interests of its pupils. Another advantage is that friendships are formed here among the pupils themselves, who arrange to go out together. Several pairs of pupils are going out in this way this spring, and I need not

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point out how much pleasanter and safer this is than if they went out singly among strangers. This will work advantageously in another way, which may be illustrated thus:—By next year there will be Colonial College students sprinkled all over Manitoba (for example), that is, in all parts of it. Now, these students, even if they do not see much of each other, will write to each other, and compare notes of the relative advantages of their several localities. Information will thus be circulated among them which may be of infinite value, to say nothing of the feeling of confidence which the neighbourhood of old friends must tend to give. I quite feel that there is a wonderful future for this College, if it is wisely and carefully worked, as there is every reason to hope it may be. Its organisation is being steadily and rapidly (if quietly) extended throughout the British Colonies, and in a few years it ought to do really good work in strengthening the ties which unite them to the Mother Country."

I have myself paid several visits to the College, and I have been struck with the fact that, in a little book\* recently published, written by two sons of Professor A. J. Church, who have settled in Canada, the necessity of practical knowledge just in the form in which it is given at the Colonial College is insisted upon.

In Canada itself, however, every facility is now afforded for the acquirement of the requisite knowledge. In company with Professor Robertson, I spent a day at the Ontario Agricultural College at Guelph, which was established fourteen years ago, and which gives a general commercial English education, combined with technical education in agriculture. The College itself is an exceedingly handsome building, whilst the farm is a well-arranged area embracing different soils, lowlands and uplands, covering 650 acres. It was purchased by the Provincial Government in 1873 for £15,000, and up to the end of 1880 had cost for live stock, implements, drainage, &c., no less than £45,000 more. Its President is Professor James Mills, M.A., under whose able direction it has become one of the best in the country. A great feature of the College is that the students themselves are enabled to obtain great reductions in the already low fees by their labour on the farm, thus, in some cases, reducing the fees to a mere nominal sum. In 1887, on the farm itself, the students earned no less than £640 by their labour. The College is, of course, very largely helped by grants from the Government. In order that it may be seen how the College is worked, I would mention that the fees are as follow:—

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\* *Making a Start in Canada*: Letters from Two Young Emigrants; with an Introduction by Alfred J. Church, Professor of Latin in University College, London. Seeley & Co.



- (1) The entire cost to an Ontario farmer's son able and willing, with considerable experience in farm work, is from £10 to £14 per year for board, washing, and tuition.
- (2) To an Ontario young man, without any previous knowledge of farming, £12 to £15 a year.
- (3) To students not from Ontario, £15 to £20 a year.

The financial statement of the College and Farm, and what it does, was for the year 1887 as follows:—

I.—COLLEGE.			
	£	s.	d.
(a) College maintenance.....	4,578	0	0
(b) Maintenance and repairs of buildings ....	1,077	0	0
			5,655 0 0
Revenue from various sources (including tuition fees and balances paid for board, after deducting allowances for work, amounting to £1,141) .....			1,161 0 0
Net cash expenditure .....			4,494 0 0

The net sum voted by the Legislature to be expended on the College was £5,163, consequently the unexpended balance for the year was £669.

II.—FARM.			
	£	s.	d.
Expenditure .....	1,842	0	0
Revenue .....	490	0	0
			1,352 0 0

On experiments the sum of about £500 was spent, whilst a rather larger amount had to be provided for the horticultural department.

The total cost of all the departments of the college, farm, and garden was £6,993, and the net sum voted by the legislature for their maintenance was £3,002, so that an unexpended balance of £1,009 remained for the year.

The number of students at the college in 1887 was 110, of whom 78 were from Ontario. They work on the farm or in the garden from 3½ to 5 hours a day during all the months of the year, with the exception of July and August, in which months there are no lectures, and they work in the fields 9½ hours per day; and for this they receive from 2d. to 5d. per hour. The following time-table, indicating the class-room work from October 1 to December 22 (the fall term), will be interesting:—

FIRST YEAR.

*Monday*: 8.45 a.m., agriculture; 9.45, agriculture; 10.45, chemistry. *Tuesday*: 8.45, agriculture; 9.45, physiology and hygiene; 10.45, veterinary anatomy. *Wednesday*: 8.45, agriculture; 9.45, English literature; 10.45, chemistry. *Thursday*: 8.45, bookkeeping, arithmetic, physiology, and hygiene; 10.45, veterinary anatomy. *Friday*: 8.45, agriculture; 9.45, chemistry; 10.45, arithmetic.

SECOND YEAR.

*Monday*: 8.45, mathematics; 9.45, agriculture; 10.45, veterinary pathology. *Tuesday*: 8.45, English literature; 9.45, agriculture; 10.45, agricultural chemistry. *Wednesday*: 8.45, mathematics; 9.45, horticulture; 10.45, veterinary pathology. *Thursday*: 8.45, English literature; 9.45, drawing; 10.45, agricultural chemistry. *Friday*: 8.45, horticulture; 9.45, agriculture; 10.45, agricultural chemistry.

The system of farm management is of a mixed character, cattle and sheep being kept in large numbers, and good root, grain, and fodder crops being grown. First of all, as to the cropping, which for 1887 I was able to obtain. It was as follows:—

Field No.	Acres.	Crop.	Yield per acre
1	19	Hay.....	1½ tons.
2	17	Fallow .....	....
3	17	Barley .....	27 bushels,
4	20	Pasture .....	....
5	20	Bush and winter wheat .....	....
6	20	Turnips .....	510 bushels.
		Mangolds .....	450 bushels.
		White Belgian carrots .....	500 bushels.
		White Australian oats .....	35 bushels:
7	17	Hay.....	2½ tons.
8	20	White Australian oats .....	32 bushels.
9	20	Mensary barley .....	30 bushels.
10	20	Oats and orchard.....	....
11	23	Hay.....	2 tons.
12	23	Pasture .....	....
13	20	Hay.....	1½ tons.
14	24	Experimental field .....	....
15	20	Pasture .....	....
16	25	Pasture .....	....
17	20	Vineyard .....	....
		Hay.....	1 ton.
18	13	Hay.....	1½ tons.
19	30	Golden vine peas .....	30 bushels.
		White cluster oats .....	20 bushels.
20	30	Bush .....	....
21	12	Mensary barley .....	25 bushels.

