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APPENDIX

TO THE

TWENTY-SIXTH VOLUME

OF THE

JOURNALS OF THE HOUSE OF COMMONS

DOMINION OF CANADA

FROM THE 25TH FEBRUARY, 1892, TO THE 9TH JULY, 1892, BOTH DAYS INCLUDED.

SESSION 1892



OTTAWA

PRINTED BY S. E. DAWSON, PRINTER TO THE QUEEN'S MOST
EXCELLENT MAJESTY

1893

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APPENDIX

LIST OF APPENDICES—1892.

- No. 1.—SECOND REPORT of the Select Standing Committee on Miscellaneous Private Bills *in re* Bill No. 75, to confer on the Commissioner of Patents certain powers for the relief of Carl Auer Von Welsbach and others. *Not printed.*
- No. 2.—REPORT of the Select Standing Committee on Agriculture and Colonization. *Printed herein.*

REPORT

OF THE

SELECT STANDING COMMITTEE

ON

AGRICULTURE AND COLONIZATION

SECOND SESSION, SEVENTH PARLIAMENT

1892

PRINTED BY ORDER OF PARLIAMENT



OTTAWA

PRINTED BY S. E. DAWSON, PRINTER TO THE QUEEN'S MOST
EXCELLENT MAJESTY

1892.

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REPORT.

The Select Standing Committee on Agriculture and Colonization present their third and final report.

The investigations of the Committee have had relation to the several operations which have been carried on by the Experimental Farms, and also to the subject of Immigration.

The evidence which has been taken by the Committee is hereunto appended and submitted by the Committee as a part of its report.

AGRICULTURE.

Mr. William Saunders, the Director of the Experimental Farms, was first examined, and the information which he furnished to the Committee conveyed a clear appreciation of the several operations which are being carried on by the staff of the Farms in relation to practical farming in Canada.

He showed that there has been an active distribution of samples of seeds, particularly of grains, the number of 11,230 samples having been sent out last season, and at the date on which he made his statement (April 1st, last) 8,950 during the present year, that is over thirteen tons of grain have been sent out in answer to applications from all parts of the Dominion, in small parcels. He mentioned, for instance, that he had a letter from one farmer who had received the usual three-pound package of the variety of "Prize Cluster" oats, from which, at the date of his letter, he had obtained a sufficient quantity of seed to sow five acres. Mr. Saunders said that the oats distributed in this way were from six to eight pounds over the standard, while the average weight of oats grown in Ontario was not over the standard. Means are, therefore, provided by this distribution of samples to permanently improve the oat crop of the country.

On the subject of barley Mr. Saunders furnished information of practical utility to farmers. He gave a report respecting a test shipment of 400 English bushels to England of the two-rowed variety. A portion of this barley was grown at the Central Experimental Farm and the remainder grown in different districts of Ontario. It was all carefully cleaned and sifted, and all broken and light grains taken out, the whole making a fairly uniform sample. It weighed from 52 to 52½ pounds per bushel. It was tested in England, both by malting and brewing, and was found, in all respects, to be highly satisfactory. Its assayed value was from 35 to 36 shillings sterling per quarter.

Mr. Saunders showed that some of the shipments made to England during the last year had not proved satisfactory nor profitable to the shippers, for the reason that the barley sent was not uniform, being composed of heavy and light, poor and good, discoloured and bright, mixed together. He stated that English maltsters will not handle barley in that state, and that unless the same care is taken as that with the shipment from the Experimental Farm above referred to, good results cannot be expected from shipments of barley to England. There is no reason, however, why Canadian farmers should not take the necessary pains, and thus secure the highly

remunerative prices of the English market. Those shippers, during the season, who took the precaution to send forward barley in a state suitable for English malting, found the results satisfactory.

Mr. Saunders mentioned that he had received a sample of two-rowed barley from Medicine Hat which weighed fifty-six or fifty-seven pounds to the bushel, this being the finest sample he had received during the year, and a proof that the Canadian North-west is adapted to the growth of the best barley. He stated as a principle that wherever the six-rowed variety can be grown of the best quality, there the two-rowed may be grown equally well, with the result, as shown by experience, that a larger number of bushels to the acre can be obtained from the latter variety, and, therefore, with greater profit.

Mr. Saunders' evidence contains the details of experience with respect to growing varieties of wheat in the North-west Territories. Experience so far has established that the Red Fife is absolutely the best for the localities in which it will grow, but that the Ladoga is valuable for many localities in which the Red Fife is not a surecrop. He showed that valuable results might be obtained from the cross fertilizing experiments with varieties of wheat now being conducted at the Central Experimental Farm. And he also pointed out it had been proved by experience that early sowing of grains had much more important bearing on successful results than is generally understood.

Mr. J. W. Robertson, the Dairy Commissioner of the Dominion, appeared three times before the Committee. The evidence he gave will be found by farmers to be interesting, important and practical, in a high degree. He showed the work that had been done by himself and assistants in the several provinces of the Dominion during the year.

He showed that the farmers of the Dominion are now becoming interested in winter butter making, and he stated that the experiments which had been tried prove the results to have been very satisfactory, the profits having been greatly increased, the butter product commanding a high price in the markets of the United Kingdom, while the value of the skim-milk to the farmer for feeding purposes was found to be equal to the extra cost of keeping the animals in milk during the winter. He expected as a result of winter butter making that the exported product would, within ten years, reach five million dollars a year, the return of which would be in cash to the farmers. He stated as a definite fact that he had been able to initiate and record more progress in regard to profitable dairying during the last year than during any previous ten years of the country's history, and he hoped to make even more progress during the present year than the last.

Mr. James Fletcher, the Entomologist and Botanist of the Central Experimental Farm, appeared before the Committee, and the information which he gave will be found to be both practical and valuable. He stated that there is not one of the more important fungus or insect enemies concerning which useful advice cannot be given, which will, at any rate, mitigate or reduce very materially the amount of injury that is being done by these pests, not only throughout the Dominion but the continent; and that great advances in economic entomology had taken place within the last five or ten years.

The evidence of Mr. John Craig, the Horticulturist of the Central Experimental Farm, will be found to contain matter of much interest for fruit growers, on various points of the experiments which have been conducted.

Mr. Frank T. Shutt, the Chemist of the Central Experimental Farm, furnished information of much interest on the subject of the relations between analytical chemistry and practical farming operations, and he showed that agriculture had very greatly gained from the experiments with agricultural chemistry, particularly in England and Germany, during the last ten years. He said that the interest of farmers in Canada in this question was proved by the very numerous letters which he received from farmers in all parts of the Dominion. The information he gave had relation to the value of nutriments of the soil, of cattle foods, and food values of dairy products. Experiments conducted at the Central Experimental Farm afford agriculturists information which they could not by direct experiments obtain for themselves.

IMMIGRATION AND COLONIZATION.

On the subject of immigration, Mr. Lowe, the Deputy Minister of the Department of Agriculture, and Mr. Burgess, of the Department of the Interior, were examined. Mr. Lowe showed that the subject of immigration had been transferred from the Department of Agriculture to that of the Interior at the request of the Minister of Agriculture, with the object, first, of utilizing the officers and agents in the latter department in the distribution and placing of immigrants throughout the Dominion, thus rendering one set of officers necessary instead of two; and second, for the purpose of placing intending immigrants, particularly in the North-west, in direct touch with the Dominion land officers, this point being one of great importance for successful colonization.

Mr. Lowe gave a brief summary of the immigration operations during the past year to the date of the transfer, and Mr. Burgess showed that the saving effected by the transfer, in having only one set of officers for both Immigration and Dominion Lands, would be from \$21,000 to \$27,000 a year.

RECOMMENDATIONS.

At the meeting of the Committee on Tuesday, the 28th June, the following resolutions were adopted, a desire having been expressed that the recommendations therein should be embodied in the Committee's final report:—

(1) "That this Committee strongly recommend the Government to assist the Dominion Horse Breeders' and Sales Association, to the extent of printing such circulars and catalogues as may be required to further the interests of said association, and to allow said printed matter to be distributed through the mails as printed parliamentary papers.

(2) "That in the interest of Canadian agriculture it is very important that buyers in the United Kingdom should be convinced that two-rowed barley of the best quality can be obtained in large quantities in the Dominion, and also that Canadian farmers should be assured that such barley can be sold by them at remunerative prices.

“The Committee therefore recommend that the services of some competent buyer be secured by the Government, whose duty it shall be to purchase during the coming season and ship to the mother country as large a quantity as possible of carefully selected first-class barley, and that the selection be made from different sections of this country where barley is grown.”

The whole respectfully submitted.

T. S. SPROULE, *Chairman.*

COMMITTEE ROOM 50, HOUSE OF COMMONS,
5th July, 1892.

THE EVIDENCE

PART I

AGRICULTURE

COMMITTEE ROOM 46,

HOUSE OF COMMONS,

WEDNESDAY, 30th March, 1892.

A meeting of the Select Standing Committee on Agriculture and Colonization convened this day to hear the representations of a Delegation Committee from the "Dominion Horse Breeders' and Sales Association,"—Col. TYRWHITT, M.P., in the Chair.

Present in behalf of the association, Messrs. JAMES MUNN, St. Thomas; M. L. STALKER, Dutton; J. W. ROGERS, Kingsmill; and Hon. Senator PERLEY.

THE CHAIRMAN.—The meeting held this morning was adjourned until this evening, the object being to consider some proposition as to the manner in which we could place our views before the Government in order that some action may be taken to accomplish our most desirable aim. All of those who are here are very much interested in the breeding of horses and in the welfare of the agricultural community, and I only trust that some scheme will be evolved whereby we can place our views before the Government in a way in which the Government can assist us and assist the horse-breeding community.

Mr. CARPENTER.—Perhaps the members of the deputation from the west can throw some light upon the question.

THE CHAIRMAN.—I would call upon some of those gentlemen to speak, and we can then see if they have some scheme; at any rate, we can ascertain the views of the gentlemen who sent them here.

Mr. J. W. ROGERS, Kingsmill, then addressed the Committee. He said: Mr. Chairman, of course there are some gentlemen here who were not present at the meeting which was held this forenoon. It may be necessary for that reason for me to give them some idea of this plan or scheme (or whatever we might call it) that we believe shall be of very great benefit to this country, or, at least, to the horse-breeding interests of the country. Of course, we have come here for the purpose of getting some assistance from the Government. One object in so doing is this: It will be the means of establishing this scheme, from the fact that we need something to inspire confidence in the scheme, both for the seller and for the purchaser of horses in this country. Therefore, we trust the Government will look favourably upon our scheme. I will endeavour to give you an idea—or offer a few suggestions—as to what we deem would be the most effective means of accomplishing our end. We believe that there should be conducted throughout the Dominion, or for each province, in a regularly systematic manner so as to follow one another in a regular manner at proper seasons of the year, a series of sales. We believe that by having a series of sales that the expense of advertising a series would be but little greater than the expense of advertising one. That is, by having a series of sales one could follow the other, and that would be an attraction; one would really help the other. Those sales combined would be of sufficiently large proportions that we believe it will attract the people whom we want to buy our horses, viz., foreigners. We cannot sell to our own people, because our own people are over-stocked. We want foreign money to buy our horses, and we believe that by the Government assisting in this way, placing such information with regard to our horses, where the sales would be conducted, &c., as they might see fit, this end would be accomplished. Of course, as I said at the outset, we need the confidence of those interested. When our printed lists, publications and catalogues, &c., are published to the world, the assistance of the Government will be a guarantee that these arrangements are to be carried on properly and justly, so that the buyer and seller can be brought together, and the producer will get for his horse what he should get. The seller will get the best price that can be obtained. He is the one who will get the profit, because he is the

producer. There are other matters, of course, that the other members of the delegation spoke upon this morning. I would be pleased to hear them state their views again to this conference.

MR. CARPENTER.—I had supposed and hoped that the gentlemen who came down from the west to interview the Minister of Agriculture in respect to this matter would have prepared some feasible scheme to lay before the meeting to-night. I find that they haven't done so, and after thinking over what transpired to day I jotted down a short resolution, not one I expect for a moment this meeting will adopt, but one which, at the same time, may give rise to a discussion that will result in something that will be satisfactory. Mr. Chairman, I beg leave to move, seconded by Dr. Roome:—

“That a Horse Breeders' Association for the Dominion be established, and that a series of fairs for the sale of horses be held, at such places and at such times as may hereafter be decided upon. And that persons who have horses for sale be required to furnish the secretary of the said association with a full and complete description of the animals offered, at least two months before said sale is to take place, so that the horses may be carefully catalogued or registered and the information so obtained printed and distributed for the use of intending purchasers.

“That the Dominion Government be asked to sanction and assist said undertaking, by printing said catalogues and allowing them to be distributed through the mails as parliamentary matter, and further sanction and promote said movement by ordering their distribution through the Canadian High Commissioner's office in Great Britain, the object of the movement being to a great extent to attract the attention of intending purchasers in the old country, by placing in their hands a full and complete description of the animals and when and at what points in the Dominion they may be purchased; and we would further suggest that the dates for holding said fairs be so arranged, one following the other at intervals of not more than three or four days, so that purchasers could take in the whole circuit of fairs in the shortest possible period of time.”

Now, Mr. Chairman, the suggestion that was made this afternoon to the Minister of Agriculture was this: That it was advisable that the Government should make a purchase of horses and take them to the old country, for the purpose of establishing the fact that sales could be made there which would be of advantage to us here. I decidedly disapprove of anything of that kind, because it is not right that the Government should place themselves in that position. Something, I think, could be arranged on the lines we have mapped out that would be of advantage. The matter is largely in the hands of the breeders themselves. If they take hold of the matter, and the Government will assist them in the way of printing, as proposed, an association can be established and a series of fairs held and information collected which will be of advantage to all concerned.

DR. ROOME.—Mr. Chairman, in seconding the resolution which has been placed in your hands, I must say that I fully agree with the remarks made by Mr. Carpenter that such a system as is mapped out in the resolution just read might be applicable towards assisting the farmers and breeders in disposing of their surplus stock of horses now on hand, and educating them in the future as to the class to breed for profit. I also agree with the mover of the resolution that it would be unwise on the part of the Government to attempt to buy up horses and ship them to the Old Country, as suggested by some one this morning, for the purpose of establishing a market for our common horses. There is now a good market for stylish carriage and saddle horses. I was informed some time ago by some gentlemen who were engaged in shipping horses to England that it was almost useless to ship our inferior or common horses to that market. Although bought cheap here, they could not be sold there at a profit after paying expenses, as it cost as much, excepting insurance, to send a poor horse as a good one, owing to improved mode of conveyance—that is, by steam and electricity. The ordinary horse, as bred in Canada at the present time, is not likely ever to be in demand again as formerly, so that it behooves every farmer or breeder to apply themselves in raising a more marketable class. And I believe

by establishing a system of annual or semi-annual sales under the auspices of an organized association favoured by the Government, which would give it prominence as being *bona fide*, and thereby induce buyers from all parts of the country and also from foreign countries to attend, causing an active competition to purchase, and by the system of registration as mentioned in the resolution, buyers at other times than at the day of sale would know where to go to purchase such horses as they might require, saving the expense of driving several days looking them up, which would enable them to pay a better price for the animal, thus dividing his profit with the breeder. But there is one thing I would suggest to these gentlemen present, that if an association is formed, to be sure and avoid bogus sales, that is, to allow parties to enter and at time of sale to bid them in if prices don't range to suit them. It destroys the interest of the buyers and breaks up the competition. I presume you have all noticed this at horse sales. No doubt, if an association is formed, rules and regulations will be framed governing these matters. I attended a breeders' sale a year or so ago in Lexington, Kentucky, when colts and horses brought from \$300 to \$5,000. Every one that was brought into the ring was sold without reserve, as no owner was allowed to bid or have any one to bid for him. The system of registration and advertising, as mentioned in the resolution, and holding annual or semi-annual sales at different places, would serve as an object lesson to breeders, which would have more effect than talking or writing on the subject, as, by attending these sales, they would notice the class of horses that brought the best prices, which would induce them to breed in that direction. Last spring, when the demand for horses seemed very small, any of you who attended the annual sale at London or Toronto must have observed that stylish horses met with a ready sale at a good price, like every other commodity. The establishing of such an association is worthy of a trial, and should receive some Government aid, as any assistance to the farmers and stock-raisers of Canada is a move in the right direction. We cannot ignore the fact that Canada has a large surplus of horses on hand, and the great problem is to know what to do with them. The electric car is taking the place of the horse car. The American horse ranches are supplying more than their people require; in fact, they are beginning to intrude on our home market, and it is a question whether we should not increase our protection against them, saving our home market in Manitoba and the North-west for our older provinces. Farmers, as the resolution is now before you, I trust you will all discuss the matter freely, so that we may come to a conclusion as to what will be the best steps to take, and what is best to be done, in the interest of the farmers and breeders.

DR. SPROULE.—There would be no upset prices at all?

DR. ROOME.—No.

MR. MUNN then addressed the Committee, at the request of the chairman, as follows:—I would just like to say that that resolution meets with our approval, and one of our objects in coming here was to ask that the Government assist us in that way. It would be of great advantage to this association if farmers entering their horses were not allowed to put a price on them, but have them entered to be sold in the same manner as those entered in the United States. Unless they do that they will never make a success of those sales. Buyers will never come to a sale where there has been an upset price on the horses. Buyers go there with the object of paying every dollar an animal is worth, and from these sales we come to know the actual value of the horses. Now, it was my idea about the trial shipments spoken of. I claim that there has never been a shipment of horses of that particular class I spoke of. We have no trouble in getting rid of the class of horses that Mr. Hodgins shipped, that he paid \$150 for. We can sell them at any time. It is the class of horses that we have on hand at the present time it is necessary to dispose of at some price. At present we have no price. In reality there must be some market for those horses, and one of the objects of the association is to get rid of them, though we want to get the prices they are actually worth. We cannot ship them to Manitoba or the United States, but we claim we can ship horses bought at \$85 and \$90 at some price. That horse is worth something; get rid of

him; and the people understanding that these are the sales, come here and find out the class of horse that is most readily sold, and they will freely come into line and raise the class of horse that is wanted. If we are going to assist those men who have horses now, we are going to assist the farmers. Take every farmer in western Ontario: I calculate he has from five to six horses on an average for every farmer in the country. We want to get some market for that class of horses. We cannot afford to shoot them, or make sausages of them, or anything of that kind. We must get rid of them in some way. The object of the association is to do this. In support of the resolution, I say that is one of the objects for which we came here. While we would like, if possible, that the Government would make a trial shipment of that class of horses, we shall be glad for the assistance mentioned in the resolution.

DR. SPROULE.—It seems to me that the resolution is in the right direction and that it might be the solution of what we are aiming at. At the outset, I heartily agree with Dr. Roome and Mr. Carpenter, that it would be unwise for the Government to attempt to go into the commerce of horse flesh. I don't think it would be a success. There is another question in my mind, after hearing the suggestions of some of the gentlemen present. It strikes me it is a great question whether it would be wise or unwise to force the present class of horses we have upon the English market, because it makes for us a bad reputation and destroys our future operations in that line, that perhaps we would have if we shipped a more suitable class of horses. Now, we had organized associations here a few years ago, and they are in operation to-day. One is the Dairymen's Association, which I think is upon somewhat the same lines that we might organize this association and make it a success, but it would be on this line: That at the outset there would be a Central Horse Breeders' Association. Whether you call it a Horse Breeders' Association, the association would handle the advertising and bring about the sale of horses. Let there be an association formed, and ask the Government to put at the disposal of that association so many thousand dollars for the purpose of paying a secretary and one or two other hands in connection with the association, and paying for printing and advertising, and then have the free distribution of this matter through the mail, as suggested by Mr. Carpenter. After we formed the Dairymen's Association we found it satisfactory and that it worked admirably. The first year \$5,000 was granted, and this money was paid out as required, for advertising, for paying a secretary and for doing other work which had to be paid for. Another matter: I think there were certain delegates from different parts of the country, whose travelling expenses were paid while attending the meetings of the association. This might be done also in the case of this association. The object was to organize the Dairymen's Association, which became a school of instruction in a measure, in addition to having an association, the object of which was to find a market for the products of the country. The Government, at any rate, decided to buy up butter and put it in the English market: but there is a difference between butter and horses. If we purchased horses we might buy a class unsuitable for the market, and destroy the reputation of the country. If anything is evolved from this meeting it will be something on these lines: That a central association will be formed, the duty of which is perhaps to get the information and get the horses catalogued and properly described, and have them handed in early, and make these sales imperative sales, without any upset price or any reserved bid. Let the horses be sold. If you have a central association—situated wherever you like, at Ottawa or at Toronto—you could have branch associations in the different provinces, some of which are hardly yet in a position to go into the business on as extensive a scale as the Province of Ontario. The branch association could get up these catalogues and have them all printed by the central association. Then they are, comparatively speaking, under the supervision of the Government. The Government sets apart an amount of money at the disposal of the central association to pay the expenses, and whatever other incidental expenses that might be incurred from time to time, such as men travelling over the country doing certain lines of work that must be done to make it a success. We have not, as yet, an association formed. When we have done so, we might announce to the

Government that we have formed an association, and ask the Government to put a sum in the Estimates for the purpose of carrying on the operations of the association. We think that can be done, and if done in that way it appears to me that it might be made a grand success. It is true that at first we might not realize our greatest expectations, but we will find a great benefit from it as from the Dairymen's and Cheese-makers' Association, and other associations in connection with the agriculture of the country. The agricultural societies are supplemented from the provincial treasury, but this necessarily would be something wider than the provinces. There is no doubt that in the future this association would extend to Quebec and the Maritime Provinces, and afterwards it can go into the wild and woolly west, where they have not at present sufficient horses for themselves, but will have after a while.

MR. MUNN.—What we want is that Dominion association formed. These views just expressed are exactly what we want.

MR. CARPENTER.—My object in bringing this matter before the association in the resolution was to have it intelligently discussed.

MR. MUNN.—In giving a grant, I think the Government should make it compulsory that men entering their horses should enter them for sale, without putting any qualification of value on them. What is the use of the Government giving a grant unless they do that.

MR. INGRAM.—The association will see about that.

DR. ROOME.—If we are to stimulate the market for horses in Canada the Government must increase the duty on horses. The step I think we should take is to put the duty up to \$30 per head, the same as the people of the United States do with us. We find they are crowding our market out. The American ranchers are now crowding their horses on us. I think we ought to take steps right away to ask the Government to put on a duty of \$30 per head.

MR. CARPENTER.—Mr. Davis, of Alberta, tells me a large number of horses are being brought in from the other side of the line.

MR. HUGHES.—The duty was paid on 2,900 horses; and as many as that came in without paying.

MR. DAVIS.—Of course, I have been talking ever since I came down here to Mr. Foster that we must have an increase in the duty on horses. We certainly should not legislate here for the benefit of Montana, Idaho or Washington Territory. As I said, over 3,000 horses came into British Columbia, the North-west Territories and Manitoba last year paying duty. These horses are entered, as a general rule, for about \$30, and 20 per cent on that is a very small amount, and I can assure you they are crowding our horse market out altogether. They do not bring in as good a class of horses as we can raise ourselves, and once getting them into the country they are bound to sell them, and they put them down at the lowest figure, selling all the way from \$50 to \$150, and they only pay a duty on \$30, as per invoices. The inspection fee would make it about \$6.50. My proposition to Mr. Foster was that we should have a specific duty on all horses to the value of \$100 of \$30, and after that let them pay 30 per cent. I think \$30 would make it prohibitory on all horses under \$100. I think my friend Senator Perley will agree with me on that. He sees bands and bands of horses coming right from Montana.

HON. MR. PERLEY.—Two hundred at a lick.

MR. DAVIS.—The American ranchers have been in the business so much that they have the advantage in that way. They raise them certainly cheaper than we can at the present time.

SENATOR PERLEY.—The man who buys these American horses is the man who is injured.

MR. HUGHES.—During Mr. Bennett's campaign I met a gentleman who had lived in the western States for a number of years. He said that one man could attend to several hundreds of these horses—three or four hundred—and they did not cost any more than from \$15 to \$18 apiece. He said that these horses had been sold in the Canadian North-west. They simply ride across the line and sell them to the farmers of the North-west. That is one object I had in bringing out

the price of horses in the United States, and showing that the market in the United States was down and that we needed to protect ourselves in Canada. Another point was this: It was referred to by Mr. Ingram to-day; and I remember, two or three years ago, when he was in the Local Legislature, he took action on the same lines—and horsemen all over the country endorsed it, and this association, when formed, can look into it—to have the provincial license law amended, allowing municipalities to license stallions, the same as they license auctioneers; at the present time, they said, there is no possible chance for a man who imports a thoroughbred horse as against a plug animal. These Canadian plugs serve mares at from \$5 to \$7 each. If there was a license of \$50 or \$60, it would soon clean out the plugs and give the better horses a chance. The opinion of the horsemen throughout the country is that they are going out of the Clydesdale and going in for roadsters and saddle horses. However, if an association of this kind was formed, I am satisfied it would do a great deal of good.

MR. SMITH (Ontario).—I think the object of this meeting is a good one, and one that should commend itself to all; but I must confess that I see so many difficulties looming up to horsemen—and I think I know them—that I think the difficulties would rather increase than otherwise. Now, I have heard a great deal about the idea of licensing stallions, but it is the old story. It has never been put into operation, for the reason, simply, that how could you tell where to stop? Where can you place the limit? The point is, that many an animal is registered that is a very poor one. I don't know where you are going to draw the line. The pedigree may be a good one and the animal a bad one; and, on the other hand, you may have a fine animal and the pedigree a bad one. I don't think it can be done. I cannot help thinking that the Ontario farmers should be alive to their own interest, enough to feel that it does not pay to use a scrub. I want to say that a good many Clydesdale men are going out of them. There was never a greater mistake made. They forget the fact that horses are not raised the same as lambs and pigs. It takes four or five years to raise a horse, and when there will be a market they won't have them for sale. They ought to look somewhat to the future. They have so many breeds of horses that while a Dominion Horse Breeders' Association might be capital and sound,—well, my impression is, that the "sale" idea can never be practically worked out. Nobody could be better pleased than I am to see it tried, but I doubt very much if you can get the Government to take that same view the gentlemen have expressed here to-night.

DR. SPROULE.—If we unite we can get them to do it.

MR. SMITH.—The men in the different breeds are going to strive for the mastery. There is no question about that. Horsemen are so strong on their particular points that they will strive for the mastery. Here this would be especially so. I would not like to throw any cold water upon the scheme. There are difficulties I see looming up, and I cannot see any hope of making a success of having sales at different points. Private individuals are taking that in their own hands. We could not compete with Grand. We would have to take a back seat with the show he is going to have here in a few days. The idea of having a Dominion Horse Fair that competes with the hand of private enterprise would never do. The idea of the Government making a trial shipment I think is outside the question. There is no question in the world but there is a good market in the Old Country for a good class of horses. There is no use in trying to send over there poor and infirm animals. They would be no credit to the country, and they would bring back no money to the speculator. If we move, let us move cautiously.

DR. SPROULE.—It does not seem to me there would be the slightest effect upon the fanciers of the different breeds of horses. Suppose a man has a hackney or a saddle horse, he is interested in a description and pedigree. It is all collected and put in a catalogue. Men coming from afar expect to find different classes of horses there. There is no reason why there should be any dispute or trouble between men holding different kinds of horses. It is not the breed of horses we might get; it is the information that a certain class of horses are suitable for certain markets. There

would be no trouble at all between the men who fancied the different breeds of horses. It would be only for the purpose of advertising and selling that the association would be formed.

MR. INGRAM.—With respect to the licensing of horses: three years ago I received several letters about the matter. I spoke to Mr. Drury, the then Provincial Minister of Agriculture, and he said he had received a number of letters to the same effect, and the only hope he had of carrying out the wishes of those who wrote them would be to give power to each county to license their horses, as that was fair; but just how to bring about that he did not know, but he thought that in the course of a few years it would right itself. With reference to the registration, it is a very important thing, and it is as Dr. Sproule has said. If I had five or ten horses to sell I would send in a description to the person who kept the register, and if an intending purchaser examined the register and found that A, B or C kept a certain class of horses, all he would have to do, if he did not wish to wait for the sale, would be to go to the persons themselves, and he could purchase the horses he wanted, without travelling around the country after them. That would be a great saving, and it would be money in the pocket of the producer or breeder.

MR. CARPENTER.—I cannot understand how there could be any conflict between the different classes of horses as suggested. I have four or five horses. I send in a description to the secretary of the association, giving the number of horses I have, their age, their colour, their size, and the breed of the horses. This information is published. It is sent broadcast over the land. Intending purchasers in the old country have simply to look at that catalogue and find out that we have for sale certain classes of horses. These horses may be at Hamilton, St. Thomas, Brantford, London, Toronto, or at other points throughout the country. I cannot understand how a conflict is to arrive in any way.