The live stock on the farm consisted of the following:—*Horses*: 9 working horses on farm, and 2 for experiment and instruction, value £330. *Cattle*: Shorthorns—1 bull, 3 cows, 1 heifer,

value £480; Hereford—1 bull, 2 cows, 2 bull calves, £630; Galloway—1 bull, 2 cows, 1 heifer, 1 bull calf, £210; Polled Angus—2 cows, 2 heifer calves, 1 steer, £180; Ayrshire—1 bull, 2 cows, 2 bull calves, £142; Devon—1 bull, 1 cow, 1 bull calf, £90; Guernsey—1 bull, 1 cow, £50; Jersey—1 bull, 1 cow, 2 heifer calves, £130; Holstein—1 bull, 2 cows, 1 heifer calf, 1 bull calf, £156; West Highland—1 bull, £10; Grade cattle—25, value £271. *Swine*: 6 Berkshire and 1 New York, £36. *Sheep*: Cotswold—10 animals, value £36; Oxford—12, £85; Shropshire—11, £38; Southdown—5, £21; Hampshire—2, £7; Cheviot—5, £27; Leicester—6, £25; Lincoln, 3, £18; Merino—2, £4; Highland, 1, £4; Grade ewes—21, £26.

Probably this is the only farm in the world on which so large a number as eleven herds of cattle and ten flocks of sheep, all of pure breeds, are to be seen; and it is well to know that these animals have been imported chiefly from England, the approximate cost in each case being as follow:—

CATTLE.		
	Bull.	Heifer.
Aberdeen Poll .....	£100	£70
Hereford .....	90	40
Shorthorn .....	80	60
Holstein .....	70	55
Galloway .....	70	50
Jersey .....	60	50
Devon .....	50	40
Ayrshire .....	50	40
Mean .....	<u>71</u>	<u>50</u>
SHEEP.		
	Ram.	Ewe.
Southdown .....	£30	£10
Shropshire .....	30	8
Hampshire .....	26	8
Leicester .....	20	7
Cotswold .....	20	7
Oxford .....	15	8
Lincoln .....	15	6
Mean .....	<u>22</u>	<u>7</u>

Since it has been in the hands of the College, entirely new sets of farm buildings and College adjuncts have been built, the latest being a very fine laboratory, which was finished shortly before my own visit. The new farm buildings are exceedingly handsome, and with their courts cover an area of over an acre. They have a south-eastern aspect, with drainage to the north, and stand on

a very deep, stiff clay loam. The general plan is a square, having a barn with the cattle under on the west, the sheep on the north, the bulls on the east, and the horses on the south side. The barn is 130 ft. by 70 ft., the horse range 150 ft. by 30 ft., the sheep 150 ft. by 30 ft., and the bull shed 40 ft. by 80 ft. There is a 30 ft. outside court for the sheep the whole length of their building, inside the square, and thus facing the south, and the bulls have separate outside courts on each side in connection with their separate inside boxes. The barn is built upon 12 ft. stone walls, so that the cattle have a clear overhead of 10 ft., the barn proper being constructed entirely of pine timber, with a height from floor to apex of 45 ft., and to cupola of 65 ft., so that from the cattle floor the building measures 77 ft. in height. The barn floor has two detached granaries, with feed-room between, corresponding to one below, and there the straw-cutter and grinder are placed. There are also 14 straw and turnip shoots, passages to horse and sheep lofts, and 12 doors equally distributed all round, in addition to windows and ventilators. The principal entrance to the cattle is on the angle between barn and horses, where steps descend to the level of all the buildings, the site being a sloping one. All the cattle are immediately under the barn, and occupy the whole space, with the exception of 16 ft. the length of the barn on the west side, which is cut off by a 14-inch brick wall for root cellars and feed-room. These cellars are floored with grout and cement, the outside walls being first lined with inch boards, then laid with tar-felt paper, and covered with finished tongue and grooved with narrow boards. The feed-room is 21 by 16 feet in centre of building between cellars, having sliding doors two-thirds of the front upon passage way to cattle stalls, where a two-ton platform weigh scale is placed. The root-pulper stands in the feed-room, in line between the cellar doors, and is driven by a belt from the engine shaft above. The stair, or access from barn, breaks upon the feed-room from the north side. The accommodation is for sixty-seven cattle in seven single rows, as follows:—For large cattle tied up, 34 head; for small cattle tied up, 14; calves in pens, 11; loose boxes, 8. These boxes are on both ends, the calves between two rows of cows with a door on each side, and all the rows cross the building, or edge on the feed-room. Watering troughs are attached to the feeding troughs in every row, the floor grouted and cemented, and box stalls laid with cedar blocks. Feed passages are six feet apart between water troughs, and main passages eight feet in width