MR. MUNN.—The association we represent does not wish to interfere with any body interested now in the business. I understand that Mr. Grand, instead of having horses consigned to him to sell, that the parties interested with him go out into the country and buy these horses themselves and make use of him to sell them. However, we do not think we would interfere with this enterprise at all. He would have the same privilege of buying at these sales, and I think it would be to his benefit to have his agent attend these sales and buy his horses. He would be able to buy them much cheaper than running around the country after them.

MR. CARPENTER.—He would be a large purchaser at these sales, too.

MR. MUNN.—There is no one but expects to get large prices. They would be satisfied to enter their horses in a sale that had Government patronage.

MR. ROGERS.—The registration would be of great value, I think, in an institution of that kind. In the obscurity of our institution in a small way, I may say, I have made inquiries to the extent of 56 horses. For example, parties have written me, asking me if I have upon my books (we have no books now of descriptions; we imagine we should have) a team of this particular kind, or a saddler, or coacher, or something of that kind. They sum up to the extent of fifty-six just in a few weeks, and very few have heard of us. Still, these letters came from New York and England, asking for teams of a certain description, saying that the price is not an object. "Have you upon your books a team of a certain description that we want?"

SENATOR PERLEY.—I am not so much interested directly as the members who come from Ontario, because at the present time we are not producing any horses for sale; we are importers, and there is no doubt if there was a chance to buy a horse, as suggested by Mr. Carpenter and the other gentlemen who have spoken, it would be of great advantage to our men out west who have come down to Ontario hunting for horses by the car-load. I would also highly approve of the idea of putting on an extra duty; I am strongly in favour of that. It is a step in the right direction. In our country it is a plague. I am known in this district where I live as being an out-and-out opponent of the broncho horse. My standard buying price of them is two dollars. They are a curse to the country; they are of no use. A man goes on the prairie with them, and he finds them a great nuisance.

I would like to see the duty increased, in the interests of the country. As regards the enterprise, I favour it, and I think the Government might be asked to give you a grant in support of it. There is no doubt that if the association is formed it will be on the lines of my friend's suggestion. Buyers can consult this catalogue proposed and have a chance of going to where the horses are and inspecting them before the sale. The man will have the price fixed in his mind and he will give it. I think this is a step in the right direction. I had no knowledge of it until to-day, and I certainly agree, after what I have heard from these gentlemen who belong to the Horse Breeders' Association in Ontario, with the principles that you are about to adopt. I should think the Government could not in any better way serve the great interests of this country, not only in Ontario, but Canada—because Ontario is the largest province, and the largest will have the largest number of horses. I think it is proper and right that you should take the initiatory steps in this matter, and I am sure it would extend to the Maritime Provinces and Prince Edward Island, and in the near future we would take advantage of it in the North-west Territories. At present we are importing a very large number of mares there. I have thought that you must be perfectly deluged with poor, miserable animals in Ontario, because every man who goes out takes good mares. These mares are brought there with a view of breeding them, and of course we will be, after a little while longer, importing horses from Ontario, but in the near future we will be producing our own horses. I anticipate we will have a home market by immigration coming into the country, and the farmers' sons of Ontario are taking advantage of their fathers' looking out farms for them in that country. In the near future we will produce enough for ourselves. People are debarred from breeding horses there just now, from the fact that horses are so high and so many are imported. They are buying these bronchos. I fancy this difficulty will be over when we are producing our own horses, and after a time will supply the demand in our country. Of course, you won't be able to send more horses into the North-west Territories in the near future than you have done in the past four or five years. Therefore, it is more highly desirable that you should adopt some system that will attract foreign buyers. I concur in the resolution, and I also advise your going to the Government asking for liberal aid. I will attend with you in my humble capacity. There is no way they can spend money to better advantage than giving you a liberal grant for this purpose.

MR. HENDERSON.—I have been much interested in this discussion, and have been much pleased that this meeting was held. I think it very desirable that some action should be taken. It appears to me that there will be difficulty for some time in getting rid of the horses that we have now, which do not appear to be saleable in the English market, and possibly they will have to go to a dead loss. I suggest this, that I think has not been brought up. It is desirable, I think, that the people of this country should know thoroughly what kind of horses are wanted in the English market, not only as to the particular kind, but the number that will be required there from year to year and the prices that would be likely to be paid for them, as well as the cost of taking the horses there and the best means of effecting the sale. A year or two ago, from the old country tenant farmers came out and went to the North-west and spied out the land, and the old country had confidence in what these men reported about that country. After that they paid little attention to what we in this country said about our country, and if we were to send some expert men to the old country to thoroughly investigate that matter and find out all about the horses there, the cost of sending them there, it would be money well spent, and I think a portion of the grant the Government has been asked to give should be given for that purpose. I believe it would have a very beneficial effect. It would give confidence to our own people here. Their report would be widely circulated, so that the farmers of this country could go to work, without even waiting for the system of licensing stallions, but with the information thus obtained they would know exactly the best kind of horses to raise, and they would be more likely to produce the class of horses for which they will find a market. I hope the movement will not be dropped, but that it will go on and prosper.

MR. PRIDHAM.—I haven't any experience in the horse business, but I have had considerable experience in the cattle business, and have exported cattle, and the kind of cattle that pays the price. I have no particular suggestions to offer.

MR. HUGHES.—A suggestion has just occurred to my mind in connection with these horse sales that you spoke of. I might give the experience in our county in cattle sales, which are possibly similar. Mr. George Laidlaw, well known during his lifetime, a number of years ago established cattle sales. He would arrange from any number, two, three and four thousand cattle, and sell them off during the fall seasons. This movement, commenced by Mr. Laidlaw, we now find has extended. We find in the sales of cattle a number of farmers in a school section club together and put their cattle in at a particular place and advertise the sales a month or two in advance, and this last fall or other falls was very successful. I attended a number of them, and the prices would range from 3, 3½ to 4 cents per pound. The bidding was brisk. Some of those sales were credit and some of it was spot cash. If the same thing was carried out in relation to horses, and notice of the sales given, as suggested by the resolution, so that buyers from a distance may come there, I am satisfied that it would pay. Mr. Grand is very anxious to find out wherever there are good horses, and he is ready at any time, as other buyers in Toronto are, to come down to any district, within reasonable reach, to inspect horses. Take the case of Mr. Gage, the book publisher, of Toronto. He wanted a particular kind of horse, and he went down into our county and spent a day or two looking around to get a suitable horse for driving in Toronto. I presume there are hundreds of gentlemen in Toronto in the same position as he is. Mr. George Gooderham, jr., of Toronto, is always anxious to find out where there is a good horse and he is always ready to buy it. Many of us are in the same position. We have a gentleman in Victoria who deals extensively, Mr. F. Bassano. He has very large stables, but his animals are not of the class that pay. They are chiefly of the ordinary class. However, he is going to deal in the more valuable class. I just throw out the suggestion about cattle sales, and hope something like it may be followed in relation to horse sales.

THE CHAIRMAN.—I think it would be well to bring the meeting to a close. We have spent a very profitable hour here in discussing this question, if for no other reason than it has reminded us of a grievance with which the country is suffering at the present time. I would suggest that you form yourselves, some half-dozen in number, into a committee, and wait upon the Government to insist that those views as expressed by Mr. Davis be carried out, and prevent the wholesale importation into the country of these American horses. I was reminded of this fact, for the simple reason that I know that car-loads of horses have been brought from Oregon into our country and sold at Richmond Hill. This man brings in two or three car-loads of Oregon horses, which come into competition with our own noble animals. I would suggest that Mr. Smith, Mr. Davies, Dr. Sproule, and three or four others, form the deputation to wait upon the Government.

The resolution was adopted unanimously, and a deputation was appointed to wait upon the Government in regard to the proposed increase in the duty on horses.

COMMITTEE ROOM 46, HOUSE OF COMMONS,
FRIDAY, 1st April, 1892.

The Select Standing Committee on Agriculture and Colonization met at 10.30 a.m. to-day, Dr. Sproule, chairman, presiding.

MR. W. SAUNDERS, Director Dominion Experimental Farms, called, addressed the Committee, as follows:—

Gentlemen of the Committee on Agriculture, of the House of Commons:—The chairman has very correctly referred to the fact that I have had very short notice. I must beg you to excuse me in case my statement is presented with less regularity and continuity than you expect. I shall be happy, in case anything is omitted on

DOMINION EXPERIMENTAL FARMS.

the present occasion, to attend to any call the Committee may choose to make on me. It affords me a great deal of pleasure, I assure you, to be with you and to have the opportunity of explaining the nature of the work which has been carried on at the Experimental Farms during the past year. The full particulars of the experimental work it would be quite impossible for me to go into on an occasion of this sort, as time would not permit, but they are all contained in the Experimental Farm report, which is now in the printers' hands, and which, I trust, will be issued very shortly. I may, however, venture to give you a few particulars in addition to what may be contained in that report, and I may also venture to draw to some extent upon the information it contains.

DEPARTMENTS OF EXPERIMENTAL FARM WORK.

As it has generally been your rule to call the different officers of the Experimental Farms before you, so as to present the various departments of the work in detail, I shall not refer to these special branches, except in a very general way. The Dairy Commissioner of the Dominion, Professor Robertson, who also acts as Agriculturist of the Farm, will give you the full particulars regarding the dairy work and experiments with stock, also the experiments with corn and the silo. I have taken charge of the experiments with grain and roots and other general agricultural work, so as to enable the Agriculturist to devote most of his time to the important duties which devolve on him in his efforts to advance the dairy interests of this country. You will no doubt have before you also the Chemist, the Horticulturist and the Entomologist and Botanist. All these departments have been progressing very satisfactorily under the superintendence of the officers who have had charge of them, and I believe it will be found, when you read the reports of their work which will appear in the report now in press, that you will agree with me that satisfactory progress is being made, and that the work is of that practical nature which will be valuable to the working farmer.

SEED GRAIN DISTRIBUTION.

I wish first to call your attention to the question of seed distribution. That is one of the features in connection with the work of the Experimental Farms which is increasing in importance every year, and which is attracting a great deal of attention from the farmers throughout the Dominion. It is a very easy matter to say to farmers: "You must use only such varieties of grain on your land as are fertile and prolific," but nine-tenths of them are unable to procure those varieties. They do not know how to set to work to get them. Hence, the Experimental Farms are doing good missionary work in keeping the farmers well advised as to the best sorts to be had, and providing and forwarding samples to farmers who desire to test them, as far as the supply at command will permit. That work is being continued. The number of samples sent last season was 11,230. The number distributed for this year up to this morning is 8,950. That is over thirteen tons of grain that have gone out in this form, and these samples have only been sent in response to direct requisitions, either from the farmers themselves or from the members who have taken a sufficient interest in the matter to send in the names of such farmers in their constituencies as they knew would be anxious to test those promising sorts of grain.

SEED DISTRIBUTION TO PROVINCES.

The samples thus far have been distributed as follows:—Ontario, 2,301; Quebec, 3,716; New Brunswick, 64; Prince Edward Island, 161; Nova Scotia, 532; British Columbia, 527; Manitoba, 571; and the North-west Territories, 778. We also have on hand, I suppose, some six or seven hundred applications which have not yet been filled, for the reason that they have come in faster than we could overtake the work. But we hope to be able to get them all off in good season for seeding. The samples are forwarded first to those districts where the season is very early, and those where the season is later

afterwards, taking care that the samples shall go out as nearly as possible in the order in which the applications are received. Some complaints have come to us from parties in different parts of the Dominion who have not received prompt answers to their communications in regard to grain, &c.

CORRESPONDENCE.

We had supposed that the shipment of the grain itself in reply to a request would be regarded as a sufficient answer, but many of our correspondents are more exacting. They want an answer that their letter has been received, and a statement of what is going to be sent to them. We are receiving at present from 125 to 150 letters per day, and with the comparatively small staff available, one for French letters and the other for English letters, we are not always able to keep up with the work, but we do our best to get all letters promptly answered.

With that large number of letters coming every day, with many other duties devolving upon me, correspondence will sometimes accumulate, and it is very difficult to keep everything up to the mark in that respect. If an unlimited sum of money could be had, we could put on an additional force at this time and get every letter answered within twenty-four hours; but, as that extra work would only be required for a limited time each year—say for two or three months—it is not very easy to arrange a special service for that short time. Therefore, if you gentlemen are sometimes favoured with letters from people who think they are neglected, I hope you will kindly tell them not to be impatient. Printed forms of letters in French and English have lately been provided, with a view to lessening the labour connected with this correspondence, and to enable us to get over it more promptly. Many persons imagine that almost every product which a farmer can desire is being distributed from the Experimental Farm. Letters are frequently received containing a full page list of things that are wanted, and wanted immediately. To such we endeavour to explain what the object of the distribution of seed from the farms is—that it is to improve the seed grain of the country, and that it is not the intention of the Government nor the desire of the House that the Experimental Farms should interfere with the ordinary business of the nurserymen or seedsmen, but that we should limit our work of distribution mainly to those seeds that are not easily obtainable—new varieties which are likely to be beneficial to the farmers.

REPORTS FROM RECIPIENTS OF SEED GRAIN.

With regard to the effect that this distribution of seed grain is having on the country, I have been much gratified by the reports which have been received, showing how these samples can be utilized and become of value to the farmers. In a letter received a few days since the writer said: "Your sample of three pounds of wheat, sent me last year, I have made to do duty for five acres this year. I took particular pains last season and sowed the sample of seed by hand, so as to make it cover a large area, and I had a sufficient crop from that sowing to seed five acres now." I notice that one of the varieties of oats distributed, namely, the Prize Cluster, has already become one of the sorts generally available. You can now buy them from the seedsmen. Those who received three-pound samples three or four years ago have now a sufficient quantity for their own use, and a surplus for sale. That variety can now be relegated to the seed dealers of the country to manage, and we can devote our attention to other and newer sorts.

PROFITABLE RESULTS.

The question is sometimes asked: What value is there in this work, and how is the country going to be repaid for the money that is being spent in connection with it? I may say that the samples of oats which have been distributed have weighed from six to eight pounds over the standard weight of 34 pounds. The average yield of oats in Ontario does not, as a rule, range above the standard. In some counties they run a pound or more over, and in others about as much under, but in ordinary seasons 34 pounds is a fair average. The seed we have been

distributing has weighed from 40 to 42 pounds. If we can by this distribution of heavier varieties increase the weight of the oat crop in Ontario alone by one pound per bushel, which is not a large increase to look for, it would make a difference in the value of last year's crop in this province of over \$700,000.

And if we can add to the crop 2 lbs. in weight throughout the Dominion the gain would be over two million dollars annually. I have good hopes that by introducing these varieties which are heavy, and also fertile and prolific in character, we shall not only be able to add to the weight, but also to the yield, so that the increase in return to the farmer will be very considerable.

By Mr. LaRivière :

Q. What about the other provinces?—A. I mention Ontario first, for the reason that it is the only province yet from which we have any full statistics of crops.

Q. Are there not some from Manitoba, too? A. Yes, but the returns from Manitoba are not quite so complete.

Q. There used to be regular returns. A. Yes; there used to be, and I hope there will be soon again, as it is an important thing to the farmers of that province to have such information.

COMPARATIVE RESULTS FROM DIFFERENT PERIODS OF SEEDING.

About a year ago, in Bulletin No. 8, I drew the attention of the farming community to the fact that a very serious loss in crops may result from delaying the period of seeding, and gave the results of a series of experiments at the Central Experimental Farm, where the grain was sown on uniform land in plots of $\frac{1}{10}$ acre each, side by side, a week apart, for a period of 6 weeks, and that each plot was separately harvested, and the yield from each plot ascertained. I showed that the yield was a decreasing one each successive week in the series, and that the crop from the latest sowing was of that character that it did not yield one half of the amount of that sown early. Similar tests have been made during the past year. The results have not yet been published, and I would like to submit to you a few figures in regard to the yield of the oats, and also of the barley and wheat.

Taking the oats first, the varieties that were tried last year were the Prize Cluster, and the Early Racehorse. They are both short oats. This year we substituted the Banner for the Early Racehorse, giving one of the long oats of good variety for milling and one short, less valuable for milling, but very useful to the farmer for feed. The result of the yield from the first sowing was 59 bushels of Prize Cluster, and 76 bushels of Banner. From the second sowing 84 bushels of Prize Cluster, and 79 bushels of Banner. This seemed to be reversing the order of the results of last year, but it may be explained in this way. On the $\frac{1}{10}$ th acre plot of Prize Cluster, when the grain was up about three inches it was exposed to a very heavy storm, and the sand blew over it, cutting the tender blades. This permanently injured the crop, so that, for the sake of comparison, that first week ought scarcely to be taken into consideration. Taking, however, the second, third, fourth, fifth and sixth weeks, the results are as follows:—Prize Cluster, 84 bushels, 54, 33, 53, and 40. The difference noted in plot four is accounted for in this way: about harvest time we had very bad weather, and in consequence of a hail storm a very large quantity of grain was beaten out and left on the ground, and could not be collected. Leaving out this plot, the yields are 84, 54, 53, and 40 bushels. In the Banner, in the same way, the yields run 79, 86, 87, 78, and 55. The Banner does not show the same lessening of yield for the first three weeks, and for this we can give no explanation.

The barley began with 65 bushels, 55, 50, 51, 40, and 27 bushels.

The returns for the wheat were:—White Chaff, 47, 32, 27, 29, 28, 19 bushels. For White Connell, 35, 26, 30, 43, 23, and 27 bushels. You will notice that these yields are very much in excess of the yields we had last year. That is partly to be accounted for by the fact that we had a much more favourable season than

in 1890, and also for the reason that this land had received in the meantime a coating of manure of from 18 to 20 tons to the acre, which, of course, helped the crop very materially.

By Mr. McMillan (Huron) :

Q. Were these small plots?—A. They were $\frac{1}{10}$ acre plots. Taking the returns of the years 1890 and 1891 together, and averaging them, and leaving out of consideration the first week's oat crops, which were so badly injured by the storm I have referred to, the results are as follows:—In the varieties of wheat the decrease in quantity of yield from the first to the second week is 27 per cent; to the second week, 30 per cent; to the third week, 43 per cent; to the fourth, 45 per cent; and to the fifth week, 52 per cent.

Taking the averages of the two years and putting them together, we find the loss on barley in the same manner is:—First week, 13 per cent; 2nd week, 26 per cent; third week, 36 per cent; fourth week, 51 per cent; and fifth week, 52 per cent, exactly the same as the wheat on the fifth plot in the percentage of loss.

In regard to oats, leaving the first week out of consideration altogether, the figures are: for the second week, 12 per cent, third week 24 per cent, fourth week 26 per cent, and the fifth 43 per cent, showing that even with the oat crop the late sowing cannot be practised without much loss.

INCREASE IN VALUE OF CROPS.

The value of the spring wheat crop during the past year in Ontario alone, taking it] at 85 cents a bushel, amounts to \$9,104,000, the barley at 45 cents a bushel represents \$7,263,000, and the oats at 30 cents a bushel \$22,500,000. Putting these three together we get nearly \$39,000,000. The percentages of loss, between the first and second, or first and third sowings, represent such large sums that the importance of early seeding cannot be too strongly urged.

OATS—VARIETIES OF, TESTED.

We will now return to the subject of oats, from which I have digressed a little, so as to bring the importance of early sowing to the attention of the Committee. The fertility of the different varieties is very largely influenced by the nature of the soil and the character of the seed. We have found that oats will yield, under the same conditions, from 40 or 50 bushels up to 80 or 85 bushels, showing that there is something in variety well worthy of the consideration of every farmer. Among oats, the Banner and the Prize Cluster have headed the list on the Experimental Farm. Both of these varieties on our best plots have yielded over 80 bushels to the acre. They also show similar fertility on the branch experimental farms, and reports from persons to whom have been distributed samples give similar results. For the introduction of the Prize Cluster, the country is indebted to the Experimental Farm. The Banner was introduced by the seedsmen, but we have helped to disseminate it, and I think it will be found that these two varieties will, when in general cultivation, add largely to the yield of this crop. The Banner is not a heavy variety, but the Prize Cluster is both a large yielder and a heavy oat. There is another point in connection with oats which is deserving of consideration, and that is the thickness of the hull. We find this is influenced very much by the district in which it is grown. There is no doubt that oats are influenced in this particular both by climate and by soil. We have had some careful experiments made on this point by my assistant in experimental work, Mr. Wm. Macoun, by removing the hulls and weighing the kernels, and it has been found that oats vary very much in this respect. For instance, Prize Cluster grown on the Central Experimental Farm showed 27 per cent of hull. The same oat in Alberta showed 32 per cent; in Prince Edward Island, 31 per cent. In the case of the Bonanza, grown in Ontario, one of the samples indicated 30 per cent, another 28 per cent; in Nova Scotia, 23 per cent; in British Columbia, 28 per cent; and in another part of British Columbia, 31 per cent. The Banner varies in the same way—29, 27, 27, and 26 per cent. Taking the whole

series tested thus far, the average is about 29 per cent of hull. We hope to continue these experiments and to test other varieties as soon as time will permit. My attention was called some time ago to a variety of oats advertised in England, known as the Royal Doncaster, which was said to have a very thin hull. A sample was obtained which was carefully examined, and it was found that the proportion of hull was only 21.67, a difference of 7.71 per cent less than the average of all the tests of other varieties thus far made. Whether this oat will retain that thinness of hull in this country we have yet to determine. It will be an interesting point to ascertain whether by cross fertilizing with that variety on our other oats we can obtain cross-bred sorts better suited to the climate and soil of Canada and with a less average of hull than our oats now have. These points we hope to investigate. A few bushels of the Royal Doncaster oats have been obtained to test on the experimental farms, and a few samples have been sent to different parts of the country. It is hoped that the introduction of this thin-skinned oat may eventually be a great gain to the country. If we should eventually succeed in securing this thinness of hull in the general crop of oats grown in this country, it would make a difference of about half a million dollars a year in the value of the oat crop of Ontario alone, and nearly a million dollars a year for the whole Dominion.

When the oat crop is a heavy one a large quantity is used by the oatmeal millers. They prefer long oats. The Royal Doncaster, Prize Cluster, and Bonanza, and several other useful sorts, are short, although heavy in weight. The milling industry is well worthy of being considered, and in order to aid in meeting the requirements of the millers a good deal of attention has been given to long varieties. One of the most promising of these is the Holstein Prolific. Another long oat which the millers think very favourably of is the Banner. These two varieties should, I think, be commended to farmers generally, and especially to those who grow oats for the millers. The Flying Scotchman is another oat which we have had good results from, and which has been distributed to a considerable extent this year.

Among the newer things in oats brought out last year for testing at the Experimental Farm there were several new sorts from France, from the well known seed establishment of Vilmorin & Cendrieux, of Paris. Some of these were very stiff in the straw and not likely to lodge. One of these was the Giant Cluster, a very promising sort, which gave a crop of 62 bushels 33 pounds per acre. Another was the Joannette, which is highly spoken of by the Ontario College of Agriculture, at Guelph, as being one of the best oats grown there. We imported these oats, at the outset of our work, from Germany, and cultivated them for two years, and they made such a poor showing that we discarded the variety as useless for this country. Seeing that the Ontario College had found it so prolific, it was thought best to try it again. The result was, that we got a very heavy crop and are sowing a larger plot of it this season. We also imported the Improved Ligowo. That is a very promising sort, which gave 55 bushels 10 pounds per acre. These three varieties are the most promising among these newer introductions.

TESTS OF VARIETIES OF BARLEYS.

We will now pass to the consideration of the subject of barley, and will first refer to the two-rowed sorts. You are all aware of the action taken by the Government three years ago in importing 10,000 bushels of the Prize Prolific barley from the firm of Carter & Co., of London, England. You will also, no doubt, remember that in the last annual report of the Experimental Farms it was stated that 50 quarters of this barley—that is, 400 English bushels—had been sent to England for the purpose of being thoroughly tested as to its value for brewing. A part of the barley of which the shipment was composed was grown on the Experimental Farm at Ottawa, but we had not enough to spare for this purpose, and four or five lots of barley were bought in as many different districts in Ontario to make up the quantity required. The barley was all brought to the Experimental Farm, thoroughly mixed and put through a cleaner and sizer, which separated a large proportion of the

broken kernels, which are so much objected to by English maltsters. By this means also the smaller and lighter grain was separated and the quality of the sample brought up to a very fair standard. When this barley was prepared for export it weighed from 52 to 52½ pounds per bushel. It was forwarded to England, where it was thoroughly tested.

A report has been received from the brewer who brewed the barley, which reads as follows:—

“The following report has been received by the High Commissioner for Canada, through Mr. A. T. Dale, respecting the brewing of a portion of the fifty quarters of malt, prepared from two-rowed barley, recently sent to Mr. J. Flinn, of Bishop's Stortford, by the Dominion Minister of Agriculture. The report is signed by Mr. Arthur O. Stopes, of Colchester:—

“In compliance with your request, I have pleasure in stating to you my opinion of the sample of malt sent me on 23rd May last, which I understand was made exclusively from Canadian barley sent you by the Dominion Government.

“From careful examination of this malt, and from information furnished me by brewers well acquainted with the use of Canadian malt in the Dominion, and also from suggestions made by the well-known brewery expert, Mr. Frank Faulkner, I felt justified in using this malt exclusively, without any mixture of other malts. I therefore proved its brewing qualities entirely upon its own merits, and, to test it as severely as possible, I brewed pale ale from it, although I fear that the colour is a little higher than I generally get from malt made from English or European barleys.

“The brewing worked easily, and I liked the handling of the goods in tun and the way they spent, indicating from the initial stages the true quality of the malt. Each successive stage followed in proper sequence in exceedingly good form; the fermentation was practically perfect, and the condition of the beer at racking was exceedingly good. The final attenuation also was just as I wished, and, as a consequence, I think the brewing operations were those well adapted to the malt, and it must have been of good quality to have given such satisfactory results at every stage.

“The stability I have proved to be exceeding good, indicating soundness of material.

“The extract was equivalent to 87 lbs. per quarter; and, coupling all the preceding facts with the judgment I formed of the malt, irrespective of its use, I assay its value 35s. to 36s. per quarter.”

That assay was accepted by the brewer as its value, and the barley has been paid for on that basis. The report then continues, thus:—

“I may say that had I wished to obtain a greater extract, so as to attain the maximum amount possible, I could readily have increased it, but I deemed it, under the circumstances, preferable to secure quality rather than quantity.

“The beer after racking has remained entirely satisfactory, and the very numerous people who have tasted it have been almost without exception of opinion that it is exceedingly good.

“Should you wish to have fuller and more complete notes of a more technical class, either as to the nature of the water employed in the brewing and of the malt itself, I shall be happy to place them at your disposal. I assume the above report is sufficient for your present purposes, and I have much pleasure in testifying, as a practical brewer, to the value that good malt of this class would prove to the brewers who understood its use.”

I have several copies of this report with me, which I shall be glad to give to any one desiring them. This, I think, clearly shows that if a uniform and well graded sample of two-rowed barley, weighing not less than 52 pounds, be sent to the English market, it will command a good price there. Such a price as that named—35 to 36 shillings—would return a very good figure to the Canadian farmer.

By Mr. Gordon :

Q. What was the selling price of English barley in the same market at that time?—A. It would vary from 35 to 42, and even 45 shillings. The finer varieties would occasionally touch 45 shillings, but that is an exceptional figure. Forty shillings is considered a very good price for the best malting sorts.

By Mr. McGregor :

Q. What would that bring us here?—A. I know that the buyers who bought this year, and who paid from eight to twelve cents a bushel more for the two-rowed barley than they were paying for the six-rowed, calculated that if they could get 33 shillings for their barley in England it would pay them well. That will give you some indication as to the price such barley should bring here. The difficulty in this subject is in getting at the cost of handling the crop and getting it to the English market. I find that the estimate made in my bulletin on this subject, published in the spring of 1890, was under the mark. I estimated the cost then at eighteen cents per bushel; but I find that most shippers estimate it at about twenty-five cents. In regard to the results of the shipments of two-rowed barley this year to the English market, the larger portion of them have been disappointing to the shippers. They have not received in the English market that price which they expected to get. Samples were sent to the Minister of Agriculture from Montreal, of the earlier shipments, and we found that they were a mixture of different qualities of poor and good, heavy and light, discoloured and bright, with more or less pease and occasional grains of wheat mixed through them. These were all mixed together and shipped over in that way. The English brewer will not handle barley of that character, because when he puts it on the malting floor the thin and light kernels will not malt evenly with the plumper grain, even if they are of the same variety. In the preliminary soaking the water will penetrate the thin kernel very much sooner than the thick one. The English brewer wants barley to be graded evenly, and if we are ever going to make our barley command what it is worth in the English market, we must have it prepared in such a way as to meet the requirements of the English maltster. There is no reason why this should not be done on a large scale, the same as we did it on a small scale. I see no reason for discouragement in the fact that this mixture which I have referred to has not brought to the shippers a profit, but in many cases a loss.

By Mr. Cochrane :

Q. What do you mean by a mixture?—A. The mixture of barley of such different qualities.

Q. You do not mean of the six-rowed and the two-rowed?—A. No, although it is said there has been a good deal of this sort of mixing; but I have no proof of it. While it has been an easy matter to find during this last season a large quantity of barley in Ontario that would average 52 pounds, it has been also easy to find, in less favourable localities for barley growing, considerable quantities that would not go more than 49 or 50 pounds per bushel. If these are mixed together, the farmer who grows the better sample is the loser, because the buyer will generally give only the price of the lower grade when they are thus mixed. There are two of the buyers, Mr. McKay, of Toronto, and Mr. Phee, of Montreal, who report that their shipments of two-rowed have given them satisfactory returns. Thomson & Co., of Montreal, and W. D. Mathews & Co., of Toronto, have been probably the largest shippers. In conversation with Mr. Mathews a few days ago, he said the result would not be satisfactory to the large shippers, but he did not consider that it was the fault of the barley. It was mainly due to the way the grain had been handled.

There is every reason to believe that with reasonable care on the part of the farmers in cleaning their barley properly, and on the part of shippers in grading the different qualities that they receive, separately, and shipping them separately—selling the poor barley at home and sending only the good abroad—two-rowed barley in

Canada can be made a profitable business, at least for those Ontario farmers residing in these districts where six-rowed barley has so long been grown with good results. It is not to be expected that two-rowed barley, which requires good soil and a suitable climate to bring it to perfection, can be grown everywhere in Canada, but wherever six-rowed barley can be grown of the best quality, there two-rowed barley can be grown equally well; and if we may judge from past experience, it will yield a larger number of bushels to the acre on the average and give a greater profit. Even if a portion of the barley has to be used for feeding purposes, it is an advantage to the farmer to grow the two-rowed sort.

By Mr. Davin :

Q. Does the two-rowed barley succeed in the North-west?—A. Yes, very well. The finest sample I have received this year was from one of Sir John Lister Kaye's farms, weighing 56 or 57 pounds. I had a bushel sent to me as a sample. It was grown further west than the Balgonie farm—on one of those farms near Medicine Hat. With regard to the varieties of two-rowed barley, it seems to be a matter of little consequence to the buyer whether he gets the Prize Prolific, or Kinver, of the Chevalier type, or the Duckbill or Goldthorpe, although these are quite different in character. (Here Professor Saunders illustrated the relative positions of the heads during growth of these two types of barley, showing that there was a considerably greater strain on the straw of one sort than the other.) Now, we find that in many places the Prize Prolific and Kinver has lodged, as have also other barleys of that Chevalier class. I do not think the Prize Prolific is any stronger or any weaker than most of the other sorts of that type, but the Duckbill and Goldthorpe stand up very much better, and I think it will be found, when we come to test the matter thoroughly, that these two varieties will suit our farmers better than any of those of the Chevalier type. But we can only arrive at correct conclusions by careful experiment. When the Prize Prolific barley was ordered it was believed to be the most promising for our country. It has succeeded very well in many places, but wherever it has been found to be weak in the straw I have suggested that farmers should turn their attention to Goldthorpe or Duckbill.

By Mr. McNeill :

Q. Will these varieties bring as good prices in the English market? A. Yes, I believe they will. There was a little doubt about that at first, for the reason that while the first samples of Duckbill which were sent to England were said to be the finest of all the varieties, it did not stand the practical test to which it was subjected by the brewers, and was deficient in germinating power, and hence unfit for brewing. In correspondence with the judges who tested this barley, they say it was not due to the variety, but to the particular sample, which only germinated 67 per cent. The average is about 95, and on this account they condemned it as unfit for brewing; but the samples of the Duckbill barley sent last season to the Brewers' Exhibition in London were pronounced equal in quality and equally suitable for brewing with the Prize Prolific and other barleys of the Chevalier type. I think it can be fairly said that the crop of two-rowed barley in Ontario has, during the past season, been a very good one.

By Mr. Davin :

Q. Will you explain to us about the germinating of barley. How is it the brewer is interested in that?—A. You refer to the process of malting?

Q. Yes; the process of malting barley?—A. In malting, the brewer puts the barley first into a steeping vat with water, and when it is thoroughly soaked it is taken out and put on the malting floor until it sprouts, and during that process of growing the starch in the kernel is converted into glucose, which is a sort of sugar, and the barley becomes sweet to the taste. Germinating is required to go on until the sprout just protrudes through the husk, and when it gets to that stage the barley is taken off the malting floor and put into

the kiln, where it is dried, and further growth checked. You will see the necessity of the process of germination going on evenly, for if one part of the grain is a day or two behind, or a day or two in advance of the other, some will be too far advanced, or some not sufficiently sprouted. The brewer wants an even, uniform sample.

By Mr. McGregor :

Q. Broken barley will not germinate?—A. No. The broken barley moulds, and causes little patches of mould all through the grain which the brewers very much dislike. Our farmers thresh too closely, with the view of making the barley weigh heavy—so close that it breaks the kernels in halves. It is better to have barley a trifle lighter, and have it sound, than broken in that way.

By Mr. Cochrane :

Q. Have you ever heard any complaints in reference to that with the six-rowed barley? Is there any difference in the six-rowed and the two-rowed barley germinating unevenly where the samples are not uniform?—A. I don't think that the same objection will hold with regard to the six-rowed, for the reason that you rarely get very plump samples. Several years ago the six-rowed barley in Manitoba was remarkably plump, and some car-loads were sent down to breweries in Ontario, the grain in which weighed as much as 52 and 53 pounds. At that time some complaints were made of this barley that it did not germinate evenly; it was too much like the two-rowed. A very plump kernel will take from twelve to twenty-four hours longer in the steep than a light, thin grain.

By Mr. McMillan (Huron) :

Q. I understand that the germinating power of the first sample of Duckbill barley sent to England was low, only about 70 per cent?—A. Yes, that is correct, and we were unable to find out why it was. It was grown by Mr. Manderson, of Myrtle, Ont., and on inquiry he stated that he had spread it on the barn floor to bleach by sunlight, and it may be possible that the germ of the barley was injured in some way by the continued exposure to sunlight on the floor.

By Mr. Semple :

Q. There are three varieties which farmers sometimes mix—the six-rowed barley, the Mensury and the Russian. The farmers have been warned not to have them mixed, but they often do so, and then there is a loss.—A. The brewers will not buy the Mensury barley if they know it. In conversing with a farmer north of Toronto, some time since, he told me he always grew the Mensury barley. I told him it did not malt with the others, but he said: "That does not concern me. The brewers buy it, and they don't know the difference. There is not very much grown in our district, and I suppose they do not find it out." If that sort of spirit prevailed amongst the farmers, Canadian barley would soon go out of demand. Fortunately, this is an exceptional case.

By Mr. McNeill :

Q. Did you make sure that the price of barley sent over to England was from 35 to 36 shillings a quarter, and that the English brewers will not pay as high sometimes as 42 shillings a quarter? Do we grow any barley in Canada that will fetch that figure?—A. The highest estimate which has been placed on any of our barleys was on a sample from Medicine Hat, N.W.T., and it was valued at 40 shillings. It was a very bright sample and very heavy, weighing 56 pounds, and I suppose if the market had been high that would have fetched 42 shillings. Mr. Stopes, the English barley expert, who addressed the Committee last year, stated that the question of colour in the English market was not of much moment. Buyers who have been in England this year, however, differ from Mr. Stopes in that particular. They say that the question of colour is of as much moment in England as it is in the United

States, and that a bright sample will always go first, provided other conditions are equal. Our climate during the ripening period matures the grain much quicker than the English climate, and for that reason it is scarcely to be expected that we can grow barley quite equal to the best English. Besides, the English farmer takes a great deal of pains in preparing his land and cleaning his barley after it is threshed, and there are no broken kernels in his grain when it goes to market.

By Mr. Cochran :

Q. These are points not well understood. I am aware, from my own knowledge, that many farmers who raise barley have never considered the facts you mention. When a man had barley to sell he always got a better price if it was heavy and bright than if it was lighter?—A. The six-rowed barley is graded in the market Nos. 1, 2 and 3. These grades are in proportion to the weight and brightness of the barley. Sometimes brightness will count, even with a heavy sample; but as a rule, in Toronto, barley weighing 50 pounds to the bushel and over will grade No. 1. A discoloured sample would probably be thrown into No. 2. The weight is the usual test in this matter, and weight indicates size of kernel and plumpness.

By Mr. McNeill :

Do you know what sort of barley the Americans have been shipping to England lately?—A. I have not visited California, where most of the grain they send is grown, but I had last year a sample said to have come from that State, known as California Prolific. It was grown on our experimental farms, and after careful comparison we all believed it to be identical with the Duckbill.

By Mr. Smith (Ontario) :

Q. A great deal of the barley sent last year from Canada to the States was sent from there to England?—A. I am not at all conversant with that feature of the trade; I think about 300,000 bushels in all of the two-rowed barley and a larger quantity of the six-rowed. From what I have heard, I believe there will be a large acreage of the two-rowed barley grown this year, notwithstanding the fact that there is some uncertainty as to the price they will get for it. As it usually yields more, it is more profitable, even as feed. While I believe that our farmers would do well to grow the two-rowed variety, still I do not think we should give up the growing of six-rowed by any means. Some recent experiments in England seem to indicate that the six-rowed may after a time become much more acceptable to the English brewers than it has been in the past. I understand that several parties have been experimenting with it lately with satisfactory results.

By Mr. Taylor :

Q. In regard to Ontario barley going to the United States and then being exported to England, I am in a position to know something about that. I have purchased 50,000 bushels of six-rowed barley, which went to Oswego and was transhipped from there to England. I think we ought to take steps to induce the Government to have the returns made out, showing exactly the country to which the barley is going. The same thing, I believe, applies to all the barley sent from Napanee, Kingston, Picton, and other places along the line of the Grand Trunk?—A. To command a good price and ready sale it is necessary that Canadian barley be properly graded, and it cannot be urged too strongly on our farmers that they should be careful in preparing their grain and keeping it from all mixture of several grades of barley, which will only bring discredit on an important product of the country. The varieties of barley of the Chevalier type which I desire to mention as those that have done the best among the two-rowed sorts are the Prize Prolific, the Kinver and the Saale.

By Mr. McNeill :

Q. Are the yields about the same of the Duckbill and the Chevalier barley?—
A. If you take a field of Chevalier barley that has not been lodged, it will compare

favourably with the Duckbill; but where it has been lodged, the grain will be lighter and the yield less. Taking the country all over, I think the Goldthorpe or the Duckbill will probably do better than any of the Chevalier barleys. Of the six-rowed barleys, which ought by no means to be neglected, there are two new varieties, "Rennie's Improved" and "Baxter's Six-rowed," which have given the best yield of any of the six-rowed sorts. They are shorter in kernel than the ordinary six-rowed, and are plump and heavy.

PREFERABLE WHEATS, AND CULTIVATION OF.

Leaving the barleys now, and taking up the subject of wheats, there are several varieties, one or two in particular, which seem to be of considerable promise. One of these is Campbell's White Chaff, of which I have a sample here, which I will pass around for you to see. That is a variety which we have been disseminating from the Experimental Farm for several years past. The originator of this wheat, Mr. Campbell, of Nottawa, Ontario, sent us a small bag of it four years ago, when it was tested on a small scale and found to be very promising. A quantity was afterwards bought from him and tested on a large scale at the experimental farms and among the farmers of Canada generally, and it has given good satisfaction, and it is now so well distributed that I think there is every reason to expect that it will soon become one of the leading varieties of the country. I have a sample here to which I want to call your attention. This is the Campbell's White Chaff, which has been grown two years at Red Deer, in the North-west Territories. This has become practically a hard wheat, while that grown in Ontario is a soft wheat.

I desire to say a few words upon an important point in reference to the cultivation of wheat in the North-west and in Manitoba. Most of the farmers there have the idea that if a soft wheat when grown in the North-west gets hard, it is then equal to the Red Fife. This is not so. The hardening that a soft wheat undergoes in that climate, while altering its appearance and improving its quality, does not give it that rich glutenous character which makes strong flour. Wheat buyers complain loudly that much of the Manitoba and North-west wheat sold as No. 1 hard consists largely of soft varieties, hardened by cultivation there, and which are not nearly equal in value to Red Fife. They are willing to pay a considerably higher price per bushel if they can get the Red Fife. But when the No. 1 hard is found to contain, in a large proportion, White Russian, Golden Drop, and other varieties which have become hard by cultivation in that climate, they are not prepared to continue to pay the difference in price that they are paying now, because it is worth very little more to them than the soft wheats of Ontario, as such wheat does not make the strong flour that they want. This difficulty has arisen from the desire of the farmers to obtain wheats which will ripen earlier than the Red Fife. In some of the more northern districts the Red Fife seldom matures without more or less injury from frost, which much depreciates its value, and to avoid this, farmers are bound to have earlier varieties, if such are to be had, and if they cannot get good sorts they will try poor ones. I have had a large number of applications this year for samples of White Russian wheat and Campbell's White Chaff, to test in the Canadian North-west, but have refused to send them, for the reason that they were not fit for the country, and that if they were generally introduced they would lower the value of the North-west wheat. You will notice in the sample of Campbell's White Chaff, which I have referred to, from Red Deer, that the change is a very marked one, from a soft to a hard wheat; but when you come to chew that wheat, or submit it to any other test, you will find that it does not contain the large proportion of gluten necessary to make strong flour.

There is an important point which the people in the North-west should thoroughly understand. One reason why I have endeavoured to introduce Ladoga wheat is because I believe it contains a larger proportion of gluten, and that it will make a stronger flour than any other variety we cultivate, excepting the Fife, and at the same time it ripens from a week to ten days earlier.

By Mr. LaRivière :

Q. What is your opinion about the test of the Ladoga lately made in Minnesota?—A. I do not think it was a fair test. An inferior sample of Ladoga was taken weighing 57 pounds to the bushel, and compared with a sample of Red Fife weighing 63 pounds. I do not know what process they put it through, whether it was ground in a roller mill or with stones. The quantity ground is said to have been 25 bushels, which the millers say is not enough to give it a fair test. Two years ago we had samples of flour made by grinding Ladoga and Red Fife which had been grown side by side. Bread was made from both, and the product submitted to this Committee for examination, and the only difference found in the character of the bread was a slightly darker yellow colour in the Ladoga.

By Mr. McNeill :

Q. It was stated that the Ladoga wheat was stronger than the Red Fife?—A. The chemical analysis showed a slight difference in favour of the Ladoga, but it was scarcely worth speaking of, and we have regarded them as about equal in this respect.

By Mr. Cochrane :

Has the climate made any difference in the appearance?—A. The colour of the grain seems to have brightened, and it may be possible that the flour will be lighter in colour. A car-load of this wheat is now on the way from Prince Albert to be tested by the Dominion Milling Company in Toronto. It was thought better to bring it to Ontario for test, as there seems to be a prejudice against the wheat among some of the millers there. It is not surprising that they want the Red Fife; it is probably the best wheat in the world; but there are some districts where the farmers have failed to ripen it, and they say they must have some other earlier ripening sort, even if it is somewhat inferior, as they do not want this disappointment year after year, if it is possible to avoid it. It is hoped that the test now about to be made will be thorough and satisfactory.

By Mr. Roome :

Q. Is the wheat hardening by cultivation?—A. It was hard from the first, and we have never seen any tendency to softness at all.

By Mr. Semple :

Q. Is the Ladoga wheat becoming any later since it was first introduced?—A. I cannot find that it is. It seems to maintain its character for earliness in every locality where it has been tested. Last year was a very unusual season, on account of the abundant rainfall, and crops grown on heavy clay were all late, no matter what variety. Under these conditions, there was always three or four days difference in ripening between Ladoga and Red Fife, and under ordinary conditions all over the country, the difference has averaged from a week to ten days. At Brandon, last year, there was a field partly cut on the 11th of August, which was long before the general harvest had begun. A field of Ladoga was growing alongside of a field of Red Fife, and the difference in colour could be seen a mile or two away. The Ladoga was ripe and the Red Fife comparatively green. On the experimental farms, the Red Fife has yielded the largest crop in our experimental plots, but in the Prince Albert district the yield of Ladoga has been in many instances quite equal to Red Fife, and in some places the Ladoga has exceeded the Red Fife in yield.

By Mr. McGregor :

Q. In Southern Manitoba, have they not complained that they have had considerable trouble with rust in the Ladoga wheat?—A. In Southern Manitoba I have advised all the farmers not to grow Ladoga, as they can usually ripen Red Fife

there. It is only in those districts where the necessity for an early variety has to be met that I have endeavoured to encourage the growing of at least a part of the crop of Ladoga. I do not think it is wise for any farmer to experiment too extensively with these new varieties. He ought to go slowly.

By Mr. Semple :

Q. Is it true that there has been a very large quantity of smut in the North-west wheat?—A. There has been a large quantity, but it has appeared in Red Fife as much as in any other variety. When I was in Virden last autumn I met two gentlemen who had large crops of Red Fife that would have graded "No. 1 hard," and they told me that they were unable to sell their wheat at any price on account of smut. They had not been believers in treating grain for smut; but they will treat their seed in future. It has been found that bluestone (sulphate of copper), applied to the grain before it is sown, is a preventive of this evil.

By Mr. McGregor :

Q. Talking of thin-skinned oats, do you think it would be good to sow them in the North-west, on account of frost?—A. That is a matter that must be settled by experiment. I do not, however, think that the skin is sufficiently thin to make much difference in that respect.

By Mr. McMillan (Huron) :

Q. With regard to barley that is apt to lodge in the Province of Ontario, do you think that the use of salt would affect it beneficially?—A. The use of salt would no doubt stiffen the straw and help the crop. In this particular, our experiments have not shown that decided difference on our land where salt has been used which would enable me to speak very positively on this point; but I know that the general experience of farmers has been in favour of the use of salt, and I am prepared to look upon our experiences as somewhat exceptional.

By Mr. Cochrane :

Q. There is one thing I would like to ask you if you have observed, that is, whether this two-rowed barley requires as much seed per acre as the six-rowed?—A. A bushel and a half has been sown in many instances, and the grain has done remarkably well, but as a rule we have sown two bushels. It is heavier in the kernel than the six-rowed, and hence there are not so many kernels in the bushel.

Q. Does it not stool more?—A. Yes; in some places where the season is short that is an objection to it, unless you sow very early and moderately thick. I think it is best to use two bushels to the acre. Some of the English seedsmen recommend a bushel and a half and a bushel and three pecks, but as a rule we sow two bushels.

By Mr. McNeill :

Q. Did late sowing affect the crop of the six-rowed as much as the two rowed?—A. It was influenced by late sowing much the same as the two-rowed.

By Mr. Hutchins :

Q. From what you know of the English market, has not the six-rowed come into favour there?—A. It has, to some extent. I have mentioned that the six-rowed has been used in an experimental way for malting, and the results so far are said to have been satisfactory; but it is very difficult to get maltsters in general to try it.

Q. Which variety would you advise the farmers to sow, in view of that?—A. It is a very difficult thing to give advice in the matter of barley growing just now, and I think that under present circumstances it is better perhaps for farmers to grow some of each.

Q. I have been told by exporters that the six-rowed has brought more than the two-rowed?—A. I think the six-rowed has given more satisfactory results to the shippers, for the reason that they bought it for from eight to twelve cents less per

bushel than the two-rowed. Wherever the two-rowed has been bought carefully, and kept from being mixed with inferior grades, the results have been satisfactory. One reason why the six-rowed has done better than usual in the English market this year is perhaps due to the prohibition of the shipment of barley from Russia. That has made barley for feed a little higher in price, and most of the six-rowed sent over from Canada has been sold for feeding purposes and for distilling. If it had to compete with low-priced Russian barley the buyers say they would not be able to pay more than 35 cents per bushel for it here. I think the best way is to give all the facts to the farming community, and allow each man to judge for himself. There are many other facts in connection with the work on the experimental farms which I shall be glad to place before you, should you think it desirable to call upon me again.

COMMITTEE ROOM 46, HOUSE OF COMMONS,

TUESDAY, 12th APRIL, 1892.

The Select Standing Committee on Agriculture and Colonization met this day at 11 a.m. Dr. Sproule, M.P., in the chair.

Mr. WM. SAUNDERS, Director of Experimental Farms, was recalled. He said:—
GENTLEMEN,—When last I had the honour of appearing before you, the time was occupied mainly in the discussion of the subjects of wheat, barley and oats. There was one point which I had been asked by a member of the Committee to speak on, but which there was not time then to refer to; that was, with reference to the efforts which are being made at the experimental farms to produce new varieties of grain by cross-fertilization.

EXPERIMENTS IN CROSS-FERTILIZATION OF CEREALS.

I have brought with me this morning three varieties of wheat which have been produced in this way, thinking that some of the members of the Committee would like to examine them. One of these is a cross of the Ladoga with the Red Fife, the Ladoga being used as the female and the Red Fife the male. This cross has produced a very fine sample of wheat, and the variety has been named "Abundance." Starting three years ago with the kernel, we have this year 32 lbs., weighing about 63 lbs. to the bushel, of what appears to be pure hard wheat. This is an encouraging result, for, as a rule, hard wheats degenerate in the climate of Ontario, and develop, more or less, soft kernels.

I have another sample here, a beardless variety, a cross between the Ladoga (female) and the White Fife (male). We have between 80 and 90 new varieties in all, but it will take 7 or 8 years before we shall be able to determine which are the best, and to produce a supply of any of these wheats sufficient for general distribution; but it is astonishing how rapidly stock can be produced by starting from a single kernel where the grain is taken good care of. By counting half an ounce of this new variety, "Abundance," and weighing the remainder, we find there are about 363,000 kernels as a result from one kernel planted 3 years ago. When we have got this far, we can by careful handling and thin sowing soon produce a very considerable quantity, which, after being tested on the other experimental farms will, if of sufficient promise, be distributed.

I have been asked to explain how this cross-fertilization is effected, and will endeavour to do so. An ear of wheat is taken soon after it has shot out from the stem, and examined. The outer coating of chaff is torn off altogether and the inner covering of chaff is pulled back, so as to expose the flower. Within this enclosure there is a soft and very delicately fringed organ, known as the pistil, the female organ of the flower, and surrounding this are three thread-like stamens, each crowned with an anther or small sac containing the fertilizing pollen. Where a cross is desired these stamens with their anthers are removed before the pollen is matured, and the pollen brought from matured flowers of the variety which is to

serve as the male and applied to the pistil, after which the part operated on is wrapped around with tissue paper. If a kernel results from this operation you have a cross, and the plant grown from that kernel will usually inherit more or less of the peculiarities and qualities of both parents. To be successful in such work requires delicate manipulation and some knowledge of the organs of the flower.

By Mr. Roome :

Q. Can you make a cross between a bearded and a beardless wheat?—A. In one of the samples I have shown to the Committee the female was strongly bearded and the male beardless, and the progeny is not bearded, showing the influence of the male in that particular. In regard to this question of beards, cross-bred varieties are very liable to sprout, and some kernels from beardless heads will sometimes produce bearded offspring; hence, you may have a variety heavily bearded this year, and from the seed of those bearded heads you will probably have a plant or two come up the next season beardless. It is necessary to select these sprouts from year to year for two or three years, and keep them separate, and after a time these several types will become fixed. When a cross is obtained in this way it creates so great a disturbance in the regular course of nature that the plant does not seem to be able to accommodate itself to the changed conditions for some time.

By Mr. McNeill :

Q. Is there any difference in the time of ripening in these crosses that you have referred to?—A. That is a point not easy to determine the first year, while the plants are being grown simply a foot apart. As a rule, there is not so marked a difference in date of ripening under these conditions as there is in field culture, where the plants have not the same opportunity for stooling; but we have noticed a difference of three or four days in the time of ripening in some of these new sorts. It is expected that this relative earliness will be more marked in field culture.

SELECT VARIETIES OF PEASE.

The subject of pease is one which I have not yet referred to. It is of considerable importance to the farming community, and we have been endeavouring to influence this crop favourably, by distributing among farmers, for seed, such varieties as are likely to be useful and prolific. The price obtained from the sale of the larger varieties of pease is considerably more than that resulting from the sale of the smaller sorts. When speaking with some of the large buyers in Toronto a few weeks ago, I found that there was a difference of from 21 to 24 cents per bushel between the value of the small pease and the large ones; the large sized sorts commanded that much more. On inquiring the reason for this, I was told that there was a considerable demand at a high price for the large pease for foreign shipment. In experimenting at the Central Farm this year, the Black Marrowfat, one of the large varieties, gave 39 bushels 21 lbs. per acre. The Mummy pea, another large sort, although not commanding quite as high a price by five or six cents as the Marrowfats, has yielded 39 bushels 13 lbs. These two varieties are now being distributed in limited quantities in those parts of the Dominion where large pease have not hitherto been much grown, and it is hoped that by this distribution, and by giving information to the farmers on this subject, to increase the relative proportion of these large pease, so that the returns for this crop may be larger. The mummy pea is a very promising variety for this country; it has succeeded very well over the greater part of the Dominion and produces large crops, and if an increase of 20 cents a bushel, or even 15, on a crop of that sort, can be got by introducing the larger sorts, it is a matter of very great importance to the farmers.

By Mr. Roome :

Q. Can pease be modified in the same way as wheat, by crossing the varieties?—A. Yes; but we have done very little in the cross-fertilizing of pease; that branch of work is carried on quite extensively by seed growers and experts interested in market gardening. Most of the new sorts are produced in that way.

SUGAR BEET CULTURE FOR STOCK FEEDING.

The question of the cultivation of sugar beets in the Dominion of Canada is one which has awakened a considerable degree of interest, and I desire to submit to the Committee the results obtained on the Experimental Farm with ten varieties of these roots which were tested last year. The highest yield was 39 tons and 1,640 lbs., and the lowest 18 tons and 80 lbs., showing that sugar beet-roots can be grown to produce large crops in this country. The analyses which have been made of them show that they contain a larger proportion of nutritious matter than any other sort of roots grown for stock; and apart from the question of making sugar from them, they promise to be a valuable crop for the farmer, and one which might be increased to advantage in those localities where the soil and climate are favourable to large returns.

By Mr. McNeill:

Q. Would you expect that they would in any district yield such heavy crops as do the mangolds or Swedes?—A. I should not expect that they would often equal the mangolds and Swedes in yield. I might say that in getting the large crops I have named the sugar beets have been grown in rows 18 inches wide, with the beets from 4 to 6 inches apart in the rows. Such crops as I have referred to could not be grown by cultivating these roots in the ordinary way $2\frac{1}{2}$ feet apart; and, in comparing the yield of those with other roots, this fact should be borne in mind.

TEST CULTURE OF VARIETIES OF MANGOLDS.

Experiments with mangolds have also been continued. A number of varieties have been tested, and the particulars of these tests will appear in the annual report which is now in the press. The heaviest yield of these roots last year was 32 tons 20 lbs. less than the heaviest yield of the sugar beets, and the lightest crop has weighed 20 tons 392 lbs. per acre. Many varieties of carrots have also been tested in a similar way. The heaviest yield in the carrots was obtained from the Guerande or Oxheart, and I think that this class of carrot, with the root short and thick, is likely to produce better results generally than some of the larger and longer sorts. These and the Short White have given us the best returns. Carrots of the Guerande type will bear close growing better than any of the old-fashioned sorts, and if crowded it does not stunt their growth; they simply crowd each other more or less out of the rows, forming a mass of closely-packed roots.

It seems that the question of variety in roots, judging from our experience, is a matter of very great importance. We have found some of the old varieties, such as the Long Red and the selected Alteringham, both of which are largely grown, fall far below some of the other varieties I have named in weight of crop. The Long Orange Belgian gave 14 tons 1626 lbs., not quite half as large a crop as that given by the Guerande.

By Mr. Cochrane:

Q. Do you find the quality to vary much in these varieties?—A. From analyses made of several of the leading sorts, there seems to be very little difference in their feeding value. They contain a little more nutriment than mangolds or turnips, but not so much more as one would have expected.

By Mr. McNeill:

Q. Have you experimented to see the effect of a little extra cultivation on these different classes of roots, because my experience is that with more cultivation you get a larger yield?—A. The cultivation these roots have had has been good. They have been kept clean, with the Planet Junior Cultivator where the rows were narrow, and, where they were 2 feet 6 inches wide, by horse cultivation, frequently the land being stirred in this way during the summer—probably every two or three weeks during the early part of their growth.