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Double stalls, 7 feet 4 inches, centre to centre; single, 5 feet; half the boxes are 20 by 17, and half 15 by 11 feet; calf pens, 7 by 8. The space behind the cattle is six feet, a door opens into manure court at each row of cattle, and passages lead to horses and sheep. Light is admitted by thirteen windows in addition to those over the six doors to court. The horse range has stalls for fourteen single and one double, with three boxes. Three of the stalls are six feet, all other  $5\frac{1}{2}$  feet in width, boxes 12 by 12; feeding passage seven feet, and the space behind horses is eleven feet. The floor is cedar block pavement. At the end adjoining barn is a small room for extra harness, that for daily use being in a press upon the wall behind each team. The feed-room, 30 by 10 feet, will hold cut hay and oats. As it was proposed to use cut hay only, there are no racks, and the mangers are divided for hay and oats. Straw is got by four shoots behind horses, and there are corresponding openings in front should long hay be wanted from the loft. Double doors, with an eight feet passage between, divide the building—the one to the manure court and the other from roadway, with two ordinary doors to said court, and two on end near bull shed. Water is got from three hydrants inside on the head passage, and light by eighteen windows. All the stalls and boxes are fitted with pillars and top rails. The horse loft is arranged to be filled with hay by a horse hay-fork. The sheep range is divided into five inside and six outside compartments—dry, solid soil inside and gravel outside. A five-foot passage runs throughout, with hay-racks upon sub-divisions opposite shoots from loft; water is supplied by three hydrants. There is a wool-room, grain bin, separate lambing pens, and pens for each of the stock rams. Eight feet doors open into the special court, which is fenced from the large manure court by a four-foot stone and lime wall. The bull shed is a separate building, 40 by 80 feet, having a ten-foot centre passage, with six boxes on each side, 14 by 14 feet, and one for straw. Each box has an outside fenced yard of 14 by 14 feet. Overhead is for hay, straw, and grain. The yard enclosed by the four ranges just described is surrounded by an eight-foot causewayed sidewalk, excepting on the sheep side, which is taken up by a special court for them. The manure from all classes of animals is taken immediately into the large court, in centre of which are two cemented brick tanks—one for the liquid from stables, the other for rainfall from buildings. Any over-accumulation of mixed liquid from the manure is taken into the

*Canadian Lands and their Development.*

first tank, and both tanks have an overflow into the open ditch north of the buildings. This manure court is laid with rough broken stones, and blinded to an average of four inches with sharp gravel and cinders. Many other items could be enumerated, such as galvanised iron shingles, horse stable walls inlaid with brick, ventilators all over, rope and pulley covers for all trap openings overhead, three coats of paint everywhere outside, a 17-horse power portable engine, with cable rope for a separate house fifty feet distant, driving straw-cutter, root pulper, grain grinder, and threshing machine as required in the barn and feed-room. Shortly before my own visit a new silo had been added, and this was being filled with maize chopped in half-inch lengths, from which very good food was expected.

The fullest details are kept of the produce of the farm. In ten years, from 1878 to 1887, winter wheat averaged 27 bushels per acre; spring wheat, 17 bushels; barley, 32 bushels; oats, 40 bushels; peas, 29 bushels; hay,  $1\frac{3}{4}$  tons per acre; mangold, 24 tons; swede turnips, 19 tons; carrots, 595 bushels; and potatoes, 114 bushels. In addition to this, experiments are continually being conducted, and not only on the farm itself, but farmers are interested in the subject by being asked to test new varieties of cereals in a similar manner to that which has been adopted by the Bath and West of England Society in our own country. In 1887 no less than 78 farmers made experiments with the best varieties of grain, in conjunction with the College. Experiments on manures, on feeding, and on dairying are made, and the whole results are given in bulletins, which are scattered by tens of thousands throughout the country.

I must apologise for dealing at so great a length with this College, but really it is an institution which has a greater bearing on the agricultural development of Canada than we realise in this country. Go where you will in Manitoba and the North-West, it will be found that the great bulk of the settlers are from Ontario. The live stock, whether of horses or cattle, found on these new lands are not, as a rule, imported direct from the old country, but from Ontario. What is done in this province has a bearing over the whole country; the work of the Ontario College has a widespreading influence in bringing about the very best management of the soils, plants, and animals in every part of the Dominion. It, therefore, helps on the highest development of the lands of Canada.

It must not be forgotten also that this institution is but a com-

plement to an educational system, which is unsurpassed by any in the world. In the early days of the provinces of Ontario and Quebec, the Government set aside large areas of Crown lands, the money accruing from the sales of which have been and are applied to educational purposes. Commencing with the primary schools (which in these provinces at any rate are free), we find them maintained partly by a school tax levied on the lands situated in the school sections, and partly from grants from the Government, which are given out of the funds above alluded to. These schools furnish a good English and commercial education, while recently agriculture has been added to the list of subjects taught. For this a very good text book has been adopted. Besides these there are the high (or, as we should call them, grammar) schools, in which the classics and modern languages are added to the course taught in the primary schools. Then there are the various colleges, which in a large part were fostered by the various denominations. Each province has several such institutions, which are officered by men of noted talent in their particular branches, and many of them by men of world-wide reputation. Some evidence of the work done by these institutions may be found in the great spirit of religious toleration which is evident in all parts of Canada. The Toronto University is composed of the various sectarian colleges, including the Catholic one, and the same is the case at Winnipeg University, which is also an amalgamation of all the sectarian colleges of Manitoba—all of which work together as one university, under the presidency of the Bishop of Rupert's Land. In the arts faculty of Toronto no fees of any kind are exacted, and in most of the colleges of the Dominion (as is the case in the high schools), where fees are exacted they are merely nominal. The faculties in connection with Toronto University, and those of McGill University at Montreal, will compare favourably with those of the old universities of the older world. Sir Daniel Wilson is the president of the Toronto University, Sir William Dawson of the McGill University, and Dr. G. M. Grant of Queen's University at Kingston; and it is sufficient to mention their names to show that too much has not been claimed for the institutions over which they preside.

As progress and education go hand in hand, the maximum of education means the maximum of advance. Such educational facilities as I have indicated show how fully alive are the Government and people of Canada to the importance of making knowledge the foundation of all development.

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## IV.—EXPERIMENT AND EXAMPLE.