Q. I think it would be worth while experimenting to see what the effect of cultivating once a week would be. I saw a lot of roots prepared for the Colonial Indian Exhibition, and there was a considerable difference between those which had been cultivated most frequently and the others?—A. What we have aimed to do is to carry on such experiments as farmers can imitate. The cultivating of roots once a week, while it would no doubt be followed by good results, would, I fear, entail too much expense for labour. The treatment of the land is given in our report in connection with the history of each.

CULTURE OF CARROTS.

By Mr. O'Brien :

Q. What was the yield of the White Belgian carrot?—A. The yield of the White Belgian was 22 tons and 1,320 pounds in one instance and 27 tons 1,440 pounds in another.

By Mr. Tyrwhitt :

Q. How did the Vosges compare with the others?—A. The Improved Short White, one of the Vosges type, gave this year 26 tons and 506 pounds, which was less than the Guerande. Heretofore the Improved Short White has stood at the head of the list. The White Vosges has given from 19 tons 573 lbs. to 21 tons 368 lbs. Taking the average of the past three seasons, the Improved Short White has given the heaviest crops.

YIELDS FROM VARIETIES IN POTATO CULTURE.

With reference to potatoes, of which 111 named varieties have been tested, we have during the past season grown them in the same manner as in previous years—that is, side by side, in rows $2\frac{1}{2}$ feet apart. The treatment of the land was in all cases the same, and the details of its treatment will be given in the annual report. The largest yield was 534 bushels and 22 pounds to the acre. That was given by the Daisy, one of the newly-introduced varieties. The State of Maine, Charles Downing, Frame Early, Delaware, and Lee's Favourite, gave yields varying from 450 to 534 bushels to the acre. I do not wish to burden the Committee with a long list of names, but if there is any particular variety concerning which further information is desired I shall be happy to give it.

By Mr. McNeill :

Q. Is there any difference in the quality of the several varieties you have mentioned?—A. Those I have given are all of first quality. As a rule, we have found that the most productive varieties are usually of good quality.

By Mr. Semple :

Q. What was the yield of such old varieties as the Beauty of Hebron and the Early Rose? How did they compare with the new varieties?—A. The Beauty of Hebron gave 347 bushels and 48 pounds to the acre, and the Early Rose gave 315 bushels and 44 pounds; whereas the yield of the Daisy was 534 bushels 22 lbs.

By Mr. Roome :

Q. Is the Daisy as good for table use as the Beauty of Hebron?—A. I think it is quite as good.

By Mr. Dyer :

Q. What was the variety of beet from which you obtained the largest yield?—A. It was the Klein Wanzleben, which is also a rich sugar beet as to quality. The next in order to that was the Bulteau Desprez, a German variety. A small quantity of the seed of each of these better sorts is being imported, and we shall be able to send samples to quite a number of different points. If any member of this Com-

mittee would like to have samples sent to two or three farmers in their constituencies, if they will kindly give me the names I shall be glad to send them, so that they may be tested; and if they are not found profitable for sugar-making, they will, I am persuaded, be found valuable for stock-feeding.

By Mr. Fairbairn :

Q. Have you any of these Daisy potatoes for distribution or sale?—A. We have none for sale. I think our plot was 172 feet long and 2 or 3 rows wide; but we shall be glad to supply samples as far as the stock will permit. There are probably 300 to 400 pounds in all.

By Mr. Roome :

Q. Has that variety not been in use in western Ontario for the last two or three years?—A. I think last year was the first season that they were advertised; they can now be had from the seedsmen.

By Mr. Marshall :

Q. I think Mr. Pearce, of London, has them.—A. It was Mr. Pearce who supplied us with them last year.

By Mr. Semple :

Q. Did the rot affect the potatoes last year?—A. In the table which has been prepared for the report, information has been given as to the size of the plot, the date of sowing, the date of harvesting, the yield per acre, and the weight of diseased tubers in each plot. Rot has been present at the Farm in quite a large number of these varieties, but it has not been specially destructive.

By Mr. McMillan (Huron) :

Q. In growing potatoes, how do you manipulate the seed?—A. We usually cut the potatoes, and aim to have an average of two or three eyes in each piece. In some experiments tried two or three years ago in growing potatoes from single eyes, two eyes and three eyes, and whole potatoes, the best results were obtained where the potato was cut with two or three eyes. If you plant a whole potato there are usually too many stalks to give good results, and unless these are cut away they crowd each other, and the tubers are generally inferior in size and weight of crop. Where there are only two or three eyes, which give a corresponding number of stalks, the potatoes are usually larger and better from such plants.

By Mr. Watson :

Q. Do you sprout seed for early "raising"?—A. We have not yet tried that. We have tried planting potato peelings, and have had fair crops. We have also cut the sprouting eyes out and planted them in the ground. These do not always grow, but when they have grown the crop has been very fair, but not so good as when pieces of the potato with two or three eyes have been used.

Q. The crop would depend much on the thickness of the peeling?—A. No; not altogether. I have been surprised at the yield sometimes obtained even when the peeling was thin.

By Mr. McMillan (Huron) :

Q. Do you pay any attention to the time of day you plant in hot, dry weather?—A. No; I do not think we have. We have tried the experiment of leaving potatoes exposed in the drills for ten or twelve hours on a hot day before covering them, and that treatment did not produce any marked difference in the crop, but it was rather less than where they were covered up promptly.

By Mr. McNeill :

Q. Do you find it is important to have good-sized seed?—A. We have found that a medium-sized potato is better for seed than a very large one or a very small one. The best average results have been obtained from cut potatoes, with two or three eyes in each piece.

Q. In selecting seed, do you select small or large potatoes?—A. If you cut your seed from small potatoes, the potatoes will usually be smaller than if cut from large potatoes. I think that is one reason why potatoes have deteriorated in many districts. The farmers have usually cut up their small potatoes for seed. I have observed that in Prince Edward Island, where the medium-sized potatoes are the marketable ones and the large ones are kept for seed, for the reason that they are not so saleable, that the potatoes appear to hold out and maintain their fertility much longer than in any other part of the Dominion. I do not know of any other way of accounting for it, than that practice of selecting the larger potatoes for seed.

FOREST TREE DISTRIBUTION AND CULTURE.

With your permission, Mr. Chairman and gentlemen, I shall now ask your attention for a few moments to the subject of forest tree distribution, which we have been carrying on in connection with our work in the North-west. As most of you are aware, there is a great longing on the part of settlers in those districts to have something in the way of a tree or a shrub growing about their homes, and when, on instruction of the Minister of Agriculture, it was announced three years ago that a limited distribution of forest trees would be made in Manitoba and the North-west Territories, and that applicants would be supplied in the order in which they applied, I was quite surprised to receive within four or five weeks 2,500 applications from settlers all over that country. Provision had been made that season for sending out one thousand packages, thinking that would be ample for all the demand likely to arrive; and we were obliged to disappoint more than one-half of the applicants, for the reason that our stock was not sufficient.

Last year we sent out 1,983 packages of forest trees, supplying all those who had been disappointed the year before, and about 200 packages of forest trees mixed with some small fruits, which it was thought desirable to test in different districts to ascertain their hardiness. Thus, 2,183 packages were distributed to that number of settlers in different parts of the North-west.

By Mr. McMillan (Huron) :

Q. Were they all sent from the Central Farm?—A. Yes; but there was some additional distribution from the Brandon and Indian Head farms. The staff at the other farms is not sufficient to permit of keeping the same accurate records as we do here, and I have not the returns yet of the number of packages they have sent out. I think there were about two hundred packages sent out from Brandon and nearly as many from Indian Head.

Q. Is there any difference between the growth of trees raised in the North-west and those sent from Ontario and planted?—A. If the seed from which the trees are raised has been grown in Manitoba or the North-west the trees will be very much hardier than if grown from seed collected in the north-western States or in Ontario or Quebec. There are very few European trees which will succeed unless they have shelter to protect them from the winds and storms.

TREE SEEDING.

A large distribution of tree seeds has also been made from the Central Farm. For several years past we had used our best endeavour to obtain tree seeds from the valleys in the North-west, with the view of distributing them over those districts where there were no trees growing naturally. A year ago last summer, in travel-

ling through the country, I found tree seeds very abundant everywhere, and through the energetic action of our superintendents at Indian Head and Brandon we succeeded in collecting about three tons of tree seeds, and these have been distributed among settlers all over the North-west country. Some 4,053 packages were sent out from the Central Experimental Farm, and almost every farmer who has received those seeds has now a nice plantation of young trees in beds or along the margins of their garden plots or about their houses.

These will soon be large enough to be transplanted to form shelter belts on the farms and ornamental plantations around the houses.

By Mr. Watson :

Q. What were the varieties?—A. These tree seeds were chiefly Manitoba maple, green ash and oak. That was a very good year for oak seeds, but Manitoba maple formed the largest part of the distribution.

By Mr. McGregor :

Q. Poplars are largely used for shelter?—A. Yes, native poplars are used to some extent, but they do not form a very desirable shelter. This year we have distributed cuttings of some of the Russian poplars which have been grown at the Central Farm.

By Mr. Watson :

Q. Are they better than the white poplar?—A. Yes, they make stouter and more thrifty-growing trees, with larger foliage than the native poplars, and the wood is of better quality. We are preparing to send out one thousand bundles of these this spring to people who have applied for them. In the course of five or six years these new plantations of trees will begin to produce seed, and in a few years we may expect to see the plains become dotted all over with plantations, as a result of the efforts now being made.

WORK ON THE BRANCH EXPERIMENTAL FARMS.

The work at the Nappan Farm, in Nova Scotia, is progressing very satisfactorily. Two or three different breeds of dairy cattle have been under test there, to ascertain their value as milk-producers, and also to furnish service in the district for the farmers who need it, so that their grade cows may be improved by crossing with the pure-bred animals. A number of instructive tests have also been carried on there with oats and barley. The crop of oats during the past season has been quite phenomenal at this experimental farm. Many of the varieties yielded over 100 bushels to the acre, showing that the season there has been very favourable. The results which are being published in connection with the Superintendent's report will, I am sure, be read with much interest by all those who are engaged in farming occupations in that province.

At the Experimental Farm in Brandon a large number of tests have again been made with cereals. All the new varieties have been tried by varying the quantity of seed per acre, and the fluctuations and variations in the crops as between summer fallowing and spring and fall ploughing have been carefully noted. In fact, all classes of experiments that were likely to interest the farmers there, in regard to the best methods of preparing the ground and the best methods of sowing, have been practised on different plots, and the results recorded in the report which is shortly to appear.

By Mr. Watson :

Q. Which do you find is the best, the press drill or the broadcast seeder?—A. I am afraid that I cannot answer that question with any certainty. Mr. Bedford's report will shortly be out, and that will give the information. Under my instructions, Mr. Bedford has recently given all these particulars to the leading agricultural

papers in the North-west. They are already out, so that the farmers may have all the information which it is important they should have before the time for seeding arrives.

One of the lines of work carried on at both of the North-west farms has been the growing of mixed varieties of grain and cutting them green for hay. The subject of winter feed for stock was one that promised a few years ago to be very difficult to solve. In the early days of the settlement of the country there was any quantity of native hay to be had for the cattle, and farmers could go out to the unoccupied lands and cut the hay and dry it for the winter. But as the settlement became more dense, and more land was taken up, and the number of cattle increased, it was found to become more difficult every year to obtain winter feed for stock, and some farmers have had to haul their hay 30 or 40 miles to get the feed necessary to tide them over the winter. By cutting oats and tares green at Brandon, five tons of cured hay were obtained, and it was found to be quite as nutritious as any meadow hay, and thus a practical solution of the difficulty of winter feed has been obtained. Other mixtures have been tried, of different proportions of oats, barley, pease, tares, wheat and rye, with much success.

By Mr. McMillan (Huron):

Q. Was the land newly broken on which you grew these oats and tares?—A. Most of the experiments made at Brandon were on land newly broken, but at Indian Head the land has been broken for some years. This mixed grain can be sown after the ordinary seeding is over; the mixture can be cut before the harvest begins, and the land so treated is cleaned from volunteer grain as thoroughly as if it were summer fallowed.

Q. Is there not a danger in sowing tares that they will get into the grain?—A. No, because they are cut green—before any of the seed ripens.

By Mr. Semple:

Q. Have you tried Hungarian grass?—A. Yes, but it is not so hardy, and does not produce to the same extent as these mixtures.

By Mr. McNeill:

Q. In what proportion are the oats and tares mixed?—A. Generally speaking, about three bushels are sown to the acre, mixed about half and half, or two of oats to one of tares. The report will give all the particulars. It was cut when the oats were coming into milk, and about the time when the first green pods were formed on the tares.

By Mr. Armstrong:

Q. Do you consider such grain as that is the best that can be sown for producing nourishment?—A. As a rule, it may be stated that all such plants when the seed reaches the milk stage are in the most suitable condition to serve as food for animals. By that time they have taken from the soil and air nearly all the constituents that they need for building up their structure, and the nutriment is very evenly distributed. After that period is reached, the process of ripening is mainly a transfer of the nutritious stores laid up in the leaves and stalks to the maturing grain. In curing any material for hay, it will be found that the nutritious matter of the plant is more evenly distributed if cut when the grain is green than if the fodder is left to a later period.

CUTTING TIMOTHY HAY.

By Mr. McNeill:

Q. Should timothy be cut while in blossom, or after the seed is formed?—A. I think the best time to cut timothy is as soon as possible after the first blossoming period is over.

Q. Does the seed then begin to form?—A. The seed is beginning to form then. The heads of timothy begin to blossom at the top, and gradually form flowers down the stem towards the other end. It is this method of gradual flowering down the stalk or head of the grass that makes people think there is a first and second blossoming period. The blossoms themselves only, endure a few hours, when they are blown away and succeeded by others lower down.

SMUT IN WHEAT—REMEDY FOR.

I desire to say a few words in regard to the question of smut, which is a very important one at the present time in the North-west, and this disease is extending also to some parts of the eastern provinces. We have suffered from this cause in some varieties at the Experimental Farm this year. The bunt smut, which is so injurious, causes the kernel to swell and turn black, but it remains on the head, and it goes with the other grain into the threshing machines. There the smutty heads are broken and the smut is distributed through the grain, giving it an unpleasant odour, and when smut is thus present the flour obtained from the wheat is so much injured that millers do not like to buy smutty wheat at any price.

By Mr. McMillan (Huron) :

Q. Is it the same variety of smut as affects the oats that enters wheat?—A. It is claimed by botanists that the varieties are different, although they act much alike. Mr. McKay, our Superintendent at Indian Head, has carried on some experiments, which show in a very striking manner the importance of treating smutty seed with bluestone in order to destroy the smut germs. He selected some very smutty grain for sowing and used part of it without treatment. The crop gave fully 50 per cent of smutty heads; that is to say, one half of the heads of the crop were smutty. When the grain was treated with a solution of bluestone in the proportion of 1 lb. of bluestone to 10 bushels of grain the proportion of smut was reduced to 15 per cent. A stronger solution applied in the proportion of 1 lb. of bluestone to 5 bushels of grain reduced the smut to 1 per cent. These several plots were all grown side by side on similar soil, and the results which have been published in the North-west papers have been much commented on. The subject of treating grain is also important for districts east, because if we get smut very bad in the eastern provinces it will need similar care and treatment of the seed to subdue it.

By Mr. Watson :

Q. Is there not a danger of killing the grain by applying a strong solution?—A. There is some danger of lessening its vitality and germinating power. We find it reduces it sometimes 10 or 12 per cent if very strong solutions are used.

Q. What quantity should be applied?—A. Ordinarily 1 lb. of bluestone dissolved in a pail of water would sprinkle 10 bushels of grain. There are farmers using it thus, and I think that quantity and strength would be sufficient.

By Mr. McGregor :

Q. Would you ever sprinkle it?—A. The common method in the North-west is to spread the grain in a waggon-box or on a barn floor, and dissolve a pound of sulphate of copper or bluestone in a pail of water, and sprinkle the grain, and turn it over with a shovel until it is thoroughly mixed, when every kernel gets moistened; if allowed to stand over until the next day, it becomes dry enough for sowing.

By Mr. Fairbairn :

Q. Did you ever try drying the seed with lime?—A. Yes, adding air-slacked lime will dry it very much quicker, and this is practised by a good many people, but it is a little more troublesome to work.

By Mr. Cochran :

Q. Did you ever test any mixed with lime in that way?—A. Yes, and the results were published in Bulletin No. 3 of the Central Experimental Farm.

By Mr. McGregor :

Q. Have you made any tests with salt?—A. Yes, we have made tests with salt, also with hot water last year, and we came to the conclusion that on the whole there was nothing so cheap or so easily handled as bluestone.

By Mr. McMillan (Huron) :

Q. Have you tried coal oil?—A. No, we have not tried coal oil.

Q. I have seen smut arrested where coal oil was tried?—A. It does not appear that there is much to be gained by further experiments, when you have a substance so cheap and so good for this disease as bluestone is. It does not cost the farmer more than from half a cent to a cent a bushel, and he cannot very well get anything that would be cheaper than that.

WORK ON THE AGASSIZ BRANCH FARM.

Gratifying progress has also been made at the Experimental Farm at Agassiz, B.C. There, many varieties of fall wheat have been tested with good results, and the subject has awakened very considerable interest amongst the farmers. Pease have also been grown with astonishing results. The yields which have been carefully verified have been as follows: the Mummy pea has given 128 bushels 51 lbs. per acre, and the Prince Albert 115 bushels 25 lbs.

By Mr. Watson :

Q. From how many acres?—A. These were not grown in large plots, but I was informed by farmers living in British Columbia that they have obtained equally good results, and that when the season is favourable such crops are not uncommon.

One of the most important branches of work being carried on at Agassiz at present is the planting of fruits of all sorts. The question of fruit-growing in British Columbia promises to assume very large proportions in the near future, and it is intended to make the experimental farm there a testing ground for the province, so that settlers who desire information as to the best varieties to plant may obtain it for the asking. A large number of varieties have already been planted there, including apples, pears, plums, cherries, peaches, apricots, nectarines, quinces, figs, grapes, some new Japanese fruits and, many nut-bearing trees, such as almonds, English walnuts, filberts, peccans, &c. All these seem to do well in that climate, and it is expected that in a few years the practical results obtained at that farm will prove a stimulus to fruit-growing in a very important degree.

By a Member :

Q. How would the English walnut succeed in Ontario?—A. The English walnut does not usually succeed in this province, except in the Niagara peninsula, and on the Lake Erie shore towards Amherstburg. I have tried to grow them at London for several years in succession, but without success.

CULTURE OF BEETS FOR PRODUCTION OF SUGAR.

By the Chairman :

Q. About the sugar beet: I do not think you gave us any information as to the value per ton. I think you told us that the best variety yielded a certain number of tons per acre. Have you any information as to the value per ton?—A. For feeding purposes?

Q. No; for sugar purposes?—A. With regard to the question of making sugar from the beet, a report has recently been published on this subject, to which I would refer the members of this Committee.

By Mr. Cochrane :

Q. I understood that you cultivated these beets for sugar?—A. They are being cultivated in some localities for that purpose, but we have grown them as food for

stock. There is more sugar proportionately in a small beet than in a large one, and they are cultivated closely, in rows about 16 or 18 inches apart, with a view to limiting their size.

By Mr. Roome :

Q. Would it not be better for feeding purposes if they were grown further apart?
—A. I think it would. When grown so closely they must be cultivated by hand, which is an expensive method, and I think it would be better for the farmer to grow them so that he could use the horse cultivator. The nutritive effect of feeding roots is a difficult subject to offer an opinion on, but that they are very healthful there can be no doubt. Professor Robertson will be able to give you the particulars of some tests which he has been carrying on with sugar beets as against mangolds and carrots, as to the effect on the quality and quantity of milk and the quantity of butter fat produced in the milk. He has only been able to continue the test for about a month, and the difference in quality does not seem to amount to much, notwithstanding that the sugar beet contains a much larger proportion of nutritive material. There is another aspect to this question of feeding roots which must not be overlooked, that is, that such a succulent food does a great deal more to help the animal economy than you might expect from the amount of nutritive matter which it contains. These juicy roots help the animals to digest their food, so that the secondary effect is more marked than the analysis would warrant one in expecting. This is a complex subject, and it is better not to have very pronounced opinions until we have had the opportunity of trying these experiments over and over again. The chemical analysis, however, shows that the sugar beet has nearly double the amount of nutriment in it that the mangel, the carrot or the turnip has.

Q. Do you attribute that to the amount of sugar available?—A. Yes; it is the sugar developed in it that forms the chief nutritive element.

By Mr. McGregor :

Q. Would these sugar beets do well in the western peninsula?—A. Yes. The Chemist of the Experimental Farms has analysed about 50 samples from western Ontario, and the average proportion of sugar is about the same as those grown in Quebec or in the neighbourhood of Ottawa.

By Mr. Featherston :

Q. Have you had an analysis of turnips and mangels, as to the amount of sugar they contain?—A. We have had analyses made for the purpose of determining the amount of nutritive matter, but the sugar has not been specially separated. The quantity of sugar is relatively small.

Q. Is there not more sugar in the turnip than in the mangel?—A. I cannot say as to that.

POTATO ROT—FERTILIZERS AND SOILS.

By the Chairman :

Q. You spoke of potatoes, and I understood you to say you had used other than ordinary manure. You found some rot. Did you take notice whether there was more rot in one manure than another?—A. The treatment of the land in which the potatoes were grown was uniform throughout, in order that a comparison of results as to crop might be fairly made. The soil was a sandy loam, and it was manured in 1888, and dressed with a coating of unbleached ashes in 1889 to the extent of 150 bushels per acre, and in 1890 it received about 400 lbs. to the acre of Royal Canadian Fertilizer. It had no manure last year. We have taken a crop off each year.

Q. What is the composition of that Royal Canadian Fertilizer?—A. It is composed of superphosphate of lime, with a certain proportion of nitrate of soda and muriate of potash. I cannot give you the exact proportion of these constituents, but they are mixed in the proportions supposed to be needed to supply the wants of growing plants.

By Mr. Roome :

Q. What is the rot in potatoes caused by?—A. By a fungus, which attacks the green stalks about the time they have reached their full size. The fungus spores get into the sap of the plants through the stalk, whence they descend into the tubers and develop there. By spraying the potato vines with a 3 per cent solution of sulphate of copper mixed with the same quantity of lime, about the middle of June, just when the vines have reached about a foot in height, it has been found in Europe that the rot may be almost entirely prevented. We expect to experiment with this material during the coming season.

By the Chairman :

Q. Do you think the kind of manure used has anything to do with the rot?—A. I think not.

Q. It was found by some of those who used the superphosphates that there had been little or no rot; while not far from the same place a good deal of rot was found?—A. I do not see that the nature of the manure could have anything to do with it.

MR. SANBORN.—I used the Capelton manure last year, and there was just as much rot as before.

Having read the foregoing transcripts of my evidence of 1st and 12th April, I find them correct.

WM. SAUNDERS,
Director Dominion Experimental Farms.

COMMITTEE ROOM 46, HOUSE OF COMMONS,

WEDNESDAY, 13th April, 1892.

The Committee on Agriculture and Colonization met at 10 o'clock, Dr. Sproule, M.P., in the chair.

The CHAIRMAN: Mr. Fletcher, the Entomologist and Botanist of the Experimental Farms, is with us this morning. I think we had better continue the course we have hitherto followed, and allow Mr. Fletcher to deliver his address, and afterwards any hon. member can ask any question he may desire.

MR. FLETCHER: Mr. Chairman and Gentlemen,—I have now had the pleasure and honour of appearing before this Committee on several occasions, but there are some members of the Committee who may not be familiar with the work that I am entrusted with at the Experimental Farm. It is the study of insects and plants. The importance of these different branches of work is not yet thoroughly appreciated by farmers, but I find that they only require to be brought to their notice to convince them of their value. The different methods of publication in reports and bulletins from the Experimental Farm give us opportunities of bringing before the public such parts of the work as have been completed, and also of making suggestions which may be of use to agriculturists throughout the country.

ECONOMIC VALUE AND PROGRESS OF ENTOMOLOGICAL SCIENCE.

The newspaper press has also very materially assisted in this work by giving publicity to many minor experiments on matters which required immediate attention and upon which it is not advisable or possible to publish official documents. My own thanks are particularly due to the agricultural press, especially to the *Farmer's Advocate*, of London, the *Nor'-West Farmer*, our own local papers here, the *Weekly Mail*, of Toronto, and the *Prince Edward Island Farmer*. I mention these as papers

which have been of use to me in my department, not by comparison with any other papers at all. They have applied for information concerning injurious insects, fungous diseases, or weeds, and have made it public when it was furnished them. In the North-west also there are some newspapers which have on different occasions made use of the department as a source of useful knowledge and have published the information so obtained for the good of the farmers in their circulation. These inquiries have been for the most part concerning insects, and, as I explained last year, I consider the work of entomology in which I am engaged is second to none in importance, to all branches of agriculture.

The study of economic entomology—that is, that branch of the science which deals particularly with the discovery of remedies for injuries caused by insects—has been developed during the last decade phenomenally. It may almost be said to have during that time become a new study. That its value is now generally recognized by farmers is apparent from the fact that last year over 2,000 letters were written from my branch to farmers throughout the country who had applied for information. This recognition of the value of these studies I believe to be due to the fact that the information given has been found useful.

I am, therefore, particularly pleased to have the opportunity of again appearing before this Committee, composed of members of Parliament coming from different parts of the Dominion, so that, if possible, I may gain their confidence and sympathy, and convince them that the work is of value. They will then, should an outbreak of injurious insects or fungous disease occur, be enabled to give their constituents advice to apply for any information they may require at the Central Experimental Farm, or at a similar institution where these studies are being carried on. It very frequently happens that large percentages of any given crop are destroyed by fungous diseases or insect enemies, and frequently, instead of seeking help, farmers give up in despair, as they do very often in the case of thistles, or “quack grass.” “There is no use in trying to get it out,” they say, “it simply cannot be done.” This is not at all the case, and it is to-day just as absurd as to say that insect enemies cannot be treated. There is not one of the more important fungous or insect enemies, concerning which useful advice cannot be given, which will at any rate give the applicant means to mitigate or reduce very materially the amount of injury that is being done; this being the case, it is indeed most valuable advice to the farmers of any district to tell them where they can get this useful information, and induce them to apply for it. The work carried on at the Experimental Farm in these two branches is, I believe, so important, that it is worth while any member remembering this fact, and bringing it before his constituents whenever the opportunity occurs.

I shall, this morning, Mr. Chairman, in the time at my disposal, lay before you a few facts concerning the lines of work that have been carried on during the past year, and also, perhaps, shall allude to some of the experiments which I hope to carry out during the coming season.

RELIABLE REMEDIES AGAINST INSECT PESTS.

I spoke of the great advance that had taken place in the study of economic entomology during the last five or ten years. This advance is due to the increased number of workers engaged in the study, but particularly to two discoveries of new remedies and the best way to apply them for different kinds of insects. I will allude to one or two of these discoveries. Amongst the most important of them is the spraying with arsenites, that is, with chemical compounds containing arsenic such as Paris green for foliage-eating insects, and kerosene emulsion for such insects as live by suction. This latter is an emulsion made of soap-suds and coal oil. Pure coal oil or kerosene is injurious to vegetation: therefore, before it can be sprayed on vegetation it must be diluted; but coal oil, being so like an oil in nature, will not mix with water. Soap-suds, however, will mix with the coal oil and also with water; therefore, this emulsion, when diluted, can be used upon vegetation without doing the same injury that pure kerosene would. This is a very valuable discovery for many forms, as the scale insects, which could not be injured by the usual methods, can now be easily destroyed.

Another remedy for these insects, which we have not tried in Canada so far, but which is very successfully used in California, is known as the "gas" treatment. This is a method by which the tree to be treated is enclosed in a tent and then the whole tree is subjected to the fumes of hydrocyanic acid. There is no doubt that, but for the discovery of these methods of treating scale insects and the insecticides, kerosene emulsion, gas, rosin, etc., the cultivation of all *citrus* fruits, such as oranges and lemons, would to-day be quite impossible, both in Florida and California.

PROPER METHODS FOR APPLICATION OF REMEDIES.

Another discovery of great importance in this study was the invention of a proper nozzle. There is, perhaps, nothing that leads so much to failure in the treatment of injurious insects as improper nozzles, and the improper use of the name Cyclone Nozzle. The latter is a small instrument invented at Washington under the direction of the United States Entomologist, and has the special feature that the fluid is forced into it in such a manner that it strikes the opposite side with force, and, being driven through a very small central orifice, it does absolutely break up into a spray. There are several nozzles in the market, but, unlike the Cyclone Nozzle, many of them have not the effect of reducing the liquid into perfect spray. The necessity of having the liquid thus finely divided is, that not only is less injury done to vegetation by a corrosive poison, as it is spread in smaller particles over the plants, but a small quantity is spread over a much larger area, and there is, therefore, a very great reduction in the cost of the materials used. Very frequently much more of a poisonous substance than is necessary for the work to be done is placed upon the plants treated. The very minutest particle is all that is necessary, and the spray has to be a very fine mist, just sufficient to destroy the insects, but not enough to hurt the plants. Many of the substances used are corrosive and injurious to any plant to which they are applied, unless they are carefully handled. Paris green is a material of this nature. If it is too strong, it burns the plant upon which it is used. It is, therefore, necessary to apply it in a definite manner and of the proper strength, which must be ascertained by experiment for each kind of plant; and, therefore, in giving instructions, it is necessary to give these in a definite manner too. Nothing, perhaps, has done more harm in the treatment of cultivated crops for injurious insects than the "rule of thumb" measure, so often recommended, "a spoonful." Everybody knows that spoons vary in size. There are table spoons, desert spoons, teaspoons, and so on; and besides this, these kinds all vary in size also, so that you can easily get one teaspoon which would hold twice as much as another one, and you might thus get double the quantity you required for certain plants. No mixture should be used with such an indefinite measure as a spoonful; every ingredient should be measured by weight. Those who try these remedies are liable to do more harm than good, even when they carry out strictly the instructions given by those who recommend remedies in such a foolish manner. The true Cyclone Nozzle or Riley Nozzle is made at Washington. A very important modification of the Cyclone Nozzle was made by a Frenchman named Vermorel, by the addition of a little needle which is forced through the orifice by means of a spring attached to the handle of the instrument. Any small obstruction which may have stopped up the orifice of the nozzle is easily removed by simply pressing the spring. This, to one who is used to working with spray nozzles, will at once be recognized as a very great advantage, for there is nothing so annoying, when you have got all your apparatus ready and in working order, as to have to stop, take it down, unscrew the nozzle to clean it out, and set to work again. Although so small, and producing such a fine spray, the use of these nozzles is applicable to even large trees. By mounting this very small nozzle—which in some forms does not measure more than half an inch in diameter across the front, and in which the orifice is only a tiny pin-hole in the middle—on a very light rubber tube, such as is used here for the gas pipe, and attaching that to a light pole, such as a bamboo fishing rod—you can raise it to any height you require in practical work. You can spray very easily all over trees thirty or even forty and fifty feet high, by tying a small

tube to a light pole in the way described, and by that means raising the nozzle to the required height. The liquid having been reduced to a very fine spray, does not go very far from the nozzle. It is therefore necessary to spray the trees on the side from which the wind blows, and it will be sometimes necessary to go through an orchard and spray the trees twice, so as to get them thoroughly sprayed.

These discoveries and inventions to which I have briefly referred, have been mostly made within the last few years, and it is not too much to say that it is now perfectly possible to wage war successfully against nearly all the leaf-eating insects which attack crops. These are very many, both in numbers and kinds, but the intelligent fruit-grower now recognizes that these very injurious insects which destroy so many of our crops are a blessing in disguise, for not only do they injure the crops and the trees of the negligent farmers most; but considering the small amount of labour he expends in treating them, he sees that he gets very large returns for his time and money. The improvements in labour-saving machinery are now advancing rapidly in all lines, and this is simply a recognition of the importance of machinery in a special line of agriculture which, up to the present time, has hardly been recognized as agriculture at all. The use of insecticides is now so necessary that it may be said, without exaggeration, it is just as necessary as the cultivation and the manuring of crops; because, with the gradual increase of the area under cultivation of any given crop, the insects which prey upon that crop have gradually increased, until now we must take special cognizance of their presence, and adopt measures to combat them.

INJURIOUS INSECTS OF THE SEASON.

I will now refer to some of the different insects which have required attention during the past year. Orchard pests of several kinds were abundant. The most important was one known as the "Eye-spotted Bud-moth," a small insect not expanding much more than half an inch across the wings. A small fact, which has been learned during the past season concerning this insect, well illustrates the value of knowing the life history of an injurious insect, so as to learn the most practical remedy. If you know the way and seasons when an insect, passes through its different stages you then have some means of finding out its most vulnerable point.

The Eye-spotted Bud-moth passes the winter upon the twigs of fruit trees as a half-grown caterpillar. There is only one brood in the year, of which the eggs are laid in June. These hatch soon after, and produce small brown caterpillars, which, during the remainder of the year, feed on the leaves of apple and other trees beneath a silken covering, growing very slowly, the size not exceeding one-quarter inch in length. About October they leave the leaves, and spin small silken cocoons or winter shelters upon the twigs. In these shelters they remain all winter; but come forth in the early spring and attack the buds, and seem to prefer those which contain flower buds. They also frequently bore down the centre of the twigs and destroy them, so that whole clusters of blossoms are destroyed at once. When that is done they go to another twig, so that one small insect can do a great deal of harm.

FALSE IMPRESSIONS CORRECTED.

There has been a mistaken idea up to the present time, by which it was supposed that these insects fell from the trees with the leaves and passed the winter beneath the trees. This being the supposed life-history, great pains were taken by fruit-growers to collect all the dead leaves and burn them. That we now know was all wasted labour, because the larvæ had left the leaves before they fell. What is now suggested is to spray the trees very early indeed in the spring, before the flowers open, with Paris green or some other arsenical mixture.

The next insect of which I will speak is the Canker Worm, which, although not generally abundant in Canada, has for some years destroyed, in the Maritime Provinces, a large proportion of the fruit which might have been grown there, simply because, when it increases largely in numbers, as it did there, it frequently strips

the trees entirely of their leaves and the fruit cannot mature. During last season a very interesting outbreak of this same insect occurred in Winnipeg, where it was reported to have destroyed several shade trees, by stripping them entirely of their leaves. The trees grown there as shade trees, are the ash-leaved maple, or the Manitoba maple, as it is sometimes called (*Acer Negundo*). It appears this tree is very susceptible to injury if its leaves are destroyed.

Mr. Fonseca, of Winnipeg, wrote to me that many of the best shade trees in the part of that city where he lives had been destroyed by this insect. Now there are very few insects which can be so easily destroyed, and at so small expenditure, \$12 or \$15 for a spraying pump, and perhaps two or three dollars more for labour, and the materials used would entirely free the shade trees in the streets of Winnipeg of this troublesome enemy. I think it will be a great pity if the city authorities do not take steps this spring, when the young caterpillars hatch, to have them all destroyed, by spraying the trees with Paris green in water. One pound to 300 gallons of water would be sufficient, and it is of importance, because the trees are so few there.

In Vancouver Island two years ago the oak trees all around Victoria were stripped by another caterpillar of the same family. These caterpillars are known, from their manner of walking, as geometers or loopers. They stripped the tree entirely of every vestige of foliage. These also could have been destroyed just as easily as those I have spoken of above.

The canker worm attacks many kinds of trees, but it is particularly injurious to apple trees. Along the Montreal road, near Ottawa, during the past season it occurred in such large numbers in some orchards that many of the trees appeared, as is often stated, as if they had been burned over with fire. With the Canker Worms were also found two kinds of Keaf-rollers, and the caterpillar of the Eye-spotted Bud-moth. These caterpillars are hidden from sight. They roll up or gather together one or more of the leaves of an apple tree and then feed from within on the leaves, so enclosed. The same poison, Paris green, destroys them all. An interesting and new attack, studied last season, was that of a *coleophora* or Case-bearer, so called from the little cigar-shaped case which it carries about with it, and inside which it lives whilst in the caterpillar state. It makes a small hole through the surface of the leaf and eats out the green cellular matter between the surfaces. It has proved rather difficult to fight because of this habit; but after extensive experiment it was found that it could be most successfully combated by throwing a Paris green spray on the foliage. This insect also passes the winter, half-grown, upon the branches of the infested trees. This fact led me to try spraying trees during the winter with kerosene emulsion, to see if the larvæ could not be destroyed inside their cases in a wholesale manner.

Dr. D. Young, of Adolphustown, Ont., has carried out very careful experiments in this line during the past winter; but on the whole the results have not been satisfactory. Some of the larvæ were killed; but many others, as well as larvæ of the Eye-spotted Bud-moth, were found on the twigs three weeks afterwards uninjured, although the twigs had a strong odour of the coal oil still perceptible upon them. This immunity from injury was of course largely due to their being protected by their cases; but also to the fact that insects which pass the winter in a torpid state are then less susceptible to injury than they are during the summer time, when they are active. Cut-worms of several kinds have been, as usual, complained of all over the country, from the North-west Territories down to the Atlantic coast. Of the remedies suggested, the best results have been obtained from two which I have mentioned when before this Committee on a previous occasion, which consist of laying poisoned bundles of green food through the crop before and just after it is planted, and also of placing a strip of tin, or wrapping a small piece of paper, around the stems of plants liable to attack at the time of planting out.

An old enemy, the Pea-weevil, has developed in large numbers during the past two years. In the County of Prince Edward, so celebrated for the production of seed pease, it has increased very much, I am sorry to say. I have tested some of the old remedies in which reliance was placed, and found they were useless. Much of

the work of the entomologist now is complicated by the fact that the popularity of this work has induced many to enter upon and undertake it who are not properly prepared to do so, and the consequence is that they write about many things they have never tested for themselves, so that the newspapers are teeming with useless recipes.

MISCHIEVOUS QUACK REMEDIES.

Three-fourths of the newspaper entomology is inaccurate, and it does more harm than good, from the fact that so many people who read about these inaccurate and useless remedies try them and fail. Perhaps there is no remedy more written up in the newspapers than putting salt on fields attacked by Wire-worms, and from my own experience I can only say that it is utterly useless. A special study of Wire-worms has been made with great care during the past season at Cornell University by competent observers, and all the old remedies, many of which have been used and recommended over and over again, have been found utterly useless, and we must now say that we have not yet found any good remedy for Wire-worms, which attack the roots of plants, and particularly potatoes and grasses.

Breaking up in the fall such ground as is infested, when there is a time during which they are susceptible to injury from the disturbance or from atmospheric influences, has been found useful; and also poisoning the adult beetles which lay the eggs from which the Wire-worms are produced, by the use of poisoned potatoes or clover.

With regard to the Pea-weevil, I will mention some of these useless remedies.

In the first place, you will find it frequently said that infested pease, if thrown into water, will float and come to the top. This is not the case, as can easily be seen by any one who will try the experiment. It was also said that if infested pease were kept in a warm room during the winter all the pea-weevils would come out, and would die before the time when the pease would require to be sown. This is a fallacy, too, for many of them are retarded in their development, and although it is true many of them do come out and die, there are still a sufficient number left, which come out later and destroy the value of the remedy.

With regard to the remedy of holding over seed, I have found that seed-pease held over for two years are just as good for seed as those only one year old. Three samples of tested seed gave 100, 99 and 99 per cent of vitality, so that we have a sure remedy in holding over until the second year any pease required for seed.* The best remedy for destroying Pea-weevils in the pease, on a large scale, is the bisulphide of carbon treatment. This is an extremely volatile and dangerous material. It is heavier than air, and when it is vaporized it is so much heavier than air that it can be poured out from one vessel into another, only that it is quite invisible, and if it is present, can only be told by a test. It is a dangerous and inflammable substance. If it comes into contact with flame, an explosion will take place. It must be used with great care, and can only be used to disinfect pease by those who possess proper apparatus. It is not applicable for ordinary farmers to use, but all the large seed-growers and seed merchants have close chambers where their pease are disinfected in this manner.

Last year, in the vicinity of Arnprior region, some 3,000 bushels of pease were imported from the United States to be used for seed in that district, because the pea-weevil not occurring there naturally, the seed-pease grown there would be free from weevils, and therefore much more valuable than seed grown in most of the seed-growing districts of the United States. All insects have their metropolis or centre of greatest occurrence, and the Arnprior district is outside of the area where the pea-weevil occurs naturally. Consequently, the seed-growers sent their seed to that district to be grown, in order that they might get clean seed. It is probable that the mature insects cannot endure intense cold, and there is, therefore, I think, very little danger of importing the pea-weevil into that district to increase and remain there. Some of the perfect insects were sent to me last April, and I was asked if they

* Some seed of Black-eyed Marrowfats, 8 years old, grew well and produced a good crop.

were injurious, and if so, it was suggested that I should write to the local newspapers, giving an account of the insect, and advise as to the best course for the farmers to follow who had bought seed. Under the existing circumstance, the farmers having bought their seed, and got their land ready for sowing, destroying the weevils in the seed was the only practicable remedy.

A SUCCESSFUL REMEDY FOR PEA-WEEVIL.

The remedy used successfully was this: The pease were poured out into a large receptacle half filled with hot-water—wash-tubs were used generally; cold water, which had been got ready beforehand, was then thrown over them and the tub filled to the top. Directly the pease were thoroughly wetted the cold water was poured in, and they were then left to soak for 24 hours, and the beetles were all destroyed.

By Mr. McNeill:

Q. Did that hot water treatment injure the pease?—A. Not if they were only left in the hot water for a few seconds. The instructions required that the cold water should be all ready and standing by, and then poured in at once.

Q. How long would the pease be allowed to remain in the hot water?—A. They are poured right into the hot water from the sack, and then the tubs are filled at once with cold water and left for 24 hours. The pease can then be partially dried before sowing, so as to run easily through the spouts of the seed-drill. The inaccurate statement is frequently made that pease injured by the pea-weevil are just as good for seed as those that are not. This was stated positively to me to be the case at a Farmers' Institute meeting by a farmer who professed to have tested the matter and reaped a heavy crop. His good crop I believe resulted from the fact that pease and many other crops are frequently sown too thickly, and that the plants which grew from the uninjured seed sown filled out and hid the deficiency of the weeviled seeds which did not germinate. It is contrary to reason that a pea, the substance of which has been diminished nearly one-half by an insect, should be as good for seed as if it were complete, and had the same amount of nourishment to feed the young plant as nature placed there originally.

RECIPE FOR PREPARING KEROSENE EMULSION.

By a Member:

Q. You spoke of kerosene emulsion. What are the proportions used in making it?—A. It is made by making a mechanical mixture of kerosene and soap-suds in the proportion of two of kerosene to one of soap-suds. These two materials are worked together with a force pump for about five minutes, when a thick creamy batter is formed, and this can be reduced again to any weakness or state of dilution with cold water. Paris green is about the cheapest good remedy for insects where it can be applied; but it cannot be applied with all insects, and this kerosene emulsion covers all classes. Directly it touches the insect it spreads all over its body. Insects, as most people know, do not breathe through their mouths. They breathe through little pores which are situated along their sides, and any oily material, like kerosene, when it touches their bodies, suffocates them, by spreading over the body and stopping up the breathing pores. As to the exact proportions of soap-suds and coal oil, they are easily remembered, but I have always avoided, when possible, giving exact formulæ of remedies when speaking in public, because they are all published, and it is so easy to make a mistake in taking down a remedy given by word of mouth. I have given concisely, with full instructions for their application, all the more important remedies for insects in Bulletin No. 11 of the Experimental Farm series of the pamphlet, "Recommendations for the Prevention of Damage by some Common Insects of the Farm, the Orchard and the Garden." Some 25,000 have been distributed through the country, and it can be got by any one who applies for it.

The proportions are as follows:—One half of a pound of ordinary soap is dissolved by boiling in one gallon of water, and when it is boiling hot it is poured into

two gallons of coal oil (kerosene), and churned with a syringe or a force pump, and in about five minutes it becomes thick and creamy; when this cools it consolidates into a jelly-like mass, which can be diluted with cold water. Kerosene emulsion has been found particularly useful during the past season for the treatment of one of the worst enemies we have in the orchard.

THE OYSTER-SHELL BARK-LOUSE.

This pest is injuriously abundant in every part of Canada, but owing to its inconspicuous appearance it is seldom noticed until it has completed its work of destruction and killed the tree. It attacks many kinds of trees and shrubs, but is particularly troublesome on apple trees and black currant bushes. I have also found it on mountain ash, birch and ash trees. At this time of the year it may be found on trees in the shape of a small elongated scale like a miniature oyster shell. This is really the dried up body of the female insect, beneath which will be found a large number of white eggs. In the month of May the young emerge from beneath the scales in countless numbers. They are minute creatures, hardly visible to the naked eye. They then climb up to the young wood, where the bark is tender, and through it they insert their little tube-like beaks, and never move again, but remain fixed by their beaks, sucking the sap out of the tree. They gradually secrete a waxy fluid, which covers and protects them. This covering resembles in appearance an oyster shell. There are probably more orchards killed and there is more loss to fruit from this one cause, than from all other causes put together. Farmers and fruit-growers frequently do not fight it, because they do not recognize it as an enemy that can do them harm. But if they do recognize it and apply kerosene emulsion, they can destroy it as effectually as all other insects.

By Mr. McNeill :

Q. Do you wash the bark?—A. Yes; and the emulsion can be sprayed over the trees at the time the young are hatching, when all will be killed. When reducing the emulsion for this purpose, it can be diluted with nine times its volume of water.

Q. Would that be strong enough for these insects?—A. Yes, sir. A great many insects can be got rid of by using a mixture of even half this strength.

By Mr. Roome :

Q. Would it not injure the tree if put on too strong?—A. If it were put on stronger it might be injurious, but as a matter of fact you could not put it on much stronger without difficulty, for that is about the consistency you can use easily through a spray nozzle. Where the bark-lice are very numerous, the emulsion can be used early in the spring in the way of a wash or swab, to be put on either with a sponge, cloth or mop.

THE PEAR TREE SLUG.

The pear tree slug is another insect which, during the past year, developed in injurious numbers. It is a slimy creature, that lives on cherry and pear leaves, and should be treated at once when observed with a weak Paris green spray of 1 lb. of the poison to 300 gallons of water.

In the North-west Territories, during the past year, a native insect has occurred in very large and injurious numbers. It is a conspicuous red and black beetle, not quite so large as the Colorado potato beetle, which is found in this part of the country, but it feeds on plants of the cress family, such as turnips, radishes and cabbages. This did so much injury that I received in July and August some thirty or forty letters from settlers in the North-west. The insect was treated with Paris green successfully. It is called the Red Turnip Beetle.

A POPULAR FALLACY CORRECTED.

The subject of spraying with arsenites is one that has gained very much importance lately through the ridiculous and utterly absurd statements made throughout the world in newspapers. It was first stated by an obscure London horticultural journal—but when you read the articles you saw at once that the object was to get a little cheap advertising—that all American apples were saturated with arsenic. This statement was reproduced in many newspapers, and as the original paper which started the falsehood, in a later issue, gloated over the fact that these articles were copied all over the world, the paper thus showed its hand; it wanted to get cheap advertising. The statement is absurd that any apple or other living vegetable tissue can be saturated with arsenic, from the fact that the poison is so exceedingly corrosive that before any vegetable tissue could become saturated, even if this were possible, it would be destroyed before the poison could penetrate. The only suggestion of truth in regard to this statement is that we do spray our orchards with Paris green, which is an aceto-arsenite of copper. But that is not arsenic. It is an arsenical compound containing about 45 per cent of arsenic; but it must be remembered that this is not the same by any means as arsenic, which is soluble, while Paris green is almost insoluble; so it is not at all like putting on our trees a mixture containing 45 per cent of soluble arsenic. It is only an insoluble compound which, by the special treatment recommended, never can and never does get into the fruit. Then, besides this, it is applied at the small rate of 1 lb. to 200 gallons or more of water. This quantity of water is sufficient to spray a great many trees—a tree of the ordinary size takes from one to three gallons—and these trees bear many hundreds of apples, and thousands of leaves, so that there would be only a very minute quantity of poison on each fruit. Even supposing soluble arsenic were used and every apple were covered with it, none could get into the apples. At the time apple trees are sprayed the fruit is very small, indeed, hardly formed, and is then protected from anything falling on it by a thick covering of down and the spreading lobes of the calyx. In spraying, the liquid is applied as a very fine mist; most of this falls on the foliage; but some—a minute quantity—falls into the open calyx, where the eggs of the codling moth are laid. It is an infinitesimal quantity, yet is sufficient to destroy the insect if it be there, as frequent experiments have shown us. I cannot imagine anything more absurd, however, than the idea that there could be any arsenic in apples, which had been sprayed, as soon as the flowers had dropped, with Paris green. In the first place, the quantity of poison is so small it is practically insoluble, and above all, it is not at all adhesive, so that directly the small amount of moisture in it which is sprayed on to the trees has evaporated it is a dry powder. Even supposing you put it on as thickly as you could all over the fruit, the natural expansion of the apple in growth would disseminate it and force it off the surface; the frequent rains we get during the summer, and the frequent winds, all help to remove it, and we know that it is entirely gone, as proved by experiment, long before the harvesting of the fruit takes place. Yet these articles appeared, and our own papers copied them and commented upon them. Now, this is where the injury comes in: spraying with arsenites is the remedy we have been trying for years to persuade farmers to adopt in order to protect themselves against a great and unnecessary loss. I claim by the application of this one remedy for the apple worm, that a saving of at least 75 per cent can be made in the quantity and quality of the fruit. Such articles raise a doubt as to the advisability of using what is a good and safe remedy. We are told: "Paris green is poison, and therefore is dangerous." Of course it is poison, otherwise it would not do the work we use it for; but the statement as to the danger of poison getting into the apples is absurd, because impossible. The quantity used is so small that the elements to which it is exposed would destroy or remove it long before it could penetrate a growing apple. Through the kindness of Mr. Woolverton, the editor of *The Canadian Horticulturist*, I procured some apples that had been sprayed twice, and had them analysed most carefully by the Chemist of the Farm, who took very

great care to analyse them all by a process by which, if there had been even one fifty-thousandth part of a grain of arsenic in them, it could have been detected. He found there was not a trace of arsenic. Yet these people write such nonsense and spread it all over the world, and some foolish people, without taking the trouble to think, believe them.

If we did not know the reason why this was done it would be inexplicable, but we do. We know to-day that our Canadian apples are better than any apples in the market. We know that Americans come here and buy them because they are much better than theirs. To show that conclusively, you have only to go to a horticultural exhibition in the United States, or to see the difference most plainly, go to the Pacific coast. Buy apples in San Francisco and go up the coast, through the Pacific States, and you will know with your eyes shut which apples are best. They improve perceptibly in both colour and taste as you go north. It is due to the climate that fruit grown in the south is not as good as our northern-grown fruit. Our apples are better than any others, and are taking the first place in the market. They are fetching a higher price in England than the native apples, or any that can be imported. Our apples, too, are perfectly safe as food. They have been tested by a chemical analysis that cannot fail, and this analysis is backed up by the common sense of any one who examines the matter. Many analyses have been done with care, and show there is not the slightest danger in the use of Paris green, as directed by entomologists. It is important for all to know this and understand why it is so, when people say they won't use Paris green, because they injure the crop. That is all nonsense. The only injury spraying could do would be by destroying the leaves, if it were used too strong. If the leaves of a tree are destroyed, it cannot produce any fruit. I occasionally meet people still, even in Canada, who say they do not put Paris green on their potatoes, because it may injure the tubers. There is no fear, whatever, of Paris green getting into the tubers, for those are merely receptacles for storing up starch for a special purpose, and are not roots, but enlarged buds at the extremities of underground stems. Their contents are manufactured by the plant from gases taken in through the leaves from the atmosphere and from water taken up by the roots. Thus, the starch in the tubers is a compound material, an important part of which must come from the air through the leaves, and the tubers, not being roots, take up themselves nothing from the soil, but are merely receptacles, as just explained, for the preservation of a special product, which is to insure the perpetuation of the plant over the winter.

Again, the form that this arsenic absorption scare took some years ago was that the poison could be absorbed by the pistils of flowers upon trees which had been sprayed. This was equally absurd with the present contention, for not only are trees sprayed after the petals have fallen and when the pistils have performed their office, and in most cases dried up, but even if they were sprayed with Paris green while the flowers were in blossom and their essential parts in their prime, it must be remembered that the stigma of a flower is without any epidermis, and is, therefore, exceedingly delicate, so that any corrosive poison like arsenic, in even a very weak solution, would be much more likely to injure the stigma than to be absorbed; and further than this: even in the natural operation of fertilization, the stigma is a passive organ, and absorbs nothing. The activity is on the part of the pollen, which pushes out its foveola-bearing tubes and protrudes them through the tissues of the stigma down into the ovary. This susceptibility of the pistil to injury has been taken advantage of in the State of New York in the treatment of a local but very injurious insect.

THE APPLE MAGGOT.

It was deemed necessary to resort to the extreme measure of destroying the whole crop of fruit so as to reduce by that amount the food supply of the insect for a year, and it was suggested that this could easiest be done by spraying some corrosive material over the trees while in blossom. This remedy, however, leads us to a difficulty which has lately been considered by the Ontario Government. Apiarists

claim that fruit-growers have been spraying their trees whilst in blossom and that their bees have been poisoned by gathering the poisoned nectar. Of course, the practice of spraying trees while in blossom is quite wrong, and should be stopped with a firm hand for all considerations. The horticulturist is liable to injure his fruit directly, and if it be true that the bees are poisoned, he not only injures the bee-keepers, but also destroys his best friends. Bees are known to perform such an important part in the fertilization of many flowers that advanced fruit-growers keep bees in their orchards for that very purpose. We all know that the quantity of blossom on fruit trees in the spring cannot be taken as an index of the quantity of the crop that will be reaped, unless there be at that time sunny weather, so that the bees and other insects may visit the flowers and fertilize them. Botanists have discovered that it is far more advantageous for flowers of a plant to be fertilized by pollen taken from other flowers, and this is carried so far that nature herself provides, in many flowers, means by which fertilization by their own pollen is impossible. In some plants we find separate male and female flowers; these may be either on different plants altogether or upon different branches of the same plant. Again, in cases where the flowers are perfect, and contain both male and female organs, we find that these may mature at different times, so that when the female organ, the pistil, is ready to receive the fertilizing pollen, the anthers of its own flower may have already shed their pollen, or *vice versa*. Charles Darwin, the great physiologist, summed up his observations on this subject in the trite generalization that "nature abhors self-fertilization."

Although in some cases self-fertilization may be possible, it is not so in all, and it is probably better in all plants that the pistil be fertilized by pollen from other plants. Now, with regard to bees being poisoned by gathering honey from flowers which have been sprayed with Paris green: although I do not know of any actual experiments having been tried, from what I have lately read on the matter, I think that it is quite possible that they can be poisoned, and if so, we may just as well recognize it at once. Sometimes enthusiasts go too far—some saying that it cannot be done, whilst others say it can. What we want, however, are facts ascertained by careful observations. Bee-keepers claim that they know of actual instances, when bee-hives have been located near orchards which have been sprayed during the time that the trees were in flower, and that the bees have been found poisoned. A writer in a late number of the *American Bee Journal* claimed that the Paris green could be plainly seen in the bees' bodies. This last statement, however, I think, must surely have been an exaggeration, although it is probably the case that they may have been poisoned either by the nectar or by drinking water from the sprayed leaves. It was also claimed that the honey stored away in the comb was poisonous; but this last statement will require far more proof than has as yet been brought forward.

Honey, as it occurs in the comb, is an altogether different thing from the nectar of flowers. Before it becomes honey it has to be partially digested by bees, and is not honey at all when in the flowers. The bees suck up the nectar and elaborate it into honey. I am under the impression that before they could turn poisoned nectar into honey they would be killed by the poison. Another safe-guard is this: at the time fruit trees are in flower, although the bees might be poisoned, if some careless fruit-grower were to spray at that time, it would be very unlikely that poison would get into the honey we eat. The honey stored away in the honeycomb is only the surplus. At the time when spraying is done, early in the season, bee-keepers tell me that the bees use the honey they collect then almost entirely as food for their brood, and the honey we steal from them afterwards is only the food which they have laid up for themselves for use during the winter; or, in other words, there is no surplus honey, apiarists say, at the time of the year when fruit trees are in flower. I believe that bees have been found, and Prof. Cook, of Michigan, a high authority on bees, states that larvæ have been found poisoned through partaking of this poisonous food. This is the whole thing, and the question came up for discussion the other day before a committee of the Ontario Legislature, when I was asked by the provincial Minister of Agriculture to go to

Toronto and give evidence before the committee. The question that was put to me was this: "Is there any practical or scientific reason why this Act to prevent the spraying of trees while in blossom should not pass?" I could not think of any reasonable objection; for, spraying when the trees are in flower is quite unnecessary and is very unadvisable; because, if, as apiarists claim, their bees are poisoned if Paris green be applied when the trees are in bloom, and I maintain you may do more harm than good by destroying the pistils of the flowers. Why do bees visit flowers? To get the honey, and nature provides this so as to attract insects at the time when they can be of most use in fertilizing the flowers. Directly the pistil is fertilized, no more honey is developed; it is no more use to the plants. If we wait for spraying until the flowers drop off, there is no danger of poisoning the bees, because they do not then visit the trees. There is nothing to take them there; but by spraying the trees after the flowers drop, we do destroy the little caterpillar which hatches from an egg laid by the codling moth in the calyx, and the small quantity of Paris green which we recommend—one pound in two hundred gallons of water—is sufficient to kill the larvæ, and as a consequence we get a return for our labour in 75 per cent more fruit than we should otherwise have had.