The College at Guelph was established by the provincial legislature, the Bill for the purpose having been introduced by the Hon. John Carling, who was then a member of that body. That gentleman is now a member of the Dominion Parliament, and a very excellent Minister of Agriculture. Having seen the beneficial results which followed the establishment of the Guelph College, he has signalled his term of office as a Minister of the Crown by the further establishment of a central experimental farm at Ottawa, on the borders of the provinces of Quebec and Ontario, as well as others at Nappan, Nova Scotia, for the maritime provinces; at Brandon, for Manitoba; at Indian Head, for the North-West territories; and at Agassiz, for British Columbia. Previous to their establishment, Professor Saunders, F.R.S.C., made a report on the whole subject, after visiting many similar colleges and farms in the United States. The result was that these experimental farms were established, their objects being:—

(a) To conduct researches and verify experiments designed to test the relative value, for all purposes, of different breeds of stock, and their adaptability to the varying climatic or other conditions which prevail in the several provinces, and in the North-West territories;

(b) To examine into scientific and economic questions involved in the production of butter and cheese:

(c) To test the merits, hardiness, and adaptability of new or untried varieties of wheat or other cereals, and of field crops, grasses, and forage plants, fruits, vegetables, plants, and trees, and to disseminate among persons engaged in farming, gardening, or fruit-growing, upon such conditions as are prescribed by the Minister of Agriculture, samples of such surplus products as are considered to be specially worthy of introduction;

(d) To analyse fertilisers, whether natural or artificial, and to conduct experiments with such fertilisers, in order to test their comparative value as applied to crops of different kinds;

(e) To examine into the composition and digestibility of foods for domestic animals;

(f) To conduct experiments in the planting of trees for timber and for shelter;

(g) To examine into the diseases to which cultivated plants and trees are subject, and also into the ravages of destructive insects, and to ascertain and test the most useful preventives and remedies to be used in each case;

(h) To investigate the diseases to which domestic animals are subject;

(i) To ascertain the vitality and purity of agricultural seeds; and

(j) To conduct any other experiments and researches bearing upon the agricultural industry of Canada, which may be approved by the Minister of Agriculture.



In company with the Hon. John Carling, to whom I am indebted for many courtesies, Dr. Fream and myself visited the Central Farm, near Ottawa, and we were both very much impressed with its situation and management. It occupies some 500 acres, and, although it had been only established for a year, Prof. Saunders (who is the director of all these farms) had already many important experiments under weigh. I was extremely pleased to find that, from the first moment of the working of the farm, an endeavour was made to interest the ordinary farmers of the Dominion in its work. One of the most important factors in the farming of those large areas of fertile lands in the North-West must be the acclimatisation of quick ripening varieties of grain. The soils are fertile; but late summer frosts may be dangerous, and so quick-growing crops are necessary, if the results of farming are to be always depended upon. With the establishment of these farms, therefore, trials were commenced with Ladoga wheat, a variety obtained from northern Russia. Small bags of seed were also sent out to settlers in Manitoba and the North West. The experience at Ottawa is that this variety will ripen at least a week earlier than the red Fyfe, and I think, from what I saw in north-west Manitoba, that this will be confirmed. I myself saw it growing side by side with the red Fyfe in at least thirty instances in north-west Manitoba, and in only one case was there any doubt as to its greater earliness. In that case my friend, Dr. Fream, examined the two crops very carefully, and expressed the opinion that the Ladoga was the most forward. Should this prove to be the case, the exceptional frosts in the early summer (which are only occasional, and only occur in some districts, chiefly low-lying ones) will do even less damage in the future than they have done in the past. It is a useful work, and one that will materially help in the settlement of the country.

It may not be out of place to observe here that in the old provinces it was not an unusual occurrence for the earlier frosts in autumn to damage the wheat and other cereal crops, but with improved cultivation this condition of things ceased. Prince Edward Island affords a good illustration of this. Parliamentary records show that applications were made to the Legislature for relief upon that very ground, which relief was granted. Early settlers in Ontario suffered from a similar state of things, though, perhaps, not so continuously as those in Prince Edward Island. It is very feasible to imagine that as the tilth of the soil becomes finer, and the drainage more perfect, more heat is absorbed and

retained. It may be that this will be the case, also, with the prairie lands, and that with cultivation and settlement the occasional danger from summer frosts will disappear.

In addition to this, I learn that this year samples of nearly every variety of grain and pulse crops grown in Europe have been obtained, and will be tested. As Ottawa has a climate which represents the average condition of a large portion of settled Canada, and which is favourable to the growth of grapes, and fruits of most kinds in the open, and in which cereals and most field crops can be grown successfully, the introduction of new crops may be safely expected, and these cannot but afford new sources of wealth.

The investigations into the causes of plant diseases had already made some progress, and at the time of my visit a very interesting report on "Smut in Wheat"—an important matter to a country which exports grain so largely—was being issued.

The farm buildings are very commodious, and well adapted for the purposes for which they are intended. This year they will be filled with cattle, sheep, pigs, and horses, and the whole will undoubtedly prove a very useful central station, from which practical information will go forth which cannot fail to improve the standard of farm practice in the Dominion.

The other experimental farms were being prepared last year, and will commence their labours this. I only saw the site of that at Indian Head. This comprises one entire section and an angle between the section and the Canadian Pacific railway containing 48 acres, in all 688 acres, and is situated east, and adjoins the town site half a mile from the station. The railway passes along the south boundary, from which a fine view of the whole farm can be seen. Through the section two creeks run in a north-easterly direction to the Qu'Appelle river. One is the outlet for a lake six miles south; the other proceeds from flowing springs seven miles south-west. These creeks, besides being of great value to the farm in supplying water and affording suitable slopes for all kinds of experimental work, will also beautify the site chosen in a way that cannot be easily surpassed by any prairie section in the north-west. The soil is a black loamy clay on the northern portion of the section, changing to sandy clay loam, with a few gravel ridges on the southern part. The subsoil is a very porous clay, which easily absorbs all moisture and retains it during the most severe drought, underlying the surface soil from twelve inches to three feet. Hardly any amount of

rain or dry weather can seriously affect the crops. The whole of the section was broken in 1882-3 by the Bell Farming Company; and has by them been under cultivation ever since. When the Government obtained possession at the beginning of last year, no part of it was ploughed, and consequently no preparation for experimental work could be made until spring opened. During the winter, plans of buildings were made out, and when submitted to the proper authorities, were approved of by them as suitable for the country. Tenders were asked for their erection, and last autumn the contractor was at work at the foundations. The buildings to be put up comprise superintendent's house, horticulturist's and foreman's dwellings, a basement barn 110 ft. by 48 ft., and a horse stable. Sheep house, implement house, and other necessary buildings will be added this year. It is needless to say that all these will be of the most substantial character.—

In England we have derived great advantage from experiments and example farms, and it is likely that equally satisfactory results will accrue to Canada.