By the Chairman :

Q. You must put that on by spraying?—A. Yes.

By Mr. McNeill :

Q. What quantity of that poison destroys human life?—A. I think two and a half grains of arsenic is a fatal dose, and Paris green contains about 45 per cent of arsenic in chemical combination.

Q. How much of that mixture would it require to poison a man?—A. Well, a pound of Paris green in 200 gallons of water is the strongest we ever use. I suppose a cupful might make a man feel uncomfortable.

Q. The particle that would fall upon the fruit would have on a person no effect whatever?—A. No. I would not at all mind eating fruit which had been sprayed. Think of the small size of the apple at the time; it is only just forming, and it is raised up in such a way that the calyx would cover the whole fruit, and most of the spray would fall inside the calyx. The egg does not hatch for a week or so after the flowers drop off. The moth flies to a flower, directly it has opened, and lays a little egg inside it. In time the egg hatches, but not for a week or ten days. At the provincial committee at Toronto there was some discussion on the effects of spraying for the Plum Curculio; but this insect is not at all attracted to the plum trees by the nectar of the flowers. It lays its eggs just beneath the surface of the plum when the latter is about as big as a large pea.

FUNGOUS DISEASES OF PLANTS.

Allow me now, Sir, to turn to another part of my work: the study and treatment of the diseases of plants due to the attacks of parasitic fungi. During the last four or five years most satisfactory results have been secured by cryptogamic botanists in the treatment of these plant diseases. Remedies have been discovered by which some of the most destructive of these may be controlled with comparative ease. The black spot of the apple, the mildew of the grape, and particularly the rot or blight of the potato, are notable instances where a large amount may be saved by preventive treatment.

POTATO ROT AND ITS REMEDY.

The last named of these diseases, the potato rot, causes a great diminution of the crop every year throughout the length and breadth of Canada—perhaps, year in and year out, 50 per cent of the whole crop grown. The life history of the fungus which causes this disease has been worked out and is well understood. It passes the winter inside the potato tuber. When growth begins in spring it germinates, and throws out its vegetative system, and creeps up through the tissues of the potato

stem, and during July and August manifests itself as a white frosty growth or mildew on the potato tops; this is followed by the leaves turning brown in spots, and giving the appearance known as potato rust. At this time spores or seed-like bodies are formed, which drop from the potato tops to the soil beneath and are washed by rain down to the forming tubers below the surface; here they germinate, and penetrate the tissues and eventually destroy the potato. Now, if one of the known fungicidal mixtures be sprayed over the potato tops as they grow in the field, beginning at the time the white frosty appearance first shows itself, the spores will be destroyed and the crop saved.

The spraying will require to be repeated at least twice. The mixture which has given the best results is the Bordeaux mixture. This is made as follows: Dissolve 6 pounds of copper sulphate in 10 gallons of water; throw this into a barrel which will hold 45 gallons. In another tub slake 4 pounds of perfectly fresh lime in 6 gallons of water. When all the lime is slaked pour it slowly through a strainer into the copper solution; a coarse gunny sack tied over the head of the barrel answers well for this purpose. Afterwards fill the barrel up to the top with water, which will make 45 gallons; stir thoroughly, and all is ready for use. It is best to use powdered copper sulphate, and the lime must be quite fresh.

Made as above, the mixture costs about one cent a gallon, and a barrel will be sufficient to spray a very large area. This last point of course will be regulated by the kind of nozzle used.

I regret to say that so far, although the efficacy of this remedy has been thoroughly proved, very few of our Canadian farmers have been persuaded to try it. It is a new remedy, and they seem to prefer old methods, with their attendant dangers, to trying anything new, no matter how great the advantage may be. What makes this remedy particularly convenient is that it may be used at the same time and with the one application as Paris green, which all good farmers now know that they must use to protect their potato crop from the Colorado potato beetle; one-fourth of Paris green in the above quantity is sufficient. I am in hopes, however, during the ensuing season, to carry out some experiments which will prove conclusively the great advantage of this easy and cheap remedy.

As the potato blight does not occur every year, if careful watch were kept, so as to detect the first appearance of the mildew upon the leaves, probably the cheapest way to treat potatoes would be not to apply the fungicidal mixture until the disease showed itself; and then at once, as soon as it is noticed, the potatoes should be sprayed. Prof. Jones, of Vermont, records a successful experience on this line, by which a large proportion of a crop was saved by a single spraying, while the product of two contiguous plots that were not treated was badly diseased.

By Mr. McNeill:

Q. How is it used?—A. By spraying. In applying this it is best to use proper spraying apparatus, and particularly a good nozzle. Thus the work is done much more thoroughly and also more easily. We have two different kinds of spraying pumps on the Experimental Farm. One is a knapsack sprayer, which holds about four gallons, and is carried on the back. This I found a very useful and convenient instrument.

By Mr. Roome:

Q. Do I understand these spores attack the tubers when growing?—A. In July and August spores are produced on the diseased tops, and, some time after they fall, get into the ground, and produce the same disease, manifested in a different form, viz., the rot of the tuber. Although spoken of, and usually seen as a wet putrescent decay of the tuber, as a matter of fact potato rot is really a dry rot. The wet rotten condition is simply the decaying of dead tissue, and a similar condition is produced when potatoes are killed by freezing; when attacked by the dry rot the life of the potato is destroyed and it then decays.

Q. The disease must be owing to some kind of poison in the tuber. Supposing you remove the tops altogether?—A. That is done when the disease develops late in the season, but if done early the potatoes would not form. When the top is injured the tubers are not produced.

Q. Does it strike the tuber itself? A. Yes, the spores first form on the tops, and then, being washed into the soil, attack the forming potatoes.

By Senator Perley :

Q. How does it get into potatoes in the cellar?—A. The dry rot was in the potatoes when carted from the field ; some of them, however, might not show any disease until you cut them.

By Mr. Roome :

Q. I suppose the disease matures there?—A. Yes. It either keeps growing and throwing out its branches through the tissues, when the tuber rots, or it lies dormant until the next year as dry rot.

By Mr. Rosamond :

Q. Where can you get these spray pumps?—A. You can import them from the United States. I can give you several addresses. I am afraid I do not know of a Canadian maker yet. There was a maker, I believe, at Picton, and another at Leamington, but I have not seen their pumps. There are several makers in the United States.

By Mr. McNeill :

Q. You often find potatoes put away that appear quite sound, but are not sound?—A. Yes, the disease is hidden inside the potato. Directly the spore reaches the growing tuber it germinates, and shoots out microscopical tubes, which penetrate the tissues.

Q. I understand the best way to treat this is to have a man going through the field with a knapsack sprayer?—A. Yes, a man can walk quickly and keep the spray going all the time.

By Senator Perley :

Q. How many rows at a time?—A. That will largely depend upon the wind. Last spring I sprayed three acres of pease walking through them as fast as I could. I was able to spray a strip 20 feet in breadth because of a gentle breeze blowing at the time. There was an attack of a kind of marching cut-worm. They appeared in great numbers, and swept three and a-half acres of our pease before the attack was noticed. Directly it was observed, I had the field sprayed with a very strong mixture of Paris green and water. We stopped the cut-worms at the line where they were when the spraying was done, and the pease grew up again and bore just as heavy a crop as those which had not been eaten off. The mildew of the grape may be very satisfactorily treated with the carbonate of copper mixture, recommended by Mr. John Craig, our Horticulturist, in his Bulletin 10. Mr. John Lowe, Deputy Minister of Agriculture, has a vineyard with several hundreds of vines. Last year he probably lost half of his grapes, many hundred weight. This year he did not lose 20 pounds, a saving which I attribute entirely to two careful applications of the carbonate of copper treatment.

CULTIVATION OF FODDER GRASSES ADAPTABLE TO CANADA.

Before closing, I should like just to refer to another subject upon which I have been engaged, and which I brought before you last year: the cultivation of fodder grasses. We find from experiment that many permanent pasture mixtures which are offered for sale contain grasses not suitable to this climate. We have in this country a great many grasses suitable for cultivation which would produce valuable

fodder plants and which can be grown successfully; they are being grown and carefully tested on the Experimental Farms. A small distribution is now being made of seeds of some of the more promising of these varieties. They are being sent to such farmers as have asked for them. I have now perhaps 180 or 200 English names on my list. I want to get another 20 or 30 English, and another 50 or so French, and these will be attended to in the order in which the applications are received, until the supply to be distributed is exhausted. If any members present know farmers who would like to try these new grasses, I shall be glad to get their names. I am only sending out small packages, containing seed enough to sow a single drill 20 feet in length. This will give the growers a small quantity of seed, and will also show what grasses will succeed in the different districts. Instructions are sent with each package, and I believe it will be an experiment of great value to the country.

GRASSES UNSUITABLE IN CANADA.

I might mention the names of some grasses which have proved unreliable and not suitable for this district. Some of these are sold at high prices. Sweet Vernal grass is advertised at \$9 a bushel. It is of no value here.

The Italian Rye-grass and the Perennial Rye-grass are utterly useless, and yet they make probably 50 per cent of all seed mixture sold in this country.

By Mr. McGregor :

Q. Are they not good in western Ontario?—A. In western Ontario the Perennial Rye-grass does in some districts, but not in all. I do not think that in Canada it will do as well as some other grasses. In Scotland it is the favourite grass, and produces enormous crops. One of the chief causes of complaint from purchasers of grass seeds is that they are used on their English or European reputation, because no one has tried them in this country. Our seedsmen do not grow them themselves, but they take the character given them by European seedsmen. They do not take into consideration the fact that they are to be grown in an entirely different climate.

I will not delay the Committee any longer, Mr. Chairman, but will finish by asking the members present to do me the favour of applying to me or letting me know at any time when crops in their neighbourhood are attacked by insects or fungi.

By Mr. McNeill :

Q. At what time do you spray grapes?—A. Grapes should be sprayed first when the leaves are about an inch and a half in diameter, before the flowers open, and twice afterwards at intervals of three weeks.

Having read the preceding transcript of my evidence, I find it correct.

JAMES FLETCHER,

Entomologist and Botanist, Dominion Experimental Farms.

COMMITTEE ROOM 46, HOUSE OF COMMONS,

THURSDAY, 21st April, 1892.

The Committee on Agriculture and Colonization met at 10.30, Dr. Sproule, chairman, presiding.

MR. JAMES W. ROBERTSON, Dominion Dairy Commissioner and Agriculturist, being called, addressed the Committee as follows:—

MR. CHAIRMAN, AND GENTLEMEN OF THE COMMITTEE.—I have consulted with the chairman, and it has been thought that the better plan for me to pursue will be to give you a talk this morning on the work under my charge in my capacity as Dairy Commissioner; and then, if you require my presence at another session, I shall give an account of my work as Agriculturist in connection with the Central Experimental Farm. I think, perhaps, I shall consume most of the time this morning in giving you a statement of what we are trying to do in connection with the outside experimental dairy stations.

EXECUTIVE WORK BY THE DAIRY COMMISSIONER—GENERAL PROGRESS.

It is two years since the Government appointed a Dairy Commissioner for Canada, and I am glad to be able to report that in every province of the whole Dominion an increased interest has been awakened in dairying and in all the allied branches of farming. When the proposal to establish experimental dairy stations was concurred in, and when Parliament made provision for that work, I think we inaugurated one of the best movements in connection with improving the condition of agriculture that we have ever started in the Dominion of Canada. That is my own opinion, because I think it will have a very far-reaching influence on the profits and the condition of the people. The duties of my office, as set forth by the Order in Council appointing me, were specified as being mainly to give information by means of lectures. I have sometimes been twitted for running away from home so often and speaking in public so very much as I do; but my duties, as set forth by these instructions, were to give lectures on dairying and improved methods of agriculture. Since my appointment, the duties of the office have been multiplied; they have been largely increased, and the sphere of our work has been extended gradually. While I give many lectures, I spend the larger share of my time in executive work and in planning how to develop dairying, and to improve agriculture in all the provinces.

It may be interesting to examine the data of a few features of this work. Last year I was able to attend forty-nine conventions in the different provinces of Canada. At most of these conventions there were two, sometimes four, and sometimes five sessions; on the whole, I delivered some 100 lectures last year in different parts of the Dominion. These were given in the provinces in this order:—Ontario, nineteen; Quebec, eight (I have a special assistant in the Province of Quebec, who is a capital speaker in the French language, and he relieves me of much work there); New Brunswick, two; Nova Scotia, four; Prince Edward Island, three; Manitoba, three; North-west Territories, one; British Columbia, nine. Since the new year I have addressed twelve conventions in different parts of the country. Besides these meetings, my assistants (who, in addition to being experts in cheese and butter-making, are fair public speakers, in the sense of presenting their ideas in consecutive order, and in good language), attended 242 meetings, so that in connection with my work as Dairy Commissioner, we gave addresses upon 291 occasions in 1891. The

MR. JAMES W. ROBERTSON,

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number of people in attendance varied all the way from two dozen up to six hundred. I think the average would run nearly 100 persons. We came into direct contact in meetings with nearly 30,000 people last year. That means a great deal. It means this: That every man who attends a meeting becomes interested in our work, and reads every publication with more profit to himself and a more hearty appreciation of what we are trying to do in educating the agricultural community. We have not spared ourselves in that work, but have tried to attend as many meetings as possible, for the purpose of awakening an interest, so that farmers could learn and examine what we are doing for them. Besides, my assistants and myself have been able to visit 194 cheese factories and creameries, and at these places we were able to give instructions to from three to fifteen different makers. In that way nearly half the cheese and butter-makers in the whole Dominion received directions from myself and my assistants in the carrying on of their business. That is telling in the quality of the product and the general appearance of the factories so much, that cheese buyers tell me that now when they enter the factories they find a better appearance in the building; it is kept cleaner and tidier, and the men take more interest in their calling than they did before.

DAIRY WORK, AND RESULTS OBTAINED IN THE SEVERAL PROVINCES.

Now, Sir, it may be the better plan (after giving you these facts connected with our work in a general sense), to specify what we have done in each of the several provinces. In the Province of Ontario we visited 75 cheese factories and gave instructions to the cheese-makers there, and to all the others in the neighbourhood who attended, giving illustrations of the best methods of testing milk. We also had a meeting on nearly every occasion with the patrons of the factories, giving them instructions about the care of the milk at home and its preparation for the factory. That part of our work was undertaken just before I had the honour of being called before the Committee last year. Our experts were carrying on the work of travelling instruction, while we were getting ready for the starting of these experimental dairy stations.

When these were undertaken, we began to carry on experimental investigations at two points in the Province of Ontario. The object of these investigations was two-fold: We wanted to find out the very best method of making cheese, so as to obtain the largest yield and the best quality; and then we wanted to get a large quantity of cheese for shipment to the English market, so that we might advertise there how excellent the quality of Canadian cheese was, when sent forward under our own brand. Without disarranging the matter I have in hand, I might put in here that we found, in the course of our work last year, that we can make at least half a pound more of cheese from every one hundred pounds of milk, and make it quite as good as has been the practice in many factories in the Province of Ontario for the past few years. The same applies to Quebec and other parts of Canada. Now, if we can adopt methods by which many cheese-makers can get half a pound more of cheese from one hundred pounds of milk without any extra expense, it will certainly be a great advantage to everybody who is interested in dairy farming. The cheese from these experimental stations were shipped to the English market, branded "Canadian cheese," and were exhibited at different points, namely, London, Manchester and Kilmarnock. A good deal of attention was called to our country and to our products through the English press, by the comments that they made on these cheese, which were known as coming from the "Dominion Experimental Stations."

CONVERSION OF CHEESE FACTORIES INTO CREAMERIES—WINTER BUTTER-MAKING.

I need not detain the gentlemen of the Committee by a statement of the specific methods of manufacture, as that would be too technical; but I may say that after carrying on the work at these two stations—one near Perth, Ontario, and the other near London, Ont.—we carried out the plan of altering two cheese factories into

creameries for making butter during the winter. Our cheese trade has attained a position which gives us great national credit, and gives our people a great deal of profit. Our butter trade has been gradually getting a worse reputation, and has been gradually shrinking in its volume. A few of us had the notion that we could bring our butter trade up to an equality with our cheese trade, both in point of reputation and point of volume; and I think that will be attained in a few years. To bring that about, however, we considered that the men who support cheese factories during the summer time, and necessarily feed their cows all winter, should by some means be encouraged to feed these cows to some purpose and profit through the winter, by having the milk from the same cows made into butter when it was dearest, and could be transported without injury. This might have been done years ago, but there is still a feeling of timidity on the part of the farmers as to the feasibility of the project, and, therefore, I did everything I could to induce the Government and Parliament to make provision for starting creameries in cheese factories, knowing that farmers would soon copy the plan and practice. As a matter of fact, this was our manner of procedure.

MOUNT ELGIN WINTER CREAMERY.

At Mount Elgin, Ontario, we arranged to rent cheese factory buildings from the company that owned them. We paid \$100 a year rent for the use of the premises, the company agreeing to make the necessary changes, by way of putting on double windows and sheeting the inside so as to make the place tenable during the winter. Then, on behalf of our department, I arranged to put in the butter-making apparatus, so that the company was at no expense, except in the fitting up of their own buildings, to exclude the cold during the winter months. The butter-making apparatus at Mount Elgin cost about \$350, in addition to the apparatus that was then in the building for cheese-making use. Then we put in a centrifugal cream separator at a cost of \$330, so that the apparatus cost about \$680. The shafting, pulleys, belting, pipes and fitting expenses cost about \$150 more. The Government still owns that property, although the company has the right to buy it at a valuation if we should give up the work in that factory; on the other hand, if the company does not want to buy it, they can put in their own apparatus and we can take ours away. It is a fair business transaction.

Then our business arrangement with the patrons of the factory was this: We agreed to make butter from the milk which they furnished and delivered at the factory, charging them three cents per pound of butter for the expense of manufacturing, and providing tubs, fuel and other incidental furnishings. Three cents per pound will pay any ordinary manufacturer for carrying on the business of butter-making when he gets a large supply of milk or cream delivered. It will not meet our expenses this year, because for two months we kept the factory running for educational purposes, so that cheese-makers might go there and learn butter-making, to be prepared to put their own factories in operation as creameries next year. It would, however, meet the expenses in coming years on that basis. On the basis upon which we worked it, a profit could be realized by the factory patrons in other years if they managed their own business. Then we had milk testing carried on every day; and we established the plan of paying for milk according to its quality. Last year I brought this matter before the Committee, and both here and in the country outside a good many gentlemen feared that discrimination in the price of milk would lead to irritation and dissatisfaction. Quite the opposite has been the case. By paying for milk according to its quality, the men who had rich milk are better satisfied, and the men who had poor milk are wondering why they cannot have as good milk as their neighbours. The general quality is being improved, and everybody is satisfied with the plan of paying for milk according to its quality. This is the only safe and equitable business basis to establish. This comes to my mind as an illustration—because when I come before the Committee again to give you a talk on our work at the Experimental Farm I would like to justify the position I took last year in regard to the effect of feed upon the quality of milk. I have done as I said I would do. I put a lot of 25 cows

under test for over five months, and if it is desired I will bring the conclusions and the records before the Committee. Meanwhile, let me give you this as an illustration, showing how a fallacious theory may lead a man to a wrong practice. One of the patrons at the Mount Elgin creamery had 20 cows. He was a man of independent means who had a large herd of dairy cattle, and he said he would patronize the creamery—mainly for the purpose of getting a good name for the best milk that was taken there. He had been feeding his cows in the ordinary way, on corn stalks mainly, with almost no meal, and allowing them to go dry about December. He told his stable man he was to feed every cow ten pounds of ground barley every day with the usual amount of fodder, expecting thereby to so improve the quality of the milk that he would have the name of sending the richest milk to that factory. He did not do this for profit. He sent his milk to the creamery, and when he looked at the Babcock test record next morning he used some very bad French to the man in charge: he said something I would not care to repeat here, because politicians have no such things said in their hearing. But in this matter he was very indignant at this Babcock test for showing him that his milk was poor. He blamed the tester, and was willing to kick the apparatus outside the factory. He said he would not send any more milk to the factory, but he did send it next week, and did not send any more after that. The Babcock tester showed, however, that even out of his poor milk more butter could be produced at the creamery than he himself could produce at home with his own appliances. It turned out that his milk was poorer than usual because he fed his cows with an excess of meal, and barley meal at that. This agrees with our experiments at the Experimental Farm, but I will enlarge on this point next time I appear before the Committee.

By Mr. Cochrane :

Q. Can you make the milk better by feeding any kind of grain?—A. You can make the milk richer in colour and flavour, but not in percentage of solids at once.

Q. You get more milk from the cows but no more butter per 100 pounds of the milk?—A. That is it exactly.

Q. The Mount Elgin man evidently did not understand what he was doing by changing the diet so suddenly?—A. He commenced to give the cows barley meal at once, and thereby deranged their digestion. Farmers should learn not to throw away feed. The ordinary impression is that extra-rich feed will make extra-rich milk. It will make milk extra rich in colour, and sometimes extra rich in flavour, but it does not make an increase in the percentage of butter, except perhaps in Jerseys; and I will say this, that with none of our own Jerseys at the Farm does it do that.

Q. Your assistants should dwell on that point. The farmers have been taught to believe that the better you feed a cow the better the milk?—A. A full statement of our practice will be published in the Annual Report, and from our conclusions every man will be able to see what is the best practice for him to pursue. The farmers around Mount Elgin were satisfied at receiving pay for their milk according to its quality, and the variations have been quite considerable. Some men were paid for five pounds of butter per 100 pounds of milk, and some less than four pounds of butter for every 100 pounds of milk. However, they were satisfied. The man who sent to the factory milk deficient in butter fat feels that he has no right to receive a portion of that which his neighbour is entitled to for supplying better milk, while the man who has the better milk knows that he is being remunerated according to its better quality. The arrangement was carried out on a perfectly fair basis, and was, therefore, satisfactory to all concerned. After making a bargain like that, we agreed to advance to the farmers, at the end of every month, 15 cents a pound on the butter that was made from their milk, the object being to give payment on account while waiting for the returns from the butter.

PRICES OBTAINED FOR CREAMERY BUTTER.

The butter was sent to the English market chiefly. We realized, for some of the shipments sent there, 123 shillings for every hundred weight (112 pounds). I

expect it will realize for us at Ingersoll station between 24 and 25 cents a pound in the tubs. I have not got the full account of the sales yet, owing to the fact of the butter being distributed to some twenty different places in England. Then we sent some to British Columbia, which realized at Ingersoll 24 cents a pound. It was sold in the Pacific province for 30 cents a pound in tubs. We have also sent some of this butter to Montreal, which was sold there for 24 and 24½ cents a pound in tubs. We have been getting 25 cents a pound for it in pound prints, the purchasers paying the express charges. Up to the end of March I expect that the patrons of the factory at Mount Elgin will realize about \$1 for every 100 pounds of milk, and have all the skim-milk for their own use besides. That seems to me to open up a branch of business which can pay the farmers remarkably well. The farmers at Mount Elgin express themselves in this way—and I find that the farmers, in their expressions, often get as near the truth as scientific men with their technical expressions. The farmers say the skim-milk has been worth to them, for feeding calves and pigs, all the cost of the extra feed given to the cattle during the winter to keep them milking; that is, the skimmed milk has been calculated as equal to the cost of the extra feeding. The receipts from the butter are really a direct gain, which they would not otherwise have had at all.

PROSPECTIVE INCREASE.

Now, I believe we can have within ten years \$5,000,000 from the sales of winter-made butter along these lines. The skimmed milk through the winter would quite make up for all the extra expense of feed, leaving a clean gain of \$5,000,000. I do not know of any other system of farming whereby you could get that clean gain without more expenditure. I do not mean to say that this is only possible, but to say it is very probable we will have within ten years at least \$5,000,000 worth of winter-made creamery butter going to England, with cash coming back to the farmers. Now, gentlemen, if you have any questions to ask on the business at Mount Elgin I shall be glad to answer them. If not, permit me to give you a brief outline of the work at Woodstock.

By Mr. Cochrane :

Q. What would you put in that cost this \$680?—A. We put in a power churn, two cream vats, a butter worker, a centrifugal cream separator, and small utensils which are mentioned in my report.

Q. They had the engine and boiler?—A. Yes, they have them in cheese factories. Then we had to purchase in connection with that business, cream vats. But in the ordinary cheese factory the milk vats could be used for both purposes. From \$350 to \$450 would be the expense of altering a cheese factory into a winter butter factory upon the cream-gathering plan. For \$350 more a centrifugal cream separator could be put in.

By Mr. Roome :

Q. Do they deliver the milk themselves?—A. Yes, but had we collected the milk we would have charged one cent per pound of butter more for manufacturing.

Q. In the cheese factory, the factory generally gathers the milk?—A. Yes, usually.

By Mr. Carpenter :

Q. The profits from butter-making during the winter are much larger proportionately than during the summer. You are estimating a return of ten cents a gallon for the milk, and over and above that the use of their skimmed milk for calves and pigs. I do not think you can show in cheese-making above six or seven cents per gallon. Of course, there is a difference in the cost of the food?—A. I put my comparison to show the great possibilities of butter-making. I am merely putting the gain by this practice as against the loss from the previous and present practice. The cows require to be fed all winter in either case. I have not charged the feeding

of the cows against the butter, but only the cost of the extra feed, which is given above what would be required if the cows were dry in the winter. That extra cost is compensated for by the skim-milk. According to the common practice in the past, farmers have been feeding cows in the winter and getting nothing back, because they were dry from November.

By Mr. Cochrane :

Q. I understand you to say that would realize \$1.00 for each 100 pounds of milk?—A. Yes, about that; but the account sales have not been received in full.

By Mr. Wilson :

Q. That includes the extra feed, not the ordinary feed?—A. You would realize that per 100 pounds of milk from the sales of the butter.

By Mr. Bain (Wentworth) :

Q. They had to board the cow, anyway?—A. Quite so.

Q. And you charge the cow with the extra feed you give it?—A. The skimmed milk was equal in value to the cost of the extra feed in the opinion of the farmers themselves.

Q. And then this was the value of the milk you got in consequence of this?—A. It was the value of the butter obtained from the milk.

Q. There is another side of the question. You mentioned that you paid the patrons according to the quality of their milk; and the man who was paid less, because his milk was of an inferior quality, was as well pleased as the man who furnished better milk and got a higher price. You also told us that the higher feeding did not improve the quality of the milk, but increased the quantity. Where does the difference in the quality come in? Is it in the breed of the cow?—A. Almost entirely in the breed and individuality of the cows, and also in the previous feeding and care of the cows for perhaps four or five years.

Q. The steady general care?—A. Yes. I think when we carry this work on for three or four years we will find an appreciable difference in the quality of the milk, in favour of cows well fed; but the main difference is in the breed and individuality of the animals.

Q. I presume, then, in the same breed you find a wide difference in the quality of the milk from the individual cow, do you not?—A. A wider difference within the breeds than between the breeds.

Q. But now and then there is a cow comes in with very inferior milk?—A. Yes; in every breed.

By Mr. Roome :

Q. You think no improvement could be made in the animal by cautious feeding?—A. You can improve the general quality of the animal by good care from calfhood upwards. You cannot change the composition of the milk very quickly by feeding not very quickly. You cannot alter it (as far as our experiments have gone) appreciably, within two or three months of feeding. You can alter the total quantity of butter by increasing the quantity of milk. If you give her better feed, the cow will give you a larger quantity of milk, and it will be more wholesome, too.

By Mr. Bain (Wentworth) :

Q. I suppose the farmer with the richer quality of milk is the farmer known to have given continuous good care to his stock for a series of years?—A. Yes; but let me say this also, that the person who sends the richest milk does not make the most money always, as his cows may not be cows that gave a large yield of milk at that time of the year. While the milk may be richer, he may not be paid as much per cow as the man who sends milk of a poorer composition, but in larger quantity per cow.

Q. I can conceive that the farmer who fed his cows ten pounds of meal in the morning, and expected the milk at night, did not know much about the internal economy of the animal?—A. Especially if it was barley meal which he fed.

By Mr. Cochrane :

Q. What is the food that the cow will respond to quicker than meal?—A. She will respond to oil-cake and bran quicker than anything, next to fine grass.

By Mr. Bain (Wentworth) :

Q. In point of fact, bran has a very high value?—A. I think it stands higher per pound for increasing the milk than most other foods. You will get better results from a half ration of bran and some other meal than from bran alone.

By Senator Perley :

Q. Bran and oats would be first rate.—A. First rate, next to bran and pease, which are the best.

THE WINTER CREAMERY AT WOODSTOCK.

At Woodstock, which is comparatively close by, we adopted a rather different basis for carrying on the winter butter-making. We thought it was better to have a comparison between the method of collecting the milk and separating the cream by means of a centrifugal machine and the method of having the farmer set the milk at home and furnish the cream only to the factory, keeping the skimmed milk for feeding purposes. At this factory the apparatus cost some \$350, besides the shafting, pulleys, belting, etc. We did not require to provide a centrifugal cream-separator.

The business arrangement of the company was similar to the arrangement at Mount Elgin; we paid \$100 a year for the use of the premises and the company put the building in repair fit to be occupied during the coldest weather.

TERMS WITH PATRONS.

Our agreement with patrons was similar to the agreement with the patrons at Mount Elgin. We charged four cents per pound of butter for collecting the cream and making the butter in this case.

The patrons set the milk in deep-setting pails at home, and after taking off the cream, use the milk for calf-feeding, or other purposes. We have an oil-test churn; and the driver brings a small sample of each patron's cream to the creamery. We are enabled to test the quality of the cream, and have been paying for cream according to its quality. Then we compare the results from the oil-test churn with the total quality of butter churned every day, and we have never on any occasion been more than two pounds per day out. The total quantity of butter due to each farmer by the oil-test churn is recorded; and the total quantity from all the patrons is ascertained by addition. Then the total weight of butter from the churn is obtained by weighing. We have never found more than two pounds of difference between the actual quantity of butter made and the quantity called for by the oil-test churn. At the end of the month we found ourselves only a pound or two out in the whole month's make. As we were able to pay each patron according to the quality, some farmers were realizing nearly twice as much per inch for their cream as others. This arises from the different method of setting the milk. You can make cream very thin by setting, or very dense and fat.

In this case, also, the butter was sent to England, and did not realize on the first shipment—the only one of which I have any exact report—within ten shillings per hundred weight as much as the butter from the creamery where the milk was delivered and the cream was obtained by the use of a centrifugal separator. That is equal to nearly $2\frac{1}{2}$ cents per pound less value in the English market.

By Senator Perley :

Q. Was it sold in the same market?—A. The same market, the same place, and the same time.

Q. Was it bought on its merits?—A. It was sold in England under a brand on its own merits.

Then there was a clamour at this Woodstock factory, on the part of some of the farmers who had the largest quantity of milk, for the use of a centrifugal separator in place of the method we had adopted of collecting the cream. I arranged as soon as possible to put a separator into the Woodstock creamery. We have now been running a separator there for several weeks, and the farmers do very much better with that than by using the deep-setting pails at home.

We have been carrying on work at the Experimental Farm during the whole winter to supplement and complete our investigations at these creameries. Whatever we could not do at the creamery we have been doing at the Farm, and what we could not do at the Farm we have been doing at the creameries.

MILK TESTS BY DIVISION OF THE HERD INTO GROUPS.

To determine some points of difference at the Farm, I had the milk from our cows put into three groups. I had the cows themselves put into three groups—the cows that had calved eight months and upwards, the cows that had calved five months and upwards, and those from one to two months from the date of the last calving. Now, by the best system of setting milk in the deep-setting pails in cold water without the use of ice we lost 37 per cent of the butter fat in the milk of the cows calved more than five months. That is a pretty serious thing to have continue in the country, and is one of the things in regard to which our creameries propose to do the most for the country.

VALUE OF ICE IN MILK SETTING.

I want to make that clear to the members of the Committee: that by the best method of setting milk in cold water, without the use of ice (and very few farmers have ice), we left 37 per cent of the total butter fat in the skimmed milk. Then, by setting the milk from the same groups of cows, calved more than five months, in ice water of a temperature of 38°, we lost 28 per cent. That is, we lost from one-third to one-quarter of the butter fat by the deep-setting method, whereas by the centrifugal cream separator we lost only 3 or 5 per cent. In other words, we obtained from one-quarter to one-third more butter from the same milk by the use of the centrifugal cream separator than by the method of setting milk in deep pails, from cows calved more than five months. That means a great deal for the country.

By Senator Perley :

Q. What was the temperature of the water you set it in?—A. From 45° to 48° without ice, and 38° with ice.

Q. Would that be cold enough?—A. That is as cold as any ordinary spring water.

Q. How do you get that without ice?—A. We get water from the waterworks system.

By Mr. Wilson :

Q. I suppose the reports will contain all these facts?—A. Yes.

FEEDING VALUE OF SKIMMED MILK.

There is one point more I want to touch on. By the use of ordinary shallow pans in the setting of milk you do not lose more than 10 per cent of butter fat during the winter time. We are still running the creamery at Woodstock, because the farmers there are beginning to appreciate the value of the skimmed milk for raising calves. In Woodstock they raise a good deal of stock, and value the skimmed milk for that purpose. In those parts of Canada where they want to keep on raising and feeding animals for export, in the form of fat cattle, there is no doubt but that we may have creameries without any deterioration in the

qualities of the animals raised, because the calves can be raised on skimmed milk during the winter, even where cheese factories exist. If they adopt the method of altering those factories into creameries, they will have as good, or better, beef cattle for shipment than they have now in those places where no cheese factories exist.

By Mr. Cochrane :

Q. I understood you to say a gentleman told you skimmed milk paid the extra feed. Was he feeding it to calves? A. Feeding it to pigs; but when I said that I did not mean any individual particularly. That was the report of my assistant in charge of the creamery, as the general consensus of opinion, expressed at a meeting held in the neighbourhood. Dairying was the main topic of discussion, and the general opinion expressed was that skimmed milk, for all the purposes of the farm, was quite equal to the value of the extra feed they were giving their cattle.

From applications that have been made to me, the probability is that we may have at least twenty-five cheese factories in Ontario altered and running as butter factories this next winter. Already there are eight or nine separators purchased and being used this spring by way of obtaining experience. Others are waiting to put them in next fall. I expect that we will have this next winter at least twenty-five creameries running in cheese factory premises, and in a few years we will have them quite common.

By Mr. Tyrwhitt :

Q. In extracting the butter from the milk by this centrifugal process, does it matter what state the milk is in, whether it is fresh from the cows or if it has to travel for any distance in the cans?—A. It will take the butter-fat all out in either case, but the milk should be warmed to 85° by the use of steam before it is run through. The age of the milk has little or no influence, as long as it is sweet.

By Mr. Semple :

Q. It would follow that the most profitable way is, not to set the milk at the farm, but to have it go from the farm, and the cream be separated at the factory?—A. Yes; with this qualification:—Where there would be only a small quantity of milk the extra expense of hauling the milk might equal the value of the extra amount of butter realized.

Q. Is there an opportunity afforded to farmers to get their skim-milk back?—A. They are not required to wait more than fifteen minutes to get the skim-milk back again in the same cans. I think that will be the general plan adopted through the country.

By Mr. Cochrane :

Q. If it would not interrupt your speech, how do you account for the difference in the price of the butter obtained from these two factories?—A. When we collected the cream at Woodstock it was raised in every kind of place and in every kind of condition. When we separated it ourselves, it was under the care of a skilful butter-maker all the time. The product of these two factories was sold in the same market at the same time.

By Mr. Tyrwhitt :

Q. I think you have told us that the cost of these machines for extracting the cream is \$300?—A. \$330 to \$350 for the largest size, which will separate 3,000 pounds of milk per hour. A small hand machine that will separate 25 gallons per hour can be purchased for \$100. Perhaps I am not quite justified in saying that; ours cost \$80, but I believe \$100 would be about what they could be purchased for.

DAIRY COMMISSIONER AND AGRICULTURIST.

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MARKET VALUE OR FLAVOUR IN BUTTER, AND HOW TO OBTAIN IT.

One point more that has some interest in this connection, and which I should mention to you, is, that while England imported last year over \$56,000,000 worth of butter—nearly twice as many dollar's worth as she imported of cheese—she got about forty per cent of that from Denmark; and the Danish butter was selling this winter, the very best of it, ten shillings per hundred weight higher than ours. The only fault that was complained of in connection with the quality of our butter was that it seemed to lack the rich, rosy flavour which the Danish butter had. The cause of that was this:—I want to explain it, so that our farmers may avoid it in coming years: there was not a single fresh-calved cow supplying milk to the creamery until the middle of February. We made specific inquiries at Mount Elgin on that point. Now, I supplemented our work at these stations by work at the Experimental Farm. I had butter made from each of three groups of cows—cows calved more than eight months, cows calved more than five months, and cows calved not more than three months. In every case the butter from the fresh-calved cows would have fetched in the English market from ten to fifteen shillings more per hundred weight than the butter from other cows fed on precisely the same feed. The butter from fresh-calved cows is better in flavour. By having a few fresh-calved cows in each herd supplying milk to our creameries, we can get as much for Canadian butter as is obtained now for the best Danish butter. The deficiency in the flavour of our butter was due entirely to the absence of fresh-calved cows.

By Mr. Fauvel:

Q. In Denmark, have they the same means as we have here?—A. Yes; but they use more hand labour. We can equal them in every sense, and I think we can beat them in the respect that we can feed our cattle cheaper. They cannot grow Indian corn to advantage, but feed their cattle on the pulp from sugar beets instead.

By Mr. Semple:

Q. Does the system help them in making butter in Denmark?—A. They make their butter in winter, as we should here. The practice there is this:—The period when the cows are dry is July and August, and most of the cows are made to come in from August to November; therefore, they have this rich, rosy flavour in their winter butter which ours lacks; and they also have a large supply for the English market when the price is highest.

By Mr. Cochrane:

Q. What do you mean by making butter by hand?—A. They use their hands for kneading it, instead of using the butter-worker. They do the actual work with their hands, just as they knead bread with their hands. I would not like to trust to that here; I do not approve of that system.

By Senator Perley:

Q. How long after a cow is calved do you call her fresh-calved?—A. There is no specific period.

Q. Three months?—A. The flavour begins to disappear, mostly, after the cow is calved from five to six months, especially if she has been served again and is in calf. The flavour begins to disappear then very quickly, and when the cow is well advanced in pregnancy the butter-fat is insipid.

By Mr. Roome:

Q. Could butter made during the summer be kept until the winter?—A. Well, it would have a stale flavour. It loses its delicate flavour by being kept.

Q. Do you think butter-making in summer would be as profitable as cheese-making?—A. To a limited extent it might be; but not for exporting to the British market. It loses the flavour which fresh-made butter has, and we should encourage the

farmers to have their cows calve, some in the spring for cheese-making and some in the fall and winter for butter-making. One point more before I leave this winter creamery part of my subject: There has been a notion in the minds of farmers that it was difficult to send butter to England, on account of the very great expense involved. Now, our freight charges this winter from Woodstock to Liverpool have been 55 cents per 100 pounds gross. These freight rates were inclusive of charges from the station at Woodstock or Ingersoll, Ont., until the goods were delivered at the dock at Liverpool.

By Mr. Bain (Wentworth):

Q. How does the heat of the steamer affect it?—A. It is put down in the part of the steamer where they ship bacon and such articles, and where it is comparatively cool. I think we should have refrigerator accommodation in all fast steamers for the shipment of butter and fruit.

Q. It will be necessary, to preserve the flavour?—A. It will be some advantage.

Q. That must be one of the advantages which Denmark has over us, in being close to the English market?—A. Yes, it is an advantage to them.

Q. Do you know how the Danes ship their butter to the English market?—A. They have good steamship accommodation, and some refrigerators. They did ship some butter, under Government auspices, in cold storage, all the way through, and some similar lots at the same time in the ordinary way, and the cold storage lots realized (if I remember aright) over 2 cents a pound higher in the English market than the other lots of similar butter which had not the advantage of cold storage.

Q. Even for that short distance?—A. Yes. You must remember that the Danish butter is nearly a week in transit. It is mostly sent to the east coast ports.

PROVINCE OF QUEBEC—DAIRY WORK.

I will pass on, and say something of our work in the Province of Quebec. As I have already intimated to you, my assistant, Mr. Chapais, has given most of his time to the French-speaking people of the Province of Quebec. (The only other portion of the Dominion he has visited has been amongst the French-speaking people of Manitoba.) In the Province of Quebec, Mr. Chapais visited 54 places. He was accompanied by an assistant who thoroughly understands the arts of cheese-making and butter-making. Mr. Chapais has excellent knowledge of the nature of soils, the rotation of crops and the best methods of cultivation. They managed to visit altogether 60 cheese factories and creameries, and gave instructions to 152 cheese-makers, 26 butter-makers, and 8 inspectors of syndicates. It will be seen that they covered the province as thoroughly as two men possibly could in the time.

By Mr. Cochrane:

Q. Why had you to send a practical cheese-maker with Mr. Chapais?—A. Because I have not an assistant who is an expert butter and cheese-maker, and is, at the same time, a thorough farmer, able to give information on the farming aspect of the business as it ought to be given. It is a difficult matter to find one man combining this dual knowledge. I believe in the good old-fashioned practice of missionaries going in pairs. Mr. Chapais, my assistant, is one of the best dairy farmers in the Province of Quebec, and thoroughly understands all about the cultivation of soils. I would like to make this aspect of my work clear. I repeat, that it is difficult to find a man—I have not been able to find one, and I think I have the pick of the men in this business in the Dominion—who understands the cultivation of the soils, the growing of crops, the feeding of cattle, and has also the technical and practical knowledge of making cheese and butter; but when I send one of each on a tour of instruction, I consider that I have sent a strong team.

By Mr. Edwards:

Q. Do you know any man who knows the whole of the business?—A. No; and I will add this, that if the members of the Committee would induce the Government to give more assistants to the Dairy Commissioner for the Dominion the money would not be wasted.

QUEBEC CHEESE IN THE ENGLISH MARKET.

The experimental work in cheese-making in the Province of Quebec was undertaken at Dunham, and these cheese were shipped to the English market, for the purpose of illustrating there that cheese from Quebec were just as good, in many cases, as cheese from Ontario. In Ontario four years ago cheese realized an average of a cent and a quarter a pound more than the cheese from Quebec. That was a tremendous difference. Last year the cheese in Ontario did not realize more than half a cent a pound above the average of the cheese in Quebec, and many lots of Quebec cheese were just as good, and sold as high, as cheese from Ontario. But there is still a prejudice in the English market against the cheese made in Quebec, on account of the inferior quality of the article sent from that province to the mother country in the past. By shipping the cheese from the experimental station at Dunham, with the Quebec brand on them, it has given a new impetus to the inquiry for Quebec cheese from the English trade for next season, on account of the fancy cheese sent last year. In addition to the cheese factory, we had a working dairy in operation at the Sherbrooke and Montreal exhibitions. We also had at Sherbrooke a display of cheese from Quebec, Ontario, British Columbia and Nova Scotia; and in that competition the Quebec cheese carried off the Dominion sweepstakes, diploma and gold medal. Lest the exhibitors might suppose that the judges would be biased in favour of their own province, I was able to secure the assistance of one of the best cheese experts in Great Britain, a gentleman who is one of the largest importers in the Scottish market. He was passing through Canada from Vancouver to England, and, being an old friend of mine, I asked him to act as judge in the competition. He accepted the task, and his verdict was that the Quebec cheese, on the whole, were the finest he had ever examined at any exhibition, either here or on the other side of the Atlantic. That was a good deal to say, and it has had the effect of causing Quebec cheese to be inquired for more this year than ever before.

DAIRY OPERATIONS IN THE MARITIME PROVINCES.

In New Brunswick, Nova Scotia and Prince Edward Island two of my assistants visited thirty-one factories and three creameries, and gave instruction to the persons in charge. The other part of the work undertaken there was on this line: In those provinces the farmers had a notion that as soon as they supplied the St. John market there was no other outlet for their produce. They said, "Ontario can ship her cheese to England, because her name is up, but ours will not fetch the same price." To disabuse their minds on that point, and to afford some light on the subject, we determined to ship to the English market cheese from Nova Scotia and New Brunswick, with the result that these cheese sold for the highest price we obtained for Ontario cheese. The farmers in those provinces now feel that if this be the case they might just as well make an effort to place their cheese in the markets of Great Britain, and we may fairly expect that they will endeavour to turn out a quality of cheese which will be saleable in that market. Then we had a travelling dairy in New Brunswick, and gave lessons in buttermaking from the platforms. My assistant in the work has attended from twenty to twenty-five meetings a month, and has awakened a great deal of interest down there. He has a silo of his own, and as a result of the first month's meetings, twenty-five silos will be built. That is the real, practical, useful work which we have been doing in New Brunswick.

By Senator Perley:

Q. Who is your agent down there?—A. Mr. S. L. Peters.

Then we have, in connection with our work in those provinces, a chance to distribute samples of corn. In a very few districts in the Maritime Provinces the farmers have grown corn for cattle feeding. Many of them thought that corn would not suit in their climate, that the nights were too cold for it to attain a proper state of maturity. To induce them to grow corn we decided to give away samples sufficient to plant a quarter of an acre. From the different meetings, after the

farmer listens to an address on the growth of corn, he is willing to go home and plough up a potato patch, put in corn and try the experiment. Many farmers actually did that last year. From these people I have most satisfactory and gratifying returns as to their successes, so that nearly every man who planted a quarter of an acre last year will put in two to five acres this year. They see it to be the cheapest way to feed cattle that they have tried, and they are satisfied with the results.

By Mr. Bain (Wentworth) :

Q. What kind suits the Maritime Provinces best?—A. Pearce's Prolific, Long-fellow, and Canada Yellow.

DAIRYING IN MANITOBA AND THE NORTH-WEST TERRITORIES.

Then in Manitoba and the North-west two of my assistants held meetings from July onwards. They visited 15 cheese factories and 10 creameries. We had cheese shipped from Manitoba to the Experimental Farm. I found the Manitoba cheese most excellent, and their keeping qualities rather superior to that of the provinces further east. They are specially rich in flavour, and the milk of that province also was richer than the milk in Ontario and Nova Scotia. It stands quite as high as Quebec, and these two furnish the richest milk in fat of all of the provinces of the Dominion.

Q. Have they any peculiarities as to texture?—A. They have rather a salvey and rich body with a close texture, on account of the large percentage of fat in the milk.

By Senator Perley :

Q. Why is that the case, if the quality of the food does not affect the milk?—A. In Quebec the breed is different. They have many French cows with a strain of Jersey blood in them, and in the Province of Manitoba they have been fed continuously on those rich grasses, and milked for a short period of the year only.

BRITISH COLUMBIA—ADAPTABILITY TO DAIRYING.

Then in British Columbia I went down the Okanagan valley, which is well adapted for mixed farming, where the people buy everything from Ontario which mixed farming should produce. They buy condensed milk, and cured bacon and oat-meal, and various products of mixed farming. I think the visit of Prof. Saunders and myself last year will induce them to produce those things for themselves, and begin to furnish the home market with those things, instead of seeking to find an outlet for products in China and Japan. I have been amused with the anxiety of some people to find a market in Japan, while they are buying condensed milk from Truro, and butter from Wolseley, in the North-west Territories. Down the Okanagan valley and the Fraser River valley, in British Columbia, they have an excellent climate and a most productive soil; but the people are only now beginning to go into farming in an economical and systematic manner.

I visited nine places there, and we will probably send a dairy instructor for part of the season this year. Just a few words more on the new work—and the immediate prospect—which we propose to take up besides continuing what I have outlined this morning.

PROSPECTIVE DAIRY WORK IN THE PROVINCES.

In Quebec we expect to have an experimental dairy station running during the coming winter, for the same purpose that we established the station in Ontario this past winter, viz. :—To induce the farmers down there to alter cheese factories into creameries, and have an income from that source during the winter months.

In New Brunswick we expect to have an experimental dairy station for butter-making in the summer and butter-making during the coming winter. The building

is now being erected, and we expect to be in it in June. It will be located near Fredericton. The Province of New Brunswick has at last awakened to the value of this method of farming, and the people so much so, that the Provincial Government have appropriated \$10,000 to be spent in promoting dairy work in New Brunswick. They have recognized the value of our work down there so thoroughly that in the conference I had with the Government of New Brunswick they offered to turn over so much of that grant, to be administered by our department here, as we could spend advantageously for them. And so with all the provinces: there is a manifest desire to have this business developed and put on the best basis.

In Prince Edward Island we are establishing an experimental dairy station to make cheese during the summer time. The building is now in course of erection, and the station will be in operation in the month of June. The object there is to have farmers turn their attention to making cheese in the summer time and butter during the winter. This year they will plant in Prince Edward Island one thousand times as much corn as they ever planted before, because we gave away samples last year, and induced the farmers to make experiments, with which they had gratifying success.

In Nova Scotia we expect to have a travelling instructor to visit all the cheese factories, with a view of improving the quality of the cheese.

In Manitoba we will have a travelling dairy giving illustrations in butter-making, just as soon as the seeding is past, when the farmers have leisure to attend the meetings.

In the Province of Ontario we expect to have cheese-making carried on in the summer, in continuance of our investigations, and then in the winter time we will give supervision, direction and inspection to those twenty-five or less factories which commence to make butter, in order to have the quality go forward uniformly fine. If necessary, it may be branded by our own brand, to obtain and retain the standing in the English market, and provide against anything going forward of an inferior quality. I fear I have trespassed upon the time of the Committee in some measure, and have only covered part of the ground I have been trying to cover during the year as Dairy Commissioner. I have not touched on the experimental work which is under my charge at the Experimental Farm.

CO-OPERATION OF PROVINCIAL GOVERNMENTS.

I desire to say that in every province of the Dominion we have had the heartiest co-operation from the provincial authorities. There is no exception to that statement. From British Columbia to Prince Edward Island, we have had the heartiest co-operation of the provincial Governments, and we are working in the utmost harmony and accord with them. I think we have been able to initiate and record more progress in regard to profitable dairying during the last year than was done during ten years of our country's history before. (Hear, hear.) These are my own conclusions after looking the situation over, and we hope to make still more progress this year than during the past year.

THE NEWSPAPERS.

We have been very much indebted to one circumstance for assistance. All through the Dominion the newspapers have given the facts of our work the utmost publicity. Occasionally I find a friend who chaffs me on the frequency with which my name is published. I find now that the dairy information is being published without my name—much to my satisfaction. But the attention which the press has given to this dairy work has induced the farmers everywhere to attend the meetings more numerous and to adopt the practices we have recommended more generally. There has not been a single dollar spent in advertising the work in that sense, and personally I am deeply indebted to the press of this country for the help they have given us. We have had columns and columns of appreciative commendation, and I cannot recall even one single paragraph that has been written for the purpose of

hindering our work. Not a single line has been written that had anything in it that was not meant for the benefit of the farmers and for the improvement of our work. I do not think any other branch of work in any other country ever got as much help, or was indebted so much to the press of the country for unsubsidized and unpaid help. I have to thank the Committee for listening to what I have said, and if I can come before you on another occasion I will be glad to give further particulars of our work.

By Mr. Cochrane :

Q. Your commissioner in Quebec addresses meetings. What mode of procedure does he follow?—A. We call a meeting, visit the factory, and spend two days, one day with the cheese-makers in the factory, and one afternoon with the farmers from the neighbourhood, when addresses are given. I think we must average from 150 to 200 people at every meeting going through the Province of Quebec.

By Mr. Fauvel :

Q. He has not been through all the Province of Quebec yet?—A. Mr. Chapais was in thirty-four counties.

By Mr. Cochrane :

Q. Would both these gentlemen address the farmers?—A. Yes; the object was this:—One man would give a practical lesson in cheese-making or butter-making, and would also give an address to the farmers on the care and handling of milk for cheese-making or butter-making; whereas my assistant, Mr. Chapais, would give an address on the growing of crops, the care of cows, and co-operative dairying, thus covering the two branches of the subject. For the summer work we wanted to give technical instruction in cheese and butter-making.

Q. Where are your factories situated in Ontario for butter-making?—A. At Mount Elgin and Woodstock.

Q. I understand you also had several factories in Ontario where you give instruction?—A. We had one near London, for western Ontario, and one near Perth, for eastern Ontario. We will have only one this year, near Perth, as our funds will not permit us to have more in Ontario.

Q. Then the gentleman who is travelling as instructor goes to factories all over the country?—A. He did last year, before we started these experimental dairy stations. He made cheese, and gave instructions to all who came.

By Mr. Roome :

Q. This plan of locating in one place will scarcely satisfy the whole province?—A. We have no other means of finding out certain things about the best practice in making cheese; and then, when we issue our bulletins, cheese-makers will know how to put our discoveries in practice.

Q. Why not do that at the Experimental Farm?—A. Because we cannot get the milk there. If we used our own cows, the cheese-makers would say: "The cows are under your own care, and are in the same condition as those from which we receive milk."

Q. Why does not the Agricultural Department ask for more money? Parliament has never refused them money?—A. I do not know why.

By Mr. Carpenter :

Q. Respecting the feeding of cows, I took it from your early remarks that you consider ten pounds of chopped feed too much for an ordinary cow, and five pounds too little. What amount would you recommend?—A. I would give six to eight pounds per day shortly after the cow calved, and after she has been calved for six or seven months I would reduce that, until she was receiving about two pounds per day by the time she went dry. The cow will shrink in milk anyway, and I find no profit from high feeding after the six or seventh months of lactation.

Q. With regard to your meal rations, are you in the habit of dividing it, or giving it more than once a day?—A. It is best to feed twice or three times a day.

Q. Then you think eight pounds sufficient for ordinary cows?—A. I think that is the maximum for an ordinary cow.

MR. TYRWHITT.—I think any body who has had experience in feeding knows that different animals under different circumstances require different quantities of food, and that you can train them to eat large quantities without getting adequate results. The feeder must carefully watch his animals.

By Senator Perley :

Q. What does this six or eight pounds of feed you speak of consist of?—A. Of barley, oats and pease. It is a good practice to feed milking cows one and a half pounds of bran per day.

Q. Suppose you are feeding bran and oats, how much bran?—A. Three pounds of each per day, with corn ensilage.

Q. How much bran alone could you feed?—A. I have never tried bran alone, but I should say that you could not feed more than five or five and a half pounds with advantage. When I speak on the next occasion concerning our work at the Farm, you will find that by growing wheat and pease together farmers will get very cheap feed to put with corn ensilage. It is a rather unusual mixture, but it has given the best crop.

By Mr. Edwards :

Q. What about pease, barley and oats?—A. That mixture will not give quite as rich a food as pease, barley and wheat, but it is a good combination.

By Mr. Carpenter :

Q. Would chopped barley with bran give you a pretty good food?—A. If barley forms more than one-third of the mixture it is not usually satisfactory.

Q. Do you believe in the theory of keeping water constantly before the cows? A great many of our farmers water them only once a day?—A. I prefer watering them twice a day, next to allowing them to drink pure water at will.

Having examined the last preceding transcript of my evidence, I find it correct.

JAS. W. ROBERTSON,
Dairy Commissioner.

COMMITTEE ROOM 46, HOUSE OF COMMONS,
WEDNESDAY, 4th May, 1892.

The Select Standing Committee on Agriculture and Colonization met this day, Dr. Sproule, chairman, presiding.

MR. JAS. W. ROBERTSON, Dominion Dairy Commissioner, recalled, addressed the Committee as follows:—

MR. CHAIRMAN AND GENTLEMEN,—When before you on the last occasion I confined myself mainly to the branches of work which I was conducting as Dairy Commissioner for the Dominion. The greater part of my evidence this morning will relate to the work under my charge as Agriculturist on the Experimental Farm. But before I speak of the branches of work at the Experimental Farm, I would like to add to the statement I made at the last meeting in reference to the shipment of butter from the Experimental Dairy Stations to England. Since then, I have received the first full account in detail of the sales of one of the shipments of butter from the Mount Elgin creamery. It may be of interest to the Committee to learn the detailed expenses of the shipment—that being the first shipment sent from Canada of winter-made creamery butter. The creameries have closed for the season, and are again

being operated as cheese factories for the summer months. At Woodstock, where the creamery closed last week, the patrons and shareholders held a meeting, and resolved to run the creamery next winter. They have found it so satisfactory that they decided they would run the creamery on their own account if the Government would not operate it. They also passed a resolution endorsing the movement, and expressing their thanks to the Government and to those who had carried on the work.

OPINIONS OF FARMERS IN FAVOUR OF CREAMERIES.

I will not detain you long, while I mention one or two facts, taken—no t from the official report of my own superintendent—but from the speeches of practical farmers who were in attendance at the meeting and gave expression to their views.

“Mr. Blow, who has sent milk to Toronto on former winters, receiving \$2 per 100 lbs. for it, said that he considered he had done much better this year by patronizing the creamery, provided they realized 20 cents per lb. for their butter, as is expected. He was highly satisfied with the result.

“Mr. E. Rinch considered he had made double as much out of his cows as he would have done if he had made his own butter.

“Mr. Kirkpatrick said it paid him better than selling milk in Woodstock at \$1 per 100 lbs.

“Mr. Schell said that in order to make money out of a farm one had to do it by feeding stock to produce either beef or milk, and with butter at 20 cents per lb. he considered the production of milk would pay better.