#### V.—AGRICULTURE.

It would be an extraordinary fact if we did not find such endeavours to build up a country on the truest lines amply responded to. The agriculture of Canada has responded nobly. Each year sees a great advance, not only in the cultivated areas, but in the productions of meat, dairy produce, grain, vegetables, and fruits. Time will not permit a description of the agriculture of each of the provinces, and its growth. The best farming of the older provinces is amply shown in the descriptions of the Guelph College and farm. Manitoba and the North-West territories are the lands which are now being developed, and I will, therefore, confine my attention to those. The development here has been very marked, and it is evident that too much is not claimed for these lands when they are described as "the future granary of the world." I was very much amused at reading in a work\* which was put into my hands as I landed at Liverpool last autumn, that in Manitoba "the climate is too Arctic even for wheat." I had gone through some hundreds of miles of country, over the whole of which smiling fields of golden

\* "The British Farmer and his Competitors." By William E. Bear. London: Cobden Club

grain were either waving gracefully, or being harvested to the merry buzz of the reaper. I had also obtained the following figures, showing that the acreage of grain crops each year is steadily increasing:—

ACREAGE OF GRAIN CROPS IN MANITOBA.

	Wheat. Acres.	Barley. Acres.	Oats. Acres.
1884 .....	307,020	40,848	133,004
1885 .....	367,479	52,189	157,026
1886 .....	380,231	69,305	159,450
1887 .....	432,000	56,000	155,176
1888 .....	520,000	70,000	170,000
Increase in 4 years .....	212,980	29,152	36,996

These figures show that in four years the wheat area has increased by 70 per cent. ; barley, 75 per cent. ; and oats, 28 per cent. They are the best answer to such a curious misconception as that the climate of Manitoba is "too Arctic even for wheat." In 1887 the average yields were 30 bushels of wheat per acre, 36 bushels of barley, and 50 bushels of oats. Farming also is more generally of a mixed character than I expected to find it, while there are no less than 29 cheese factories—an increase of 13 in two years; and 2 creameries in the province. There are also some excellent stock to be found on the prairies, and at Binscarth the Manitoba and North-West Railway Company have established a very good stock farm, from which good pure-bred bulls of the shorthorn breed can be obtained.

West of Manitoba we have the great North-West, consisting of Assiniboia, Saskatchewan, and Alberta—unknown lands but a very few years ago, but which are now beginning to be developed. The growth of agriculture here is very marked, the latest figures I have been able to obtain being for 1885. These have to be largely increased now. They show the following growth since 1881:—

	1881.	1885.	Increase.
Horses, colts, fillies, and mules ..	10,870	24,456	13,586
Working oxen .....	3,334	5,949	2,615
Milch cows .....	3,848	11,030	7,182
Other horned cattle .....	5,690	69,557	63,867
Sheep .....	346	19,398	19,052
Pigs .....	2,775	22,542	19,767
Home-made butter .....	70,717 lbs.	510,191 lbs.	439,474 lbs.
"    cheese .....	1,060	10,270	9,210
Wheat .....	5,678 Acres.	67,255 Acres.	61,577 Acres.
Barley .....	..	11,605	11,605
Oats .....	..	35,343	35,343
Potatoes .....	811	3,676	2,865
Cultivated hay .....	..	428	428

The ranching industry is being well developed, and I was pleased to see how greatly horse ranching is being established. Sir John Lister Kaye is doing a good work in this matter, having imported a large number of pure-bred stallions and high class half-bred mares from this country. The health of the horses has, I hear, been good during the whole of the past winter, and it is very evident that the Minister of Agriculture is right when he says that "horse ranching in Alberta is becoming an important industry, and the improvement in breeding, owing to judicious selection, attracts the notice of all the visitors there."

From Atlantic to Pacific there is this evidence of growth in agriculture, and growth too in the right direction. Many visitors go to the new lands in the North-West expecting to find a very rude agriculture—wheat growing alone, or rough ranching alone. They will soon find out their mistake, for they will come across bits of farming that would be no discredit to this country, and herds that an English owner would be proud to have adorning his park. Some of the new settlers—men who were utterly ignorant of agriculture until they arrived in the country—do not farm so well as they ought, but they are gradually brought by the example and help of the better men into a fairly good system. I have neither the object nor the intention of painting Canada as a paradise: it has its difficulties as well as its advantages for the new comer as for the old settler. But honest and intelligent labour will secure the advantages and rapidly overcome the difficulties.

#### VI.—TWENTY YEARS' PROGRESS.

The following tables may be of value as showing how greatly Canada has grown during the past twenty years, so far as her exports are concerned:—

##### (1) *Export of Forest and Agricultural Products.*

	Forests.	Agricultural Products.
1868 .....	£3,652,400	£2,574,200
1878 .....	3,902,200	3,601,600
1887 .....	4,097,000	3,765,200

##### (2) *Exports of Animals, and their Produce.*

1868 ....	£1,378,600	1878 ....	£2,803,800	1887 ....	£4,850,000
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##### (3) *Exports of Wheat and Flour.*

	To Great Britain.	To United States.
	Bushels.	Bushels.
1868 .....	1,398,000	1,698,000
1877 .....	2,660,000	500,000
1887 .....	6,776,000	364,000

## (4) Exports of Cheese.

	To Great Britain.	To United States.
1868 .....	£110,000	£13,800
1877 .....	690,000	59,000
1887 .....	1,413,600	6,133

## (5) Exports of Butter.

	To Great Britain.	To United States.
1877 .....	£550,000	£13,000
1887 .....	151,400	3,400

## (6) Export of Apples.

	To Great Britain.	To United States.
1868 .....	£3,881	£7,146
1877 .....	33,723	5,377
1887 .....	129,836	39,522

In these we have a very good picture of the growth of the exports of agricultural produce—steady progress being maintained in every branch, except that of butter—a matter to which attention is being directed which cannot fail to bring about a revival of this trade. Another point which the figures show is that Great Britain is the main market for Canadian produce. For instance, in the twenty years since federation (1868 to 1887 inclusive) the following are the total values of the exports of cheese, butter, apples, and peas to the two places:—

	To Great Britain.	To United States.
Cheese .....	£15,742,000	£320,000
Butter .....	7,126,000	1,500,000
Peas .....	6,032,600	1,661,000
Apples .....	871,310	261,466

The total exports to all countries during the same period have been as follow:—

Apples .....	£1,200,000
Butter .....	9,333,600
Cheese .....	16,062,000
Peas .....	8,000,000

These figures will give some idea of the trade in what is really secondary products, but to which attention should be more and more directed.

## VII.--MINERAL WEALTH.

There is another matter which must have a great influence on the future of Canada, and that is, its great mineral deposits. Now that the Country possesses such magnificent railways as the Canadian Pacific and the Grand Trunk, there is not the slightest

reason why this source of wealth, and especially coal, copper, and phosphates, should not be very largely developed in the near future. Their development will mean, not only new sources of wealth, but new industries, more labour, and greater comforts for the people. The bituminous coalfields of British Columbia and the plains, and the great anthracite deposits on the Bow River, should have a very useful influence in developing that Pacific trade, by which we shall in the near future find our shortest route to the southern hemisphere.

But I should like to dwell in this paper more especially on the phosphate lands, as those should prove of great value, not only in supplying this country with a necessary fertiliser, but in maintaining and increasing the fertility of the lands of Canada themselves. The exhaustion of the lands of the United States offer a warning which ought not to be neglected, and should direct attention to the science of manuring, and its absolute necessity to good agriculture. "Like produces like" is a proverb of which the breeder—whether of animals or of plants—has by long experience proved the truth. Just as physiology has evolved this fact, so also chemistry—whether in the laboratory of nature or in the work-room of the scientist—has established another. It is that "nothing produces nothing." The growth of the plant, or the formation of beef, mutton, pork, or milk, is but a reconstruction, or rather, a new combination, of what already exists. The grain of wheat which is sold at Mark Lane, or the leg of mutton which the butcher sends home for the Sunday dinner, these are but a new combination of matters which have existed in other forms ever since the various worlds were called together out of chaos. The soil and the atmosphere do their part in supplying matter for these combinations, but their powers in the matter are strictly limited, and nothing is so conservative, or so slow, as is nature in giving up her treasures for new combinations, and new wealth. In these days, however, we go the pace: even nature has to work at express speed. Our beef must be made in two years, as against four or five in our grandfathers' time; our mutton in less time than lamb a few years ago; 700 gallons of milk have to be produced against 500 gallons in 1860; crops are not only taken at will, and with bigger yields, but he is a poor farmer who does not also get his catch crops as an intermediary to those crops which Mr. Mechi would have suggested. "Nothing comes from nothing," and if our soils are to go the pace, if they are to be used as machines to the utmost limits of

which they are capable ; if they are to be made to produce, not two blades of grass, but two bigger blades, where only one was produced before, then they must either have a greater supply of active constituents, in a form suitable for re-combination in meat, milk, vegetable, or grain, or the pressure breaks them down, and their latter state will be one of infertility, and they become of less than prairie value.

Our soils are living the pace ; the story of British agriculture to-day is nothing less than this ; and by the proper provision of those constituents which the soil, the plant, and the animal need in their combinations, they are perfectly able to do so. In Canada, also, the large crops will not go on for ever, unless the necessary constituents are returned to the soil. The whole matter is a subject of absolute knowledge, and there need be no mystery at all attaching to it. The "staple" of the soil—by which the machine may be made to run easily—must in the first place be maintained. For this, bulky manures, such as farmyard dung, or decaying vegetable matter, must be used ; good cultivation must be employed to secure a fine tilth and cleanliness ; and then the crops should be so arranged in their rotation that the constituents taken from the soil shall approximately balance each other. This is the first point in soil management. Had we not such a wasteful system by which most of the sewage of such a highly fed people as the English, who live on the fruits and grain of the whole world, as well as the produce of their own acres, is lost, we could from our own waste provide far more than enough of all the constituents required to maintain our acres in greater fertility than any others in the world. But all this—on which my old friend the late Mr. Mechi used to discant so eloquently—goes to the rivers and the sea, and is lost to future wealth ; and so we have to supplement our natural supplies on the farm from other sources. To find out what is needed for the soil should be comparatively easy, since the fifty years' experiences at Rothamsted give us very exact data. We know that average crops of wheat, barley, and meadow hay will take away from the soil the following (among others) constituents per acre :—

	Wheat and Straw (4,800 lb.) lb.	Barley and Straw (4,580 lb.) lb.	Meadow Hay (1½ ton = 3,360 lb.) lb.
Nitrogen .....	45·0	45·0	44·0
Potash .....	31·5	34·0	56·6
Phosphoric acid.....	21·0	21·0	13·7

\* Fream, "The Rothamsted experiments," p. 142.



In Great Britain alone we can thus estimate the quantity of the principal ingredients removed in the crops of one year alone, taking nitrogen, phosphoric acid, and potash as such. This would be as follows:—

Crop.	Acres.	Constituents removed from soil.		
		Nitrogen. Tons.	Phosphoric Acid. Tons.	Potash. Tons.
Wheat .....	2,564,237	51,469	24,040	36,060
Barley.....	2,085,561	41,897	18,552	38,921
Hay.....	7,069,453	138,842	44,184	176,734
Totals .....	11,719,251	232,208	86,776	251,715

As we have a cultivated area of 47,000,000 acres in the United Kingdom, this area of 11,719,251 acres may be taken as one-fourth, and it may be assumed that from the soil each year there is removed some 928,000 tons of nitrogen, 344,000 tons of phosphoric acid, and 1,000,000 tons of potash. A portion of these constituents would be returned in the farm manures; but, after that has been allowed for, a very large quantity of each must be obtained elsewhere. But it does not follow that all these constituents have to be supplied by man. Nitrogen exists in profusion in nature, and is constantly being renewed in active power. In the soil nitrification is going on continuously, while it is a moot point whether such leguminous plants as clover and beans do not assimilate the free nitrogen of the atmosphere. Rain and seed also supply new stores. In an active form nitrogen is the manure that is dearest of all, and yet it is doubtful if we have yet realised how sparingly it ought to be used. It is not only a plant food, but an active agent also in the soil in making it give up mineral constituents which are equally necessary to the plant. It is this point which deserves the greatest attention. Phosphates and potash are present in the soil, but the former in but small quantities, and are not renewable by nature. By putting active nitrates into the soil in the form of nitrate of soda or sulphate of ammonia the effect is to make available at once large quantities of phosphoric acid and potash for the plant. A big crop may follow the first use, but with the result that the phosphates and potash become exhausted, and the soil infertile. Until these latter are renewed, all the nitrates in the world are of no avail. Another point is, that active nitrates are not held by the soil. Once a storm comes they are washed out. At Rothamsted a greater quantity of nitrates are lost in the drainage water than the crops take up, while no trace of loss of

phosphates and but slight traces of loss of potash have been discovered. It cannot be too widely known that exhaustion of the soil is invariably caused by the loss of the mineral constituents rather than the absence of nitrates. By supplying these, nitrates can then be usefully used, but in moderation. But the backbone of the soil is a proper quantity of phosphoric acid and potash.

Canada is fortunate in this matter as in the phosphate lands in Quebec she has an enormous deposit of the most necessary of all manures. Last December a meeting was held of the chemical manure manufacturers of this country, when the complaint was made that the world's supply of phosphates was getting short. I at once pointed to the Quebec lands, which I visited last autumn and brought specimens away, as a large source of future supplies. At present only small quantities are being mined—23,000 tons last year. In 1870, however, the Carolina beds only produced 17,000 tons, and yet last year the output was one of 500,000 tons. Both to maintain the fertility of her own soils, and to export to other countries, there is a great future for these lands.

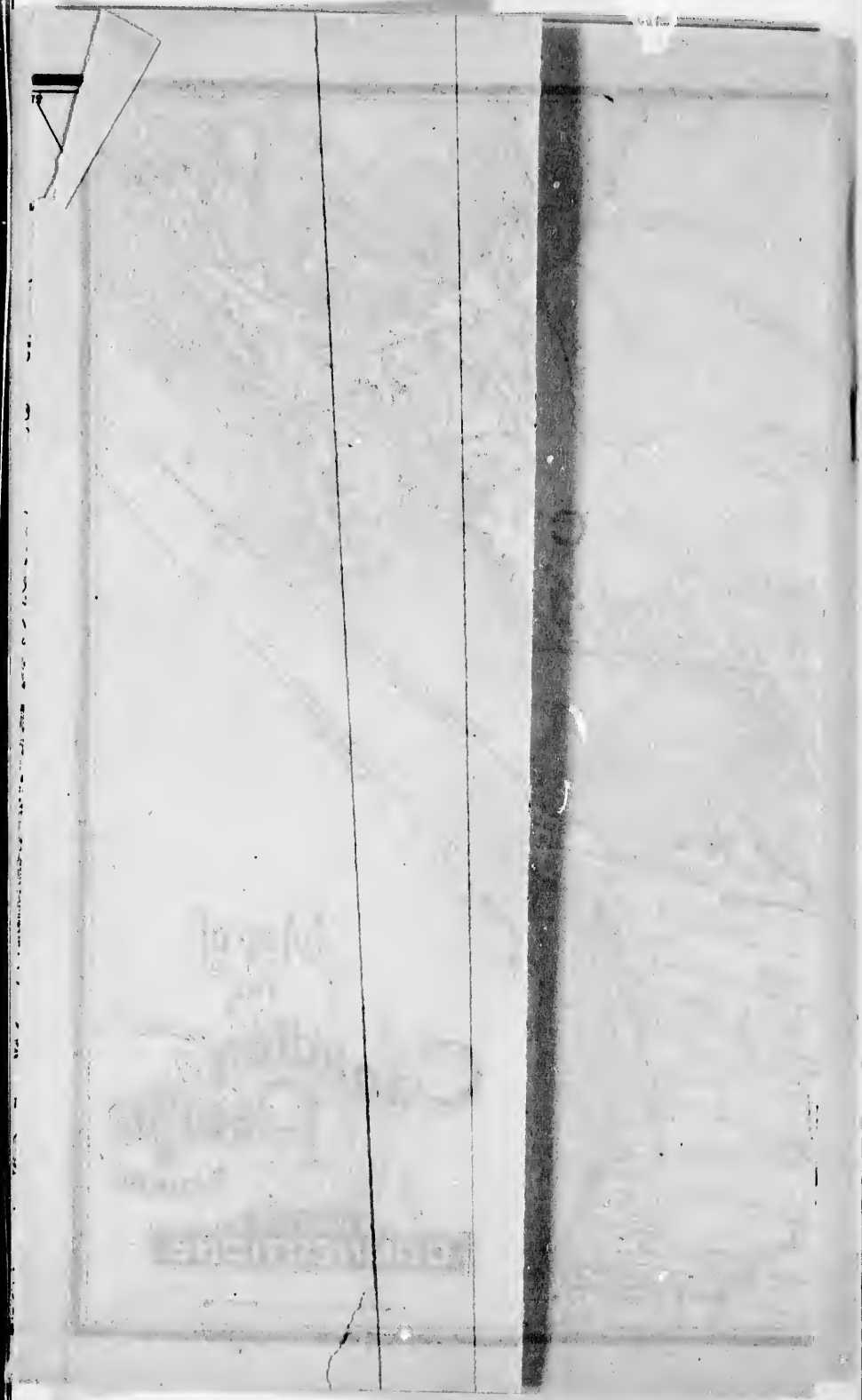
#### VIII.—CONCLUSION.

There are many other subjects on which I might speak, for Canada is a great country, and those who have to deal with it can never be, like Rosalind's lover, "gravelled for lack of matter." In the North-West Fertile Belt alone there are 300,000,000 acres of land awaiting people to subdue them and make them their own. An American writer has recently pointed out that 105,000,000 acres in that country, with its wasteful farming and low yields, were capable of feeding 50,000,000 people, and furnish besides 283,000,000 bushels of grain for export. If we deduct for roads and rivers, and put it down that 230,000,000 acres can be peopled, we shall find that the North-West alone could feed a population of 100,000,000, and still send 600,000,000 bushels of grain to the people of other countries. Even this would be only a small portion of this great country. The vast dairy manufactures in Ontario and Quebec, the fruit production of Nova Scotia, the great timber wealth in the east and in the west, its mineral resources, and its teeming fisheries,—these have been but barely alluded to. One of the primary objects of the Royal Colonial Institute is to afford an independent platform for the discussion of this and similar subjects in the interest of a "United Empire," and it is in the hope of contributing in some measure to the

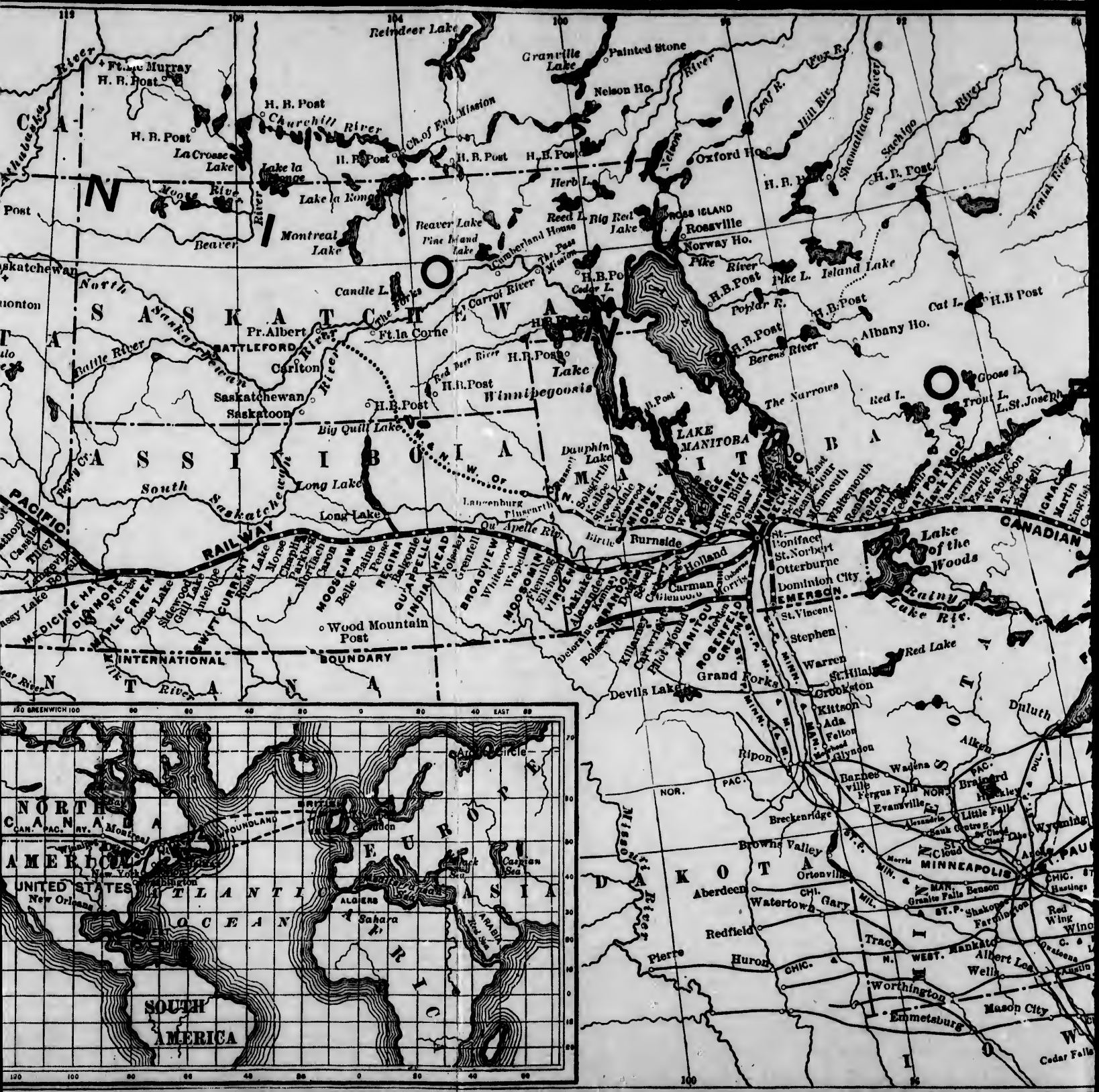
furtherance of that aim that I have ventured to address you to-night. The Colony I have chosen is our nearest and largest one, and it is the pathway of the Empire of which we are all so proud. It is a country of great promise, and, as its lands and industries become developed, the English-speaking race will, more and more, look with lively admiration, interest, and pleasure to—

“The North, the North, the cold, true North;  
The land of love and song.”

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