“Mr. Werry declared that if there was no more butter made in the winter at this factory he would have to sell his cows, as his wife says she will make no more.

“All the speakers laid great stress on the value of the skim-milk for feeding purposes. It was returned to them sweet.”

A resolution was passed, which I need not read to the members of the Committee, but the general expression of opinion has been in this direction: that the value of the skim-milk and buttermilk has been quite equal to all the cost of the extra feed they had to give to their cows. The cash received from the sales of butter was a clear gain above what they would have had in former years.

ACCOUNT OF SALES AND NET PROCEEDS OF SECOND BUTTER SHIPMENT FROM THE WINTER CREAMERIES

Now, the account of sales which I have received refers to the second shipment which was made. The first shipment was scattered over the country so widely that the full details have not yet come to hand. The butter sold in England for 12s. per 112 lbs. That was equal to 26.57 cents per lb., or a little over 26½ cents per lb. as the wholesale price in England. The freight charges from Ingersoll to Liverpool, including landing dues, amounted to 67 cents per 100 lbs.

The discount, the commission for selling, and guarantee at 4 per cent, amounted to 1.47 cents per pound, or nearly one and a-half cents. The shrinkage in weight (for which I cannot yet account, as it is rather an uncommon thing at this time of the year), amounted to .35, or about one-third of a cent per pound. The total expense, including shrinkage, between Ingersoll and the selling point, was equal to 2.49 cents per pound of butter, or nearly two and a-half cents. That butter will, therefore, realize to the farmers at the station at Ingersoll 24.08 cents per pound.

By Mr. McMillan (Huron):

Q. What would be the cost of gathering the cream and manufacturing?—A. We charge 4 cents per pound, which provided also for the packages.

By Mr. Wilson:

Q. Did you have to take the cost of manufacturing out of that 26 cents?—A. Yes. The price charged for manufacturing was 4 cents per pound at

Woodstock and 3 at Mount Elgin. To make a creamery pay well there should be at least 250 cows' milk furnished, in order to make the running expenses economical. The members of the Committee will please understand me clearly: the 4 cents per pound, which we charged this year, did not meet our expenses at Woodstock, because we kept the creamery running during the winter as a school, when we made about 70 pounds of butter per day, rather than close it up; but 4 cents per pound is an ordinary charge when creameries are established.

By Senator Perley:

Q. You charged 4 cents per pound, and each party got his milk back?—A. We charged that when we collected the cream.

Q. Did you not have some creameries at which the milk was brought to the factory and separated there?—A. Yes, and the farmers delivered the milk at the creamery. We charged 3 cents per pound for making the butter in that case; whereas we charged 4 cents if we collected it from them.

Q. They got the skim-milk at home in any case?—A. Yes, in both cases. When we sold the buttermilk for them it was paid for, besides the returns from the butter. I might mention in this connection that the quality of milk from different farmers furnished to this creamery varied from 4 per cent of butter fat to 2.93. That would be from cows calved this spring, when we ran the centrifugal cream separator for the last month. In every case we paid for the milk precisely according to its quality.

By Mr. McMillan (Huron):

Q. Were they all fresh-calved cows?—A. The milk was from farmers who were sending the milk of fresh-calved cows. There might have been a few strippers among them.

By Mr. McGregor:

Q. Do you account for that difference of quality by difference in feed?—A. Difference in the animals accounts for most of it. There is a probability that we will have twenty-five creameries running in the Province of Ontario next year which shall have been altered from cheese factories. The difficulty in getting this business developed quickly arises from the fact that the farmers have to spend from \$500 to \$750 in each cheese factory building to prepare it and equip it for the making of butter. The Governments of a few other countries have assisted farmers to speedily develop winter dairying. I want to cite to you the experience of the people of the Province of Victoria, in Australasia. In the Province of Victoria the butter trade was one of almost no consequence. The Government at first provided a grant to pay a bonus for the establishment of cheese factories and creameries in the province, and during the last few years they have also provided a sum of money for the payment of a bonus on every pound of butter which is exported. The butter realized for those who made it, on this basis, over 1 shilling per pound in London. The total amount voted by the Government of the single Province of Victoria last year was £30,000, equal to nearly \$150,000. That was not equal to the demand, on account of the large increase in the quantity of butter that was exported, and so it is now reported that the Government transferred from other appropriations enough to make the amount for this last year £53,000, or equal to \$254,000 paid in the way of a bonus on butter which has been exported. The avowed object was to give the farmers some assistance and encouragement until the business was widely and firmly established, and then leave commercial enterprise and manufacturing energy to carry it on afterward.

By Mr. Bain (Wentworth):

Q. Were they looking to the English market?—A. They shipped to the English market, and were selling their butter for 112 to 126 shillings per 112 lbs. during the winter.

Q. Did they ship in cold storage?—A. Yes.

Q. How many days would the butter be in transit?—A. About forty-five days. The imports into England in 1890 of butter from Australasia reached a value of £168,000 stg., as against a total value of £22,000 stg. in 1887. That is, they sent in 1890 \$800,000 worth of butter to England, and that business is reported to be on such a solid and safe basis that it will run itself on a large scale hereafter. It strikes me that if the Government of any country considers it prudent to bonus any article of produce which is exported no one article could be bonused with greater advantage to the people than creamery butter made during the winter. A little help to this industry for three years—no more than that—would give it such an impetus that we would make more butter the fourth winter than we would make in ten years without some assistance of this kind being given. I think I know the attitude of farmers pretty well, and the spending of \$500 or \$750 for new machinery is a great deterrent from going into any business. After a number of sections have commenced operations in this way, I believe winter dairying in creameries would take the same shape as cheese-making has taken, and that it would run independently very quickly.

BRANCHES OF EXPERIMENTAL WORK UNDER MR. ROBERTSON'S SUPERVISION.

If I may pass to the statement of the work of which I have charge at the Experimental Farm, I would like, for the sake of clearness, and to economize the time of the Committee, to put it under six different heads, so that the questions of the members of the Committee may be reserved for the different subjects in their regular sequence: (1.) I shall present a brief summary of the experimental work in the dairy building; (2.) I shall lay before you a statement of the results we have obtained from feeding three groups of cows upon rations of different richness, as to their composition, during the winter; (3.) I shall give you a statement of the conclusions from the feeding of ten different lots of steers on different rations and of steers of different ages; (4.) I will state to the Committee a summary of experimental work on the fattening of swine on the ordinary grains and on some frozen wheat from Manitoba and the North-west; (5.) We have been carrying on (as members of the Committee interested in the Farms are aware) an experiment to discover how many cattle can be fed on the product of forty acres for the whole year, and I will present a record of our crops and the explanatory notes of them; (6.) The growth of corn is one of the important branches of our farm work, and as the subjects of ensilage and silos come under my care, I will mention some of our conclusions on that branch of the work also.

THE CENTRAL EXPERIMENTAL DAIRY.

Our work in the Experimental Dairy at the Experimental Farm has been made complementary and supplementary to the work of the branch Dairy Stations outside. Whatever we could not do at the branch Dairy Stations for want of apparatus for scientific accuracy, or for want of time to carry on the investigations to completeness, we undertook to do at the Central Farm; and whatever we could not do at the Central Farm, owing to not having supplies of milk from different patrons produced from different feeds and under different conditions, we did at the Branch Stations. The two together gave us a mass of information in regard to the making of butter in the Dominion. We have carried on a great many experiments in the setting of milk, for the purpose of discovering how best to recover all the butter-fat for butter-making. It might weary the members of the Committee if I were to go into details on this point; the information will reach the people through the report which will shortly be published. We had one experiment, by setting milk at different degrees of temperature: 98°, 88° and 78°, respectively, to discover if there was any difference in the recovery of the butter-fat. We ascertained that there was practically no difference in the recovery of the butter-fat due to the temperature at which the milk was set.

We carried on an experiment to discover the influence of delay in the setting of the milk for one hour, by mixing all the milk into one vessel and setting half of it immediately and leaving the other half for an hour. We found that there was a difference of 11·48 per cent of a greater loss of butter-fat, by leaving milk one hour before setting it, than by setting it immediately after it came from the stable. These experiments are not isolated or single tests, but are the conclusions, in most cases, of twelve or more repeated experiments.

Then we had milk set for 11 hours and for 22 hours, to compare the effect of creaming after these two different periods of setting. We found an average loss of 8 per cent more of butter-fat by creaming the milk at 11 hours than if left for 22 hours. A good many farmers have fallen into the habit of adding hot water to their milk, for the purpose of getting a larger yield of cream or butter by that method of treatment. We added 25 per cent of water at 160° Fahr, to milk and 25 per cent at 60°, and compared the results with those from the same milk to which water had not been added, and there was no appreciable difference in the amount of butter-fat obtained on the average of a large number of tests.

EXPERIMENTAL GROUPING OF MILCH COWS.

We had the cows put into three groups. One group represented the cows that were calved and had been milking for an average period of nine and a-half months; the other group of cows represented those that had been milking for six months; and the third group represented those that had been milking for a little over two months.

From the first group—from the milk of cows calved between eight and eleven months—we found that 31·11 per cent of the whole butter-fat in the milk was still left in the skim-milk by the best method of setting the milk in deep-setting pails. From the milk of cows calved more than six months 27·35 per cent of butter-fat was left in the skim-milk by the use of deep-setting pails. From the milk of cows calved from one to three months there was left in the skim-milk 15·93 per cent, or 16 per cent of the total butter-fat. In other words, from the milk of cows calved for nine and a-half months one-third of the total butter-fat was left in the skim-milk; from the milk of cows calved more than six months more than one-quarter of the total butter-fat was left in the skim-milk; and from the milk of cows calved an average of two months, about one-sixth of the whole butter-fat was left in the skim-milk. Wherever the milk from cows that are recently calved is mixed with the milk from cows milking for a long period, the separation of cream is more thorough. The idea of carrying on these experiments was to demonstrate to the patrons of cheese factories (who will very shortly begin the making of butter through the winter) that they would get no satisfaction from setting milk from cows which had been milking for more than five months in deep-setting pails; but if put through a centrifugal cream separator, all the butter-fat may be recovered out of any kind of milk at any time of the year.

Lest there might be something misleading in this experiment, we had it carried on further, to compare the efficiency of creaming with the deep-setting pails and the old-fashioned shallow pans. We are conducting an experiment with the centrifugal cream separator, the deep-setting pails and the shallow pans through each month of the whole year, for the purpose of finding out which of the systems gives the best returns at different seasons. From deep-setting pails, with the experiment lasting from the 8th to the 12th December, the loss was over 45 per cent of the butter-fat, and the loss in the shallow pans was something like $5\frac{1}{2}$ per cent.

By Mr. O'Brien :

Q. What was the age of the milk?—A. It was the milk of cows calved from periods ranging from eight to eleven months. I need not detain you with the details of further experiments. The conclusion we have reached so far in all our experimental work is this:—That the milk of cows calved more than six months, with the

shallow pan system, will give very much better returns than from the deep-setting pails; and also, that the milk of cows calved recently—say, from one to five months—in deep-setting pails, will give better returns than from shallow pans. The centrifugal cream separator recovers practically the whole of the butter-fat.

(Mr. Robertson here exhibited a chart showing the quantity of butter-fat, per 100 lbs. obtained from the various experiments.)

RESULTS FROM EXPERIMENTS IN CREAM RAISING.

He went on to say: The comparative results from three months' tests between the centrifugal cream separator, the deep-setting pails in ice water, and shallow pan setting, are these:—By the centrifugal cream separator plan the quantity of milk required to make a pound of butter was 23·71 lb.; by the deep-setting pails, 25·97 lb., by the shallow pans, 24·91 lb. That is practically 23 $\frac{3}{4}$ lb., 26 lb., and 25 lb., by these different methods. I might state to the members of the Committee, also, that all these figures I have touched upon so far are given in detail, with the full tables of the work, in the annual report of last year, but which is not yet ready for distribution. For setting milk, a common cheese factory milk-can was compared with deep-setting pails; and the loss of butter-fat was 6·2 per cent greater from the use of the cheese factory milk-can.

SUCCESSFUL EXPERIMENTS IN OBTAINING FLAVOUR.

We made butter from these groups of cows in different lots, with the object of discovering if the quality of butter was much different from cows at different milking periods, when fed upon the same feed in the same stable. The only complaint about our butter which went to England, from the Experimental Dairy Stations at Woodstock and Mount Elgin, was in regard to the absence of what they called the rosy flavour or bouquet. There was an absence of that flavour, which prevented it from realizing the same price as the very finest Danish butter. We did not find it possible, by any methods of making or setting the milk, to get that desirable rosy flavour when all the cows were calved more than six months; but by mixing the milk of one fresh-calved cow with milk from cows calved more than six months, we get the precise flavour we were seeking. And the reason why our first shipments of butter were complained of slightly, although they sold for the price I have mentioned, was due to the fact that there was not one fresh-calved cow whose milk was being furnished to the creamery. The want of a few fresh-calved cows accounted for the absence of this rosy flavour. This will not be the case again, as the farmers have a number of cows "coming in" this fall. Next winter's shipments should, therefore, bring 10 shillings per cwt. higher in the same market than did our shipments of this year.

By Mr. Bain (Wentworth):

Q. Did you use any colouring matter?—A. Yes, a small quantity; but we coloured much lighter than the people here ordinarily do, and the complaint in Manchester was that the butter was too high in colour.

By Mr. McMillan (Huron):

Q. You would consider it better to have cows coming in all the time for all-the-year-round butter-making?—A. Yes; to have the milk of some fresh-calved cows every month of the year.

EXPERIMENTAL CHURNING.

We carried on an extensive series of tests in regard to the effect of churning cream perfectly sweet and a portion of similar cream quite sour. So far, it has required 14 $\frac{1}{2}$ per cent more of cream to yield a pound of butter when it was sweet than when it was churned sour. We can recover just as much butter from sweet cream when we churn it very cold. The best temperature at which to churn sweet cream is from 42° up to 56°; but the time required is about two and a-half

times longer than with cream that is sour. For the ordinary practice of the farmer, it does not pay him to churn it sweet, as it will take him two and a-half times longer, and there is likely to be a loss in quantity.

Q. Is there any difference in the keeping qualities of sweet and sour-made butter?—A. As far as our experience has gone, the butter that is made from cream that has been ripened—that is, not very sour—keeps best. We have a number of glass jars packed, which are being tested from time to time.

Q. Is the flavour of the butter just as good when made from sweet as from sour cream?—A. It is milder, and rather insipid, as compared with butter made from sour cream.

THE TURNIP FLAVOUR IN MILK.

We commenced a series of experiments to discover the possibility of eliminating the turnip odour and flavour from milk and butter. We heated the milk to 160° in one case and made butter from it, and in another case we made butter from the same milk without heating it at all. In that experiment we were not successful in expelling the odour of turnips, and a larger quantity of milk—to the extent of four and a-half pounds—was required to yield a pound of butter than when the milk was not heated at all. That is, it required a larger quantity of milk, and there was only a very slight elimination of the odour of turnips. Then we took a portion of cream from the milk of cows fed upon turnips to a very large extent—the cows were consuming at that time 80 pounds of turnips per day. You will recognize that was too large a quantity for economical feeding, but the object was to make the allowance of turnips so large that the milk would be distinctly and decidedly flavoured with them. By heating the cream to 150°—we have been heating it higher since—we realized a rather larger quantity of butter, a better quality of butter, and we quite eliminated the turnip flavour and odour. The turnip odour and flavour are not there, and the butter is better in body, better in flavour, and is keeping better up to this time. We heated the cream just after it was taken from the milk, and we ripened it in the usual way. The butter was examined again on the 8th March last, when the previous judgment was confirmed. The butter was of a quality much superior to the butter from cream not so treated, and was without any odour of turnips. The butter from the cream not so treated has a stronger odour of turnips than it had when first packed.

That is all the notes I have here to-day in regard to our experimental dairy work. I have to apologize for consuming your time upon that technical branch of the work, in which many of you may not be interested; but it is of much value to the ordinary farmer, who will get his information through your reports, and he will be guided to better methods in his work at home.

By Mr. McGregor :

Q. How long do you ripen cream before churning?—A. From 12 to 18 hours, according to its condition. In this connection, I may say that the practice now being adopted in some dairies is to scald the cream when taken from the milk, and then to add a certain quantity of fermentation starter, so that the butter-maker will know how sour the cream will be in a certain time at a given temperature.

By Mr. O'Brien :

Q. I suppose the heating would eliminate any flavour beside that of turnips?—A. Any volatile flavour, such as that of leeks. I have not tried any experiments with leeks yet, but I think the treatment I have referred to would eliminate the odour of leeks as well as of turnips.

By Mr. McMillan (Huron) :

Q. After scalding the cream, do you keep it cool?—A. It is cooled down to 50° and then ripened as usual. It is ripened at about 60°, so as to get it slightly sour.

By Senator Perley :

Q. How long does it take to scald it?—A. That depends on the quantity. It should be held at the high temperature for about fifteen minutes, in order to get the best results.

Q. And then cooled rapidly?—A. Not necessarily. There is no gain or loss by slow cooling. We cool it by setting it in water. It would retain the heat for five or six hours otherwise.

EXPERIMENTS IN RATIONING MILCH COWS BY HERD GROUPS.

A matter of importance has been the series of experiments in feeding. I propose to present a few general facts to the Committee this morning, and I shall not give you the details, because the work is still in progress. Three days' work have been put on the conclusions I have here, and I have not more than enough to occupy your time for ten minutes. We have been carrying on a test, such as was suggested in the Committee last year, to discover the influence and effect upon the quality of milk, as to its composition, by giving the animals rich food in one case, and what is commonly called poor food, in regard to its constituents or nutritive ratio, in another case. I will give you an illustration of our work with the three pens which I hold in my hand, that will save me some talking and you some questioning. I selected twenty-five cows and put them in three groups, dividing them as evenly, as to weight, breed and length of time since calving, as I possibly could. We had a Holstein, Shorthorn, Ayrshire, a Quebec Jersey and a grade Shorthorn in one group, and then we had these breeds represented in each of the other two groups. After a cow calves in one group she gets a ration composed of 40 lb. of corn ensilage, 35 lb. of roots and 5 lb. of straw. That is the fodder part of her ration—a rather weak but very succulent ration. To that is added 4 lb. of meal made from a mixture of barley, oats, wheat and pease ground together.

The cows in the other groups of similar breeds, and as near as possible of equal weights, received the same fodder ration, with 7 lb. of meal per day. The meal was weighed separately, so that they got exactly what I mentioned to the Committee. Of the rough or coarser portion of the rations they were given all that they cared to consume. With respect to the third group of cows, it was arranged that when each cow "came in" she received the same fodder ration and 4 lb. of meal per day, beginning where the first group stayed all the time. After the lapse of two weeks the amount of meal was increased to 5 lb. per day for two weeks; at the end of that period it was increased to 6 lb. of meal per day—a progressive increase in the quality of meal each fortnight. A number of those cows have now reached 10 lb. of meal per day. One group of cows are on a low grade ration, one on a high grade ration, and the third receive a ration of progressive quality. The experiment will be continued until the cows of the third group obtain 12 lb. of meal per head per day. So far we have conducted over 9,000 single tests of milk. We have not based our conclusions on imperfect data. In those 9,000 tests the milk has been in every case tested morning and evening, except on Sundays, and I did not find any greater increase in the percentage of solids in the milk of the cows receiving the progressive ration than I did in the milk of the cows of the other two groups. That is the condition of affairs after four months of testing. The conclusion I draw is, that if a cow gets a succulent ration and not more than 6 lb. of meal per day, she will produce as good milk as the cow fed on the richer ration I have mentioned. I have figures here showing the percentage of butter-fat, the other solids in the milk, and the amount of meal per day allowed to the different groups.

By Mr. Bain :

Q. What do you mean when you speak of meal?—A. It is a mixture of barley, oats, pease and wheat ground together.

Q. No bran?—A. No bran; I would have added bran but for this circumstance, that the cows are being fed on the product of the forty-acre lot of land.

By Mr. McGregor :

Q. All have received the same amount of ensilage?—A. Just the same, as long as the ensilage lasted, and a ration of hay after the silo was empty.

By Mr. McMillan (Huron) :

Q. Do your experiments lead to the conclusion that an animal is not able to furnish a better quality of milk on the richer feed?—A. It leads to the conclusion that most of the cows we have on hand are up to the limit of their capacity for richness of milk, but that few of them are up to their capacity in quantity of milk. Many cows can be fed with more meal, by which the quantity of milk can be increased; but in the case of the cows at the Farm, I think they are almost all at their limit of capacity for percentage of solids.

Q. Some experiments in other places show different conclusions. I think there is an experiment recorded at the Government farm in Ohio which leads to a different conclusion. It is evident there is great diversity of opinion upon the subject?—A. I am well aware that there is diversity of opinion, but I have not been able to observe a reliable experiment which leads to a conclusion different from that which I have mentioned. I found in our cows that the same cow will vary from one day to another—that there will be the widest variation in the milk of the same cow in the same stable, fed on the same feed, as between the milkings on successive mornings or evenings. We have found a difference of 1.75 per cent of fat between the milks from the two consecutive evenings. There is a somewhat steady difference in the quality of the milk between the morning and evening milkings.

Q. What is the cause of that?—A. The longer the time that elapses between the milkings the poorer in solids will the milk be. If a cow is milked every three hours she will give you a richer milk than would be the case if she were milked at longer intervals.

By Mr. Cochrane :

Q. What effect had your feeding experiments in making flesh?—A. The animals are weighed every two weeks, and so far I have not discovered that the animals getting the richer food have increased in weight. They may do so by and by.

By Senator Perley :

Q. It is just so much food wasted, then?—A. Apparently. We will know that more definitely when we get to the end of our experiments.

By Mr. Rowand :

Q. Do I understand you that the quantity of milk produced is increased by the better feeding?—A. Yes, when you feed meal up to 6 or 8 lb. per day with succulent fodder, but when that is passed the food is largely wasted. Our experiments last year indicated that when we were feeding progressive or richer rations the cows which were getting more than 8 lb. of meal a day did not give us any proportionate return.

By Mr. McMillan (Huron) :

Q. Have you tried your experiments on cows in good condition or those in poor condition? My experience is, that as soon as a cow gets run down the milk becomes poor also.—A. We had no cows in particularly poor condition, but we had these cows fed on poor rations.

While I give these facts to the Committee, I would not yet say that my own opinion is that there is no difference in the quality of the milk consequent upon the difference in feeding, because we have carried on the experiments for only four months, and it may be that later on changes may be noticed. This I would like to say, that the colour of the milk, and apparently the flavour of the milk, are improved

a good deal by fairly rich feed. If a cow is receiving rather poor feed the milk will be deficient in colouring matter and flavouring also. Our work this year points to this, that dairymen, especially those who furnish milk to cities (and that is a branch of the work to which I have not yet been able to give much attention)—these dairymen are wasting very large quantities of feed. The volume of that trade is up to millions of dollars annually in Canada, and a city dairyman feeding 12 to 16 lb. of meal per day gets no better milk than if he fed from 6 to 8 lb. of meal per day to each animal. I am hopeful of being able to devote some attention to this branch of our dairy work hereafter.

By Mr. Hodgins :

Q. What style of package was used?—A. We used tin-lined tubs. The better tub to use would be a wooden package with parchment lining. If I have time now, I would like to pass on to a statement with regard to the experimental feeding of steers last winter.

By Mr. Featherston :

Q. If you have made any change from ensilage to hay feeding, I would like to know the result?—A. I did not make that change in the case of these cows. I made a change in the case of cows from corn ensilage to dried corn fodder to compare the value of these two feeds. So far, the corn ensilage is ahead in regard to maintaining the flow of milk in the animal.

By Mr. Girouard (Montcalm) :

Q. You told us in your first address that you had given lectures in the country?—A. Yes, some 293—myself and my assistants. I gave 49 myself at conventions in 1891.

Q. What is the average number of assistants?—A. I have seven men.

Q. Assistants?—A. Yes; not more than that. That does not include the workmen on the Farm and in the stables, but my assistants as Dairy Commissioner.

Q. I speak of the lectures you have given in different parts of the country—you gave 293?—A. Yes, 293.

Q. And the average number of assistants was seven at each lecture?—A. Oh, no; I have just seven assistants altogether, who attended these meetings, besides the other work we did.

Q. I see you do not understand my English. What was the average number of parties who attended your lectures?—A. The average of the attendance? Well, it varied from 15 up to 500. I think we had an average of nearly 100 at all the meetings, but there is no way of getting at the precise average.

Q. Do you remember how many lectures were given by your French assistant, Mr. Chapais?—A. He gave, I think, 54 lectures in 34 different counties. I have already arranged for him to start and deliver lectures during the end of May and June in those counties which lie eastward, and in the northern part of New Brunswick. French-speaking people live there.

By Mr. Featherston :

Q. Do you find there is much change in the smell or taste of milk from cows fed on ensilage?—A. None whatever, if the ensilage be well preserved.

Q. Does it sour in any way?—A. If the ensilage has what is called acetic acid, there is no sourness either in the taste or smell of the milk.

BAD EFFECTS FROM MAKING IMMATURE CORN INTO ENSILAGE.

Q. There have been a great many complaints on that score in Toronto with reference to the use of ensilage. A great many milkmen have had to abandon some of their customers on that account?—A. That comes from putting the corn into the silo in an immature condition, and producing what is called lactic acid in the ensilage.

Q. From cutting the corn too early?—A. From cutting the corn early, and when it has, perhaps, been grown too close together.

EXPERIMENTAL FEEDING OF STEERS ON VARIED RATIONS.

Now, in the feeding of steers I have a few words to say—first, on the handling of four steers which were dehorned. The dehorning was performed for the purpose of discovering the effect of that operation upon the animals, and also to illustrate the possibilities of feeding dehorned steers running loose in a large shed, so as to economize labour and save manure. We put two of these animals (which were three-year-old steers) upon a feed of corn ensilage. From the 1st of December until the 5th of April they gained an average of 28½ lb. each. One of the animals gained 50 lb., and the other animal gained only 7 lb., running loose and fed upon corn ensilage and 5 lb. of straw per day. The corn ensilage was poor. It was ensilage largely from the plots of corn on the Farm, which had not a sufficient number of ears upon the stalks to make it as good as it ought to have been for that purpose. Two steers of the same age, and having been treated the same way, were fed upon a ration consisting of ensilage, with 6 lb. of meal to 50 lb. of ensilage and 5 lb. of straw. These steers gained an average of 128 lb. from the 1st December until the 5th April, or an average of 211 lb. from the time they were first put up, on the 29th October, until the 5th April. They consumed an average of 65.96 lb. of the mixture per day, which meant that they consumed 6½ lb. of meal per day with the ensilage and straw. The meal consisted of 2 lb. each of oil-cake, pease and barley.

By Senator Perley :

Q. When you say they increased 211 lb. on the average, what do you mean?—A. Of the two steers, one gained 197 lb. and the other 225 lb. It was the average for the two. The gain for the feed consumed in the three-year-old steers was less than the gain for the feed consumed in the two-year-old steers, or the yearling steers, or young calves.

By Senator Perley :

Q. The younger the animal, the bigger the gain?—A. The gain for the feed consumed was least in a three-year-old steer, next in the two-year-old steers, and largest in the yearling steers and the calves.

By Mr. Featherston :

Q. You would not feed the calves or yearlings as much as you would the three-year-old steers?—A. We would give them of the same ration, but they would eat less of it, and gain in weight nearly as much per day.

By Mr. Cochrane :

Q. How much do you say the three-year-old steers gained?—A. The three-year-old steers gained an average of 211 lb. each from the 29th October to the 5th April.

By Mr. McMillan (Huron) :

Q. With 6 lb. of meal?—A. With 6½ lb., running outside in a cold shed, not in a warm stable. We had four lots of two-year-old steers. The one lot of two-year-olds were fed upon a ration of corn ensilage, 20 lb.; hay, 10 lb.; roots, 20 lb.; straw, 5 lb., and meal, 6 lb. Another lot were fed upon a ration of hay, 20 lb.; roots, 40 lb.; straw, 5 lb., and meal, 6 lb. Another lot received a ration of corn ensilage, 50 lb.; straw, 5 lb., and meal, 6 lb. And another lot were kept upon corn ensilage, 50 lb.; straw, 5 lb., and frozen wheat, 6 lb. Those on corn

ensilage, hay, roots and meal gained an average of 276 lb. each, and they consumed an average of 6 1·96 lb. per day, at a cost of 18·27 cents per day. Let me tell you how I have estimated the cost this year. I put the hay at \$8 per ton; straw at \$4; roots at \$4 per ton; ordinary grain at \$20 per ton, and the oil cake at \$30 per ton. I put the corn ensilage this year at \$2 per ton; I put it last year at \$1.40. I put it at \$2 for the reason that the ensilage was wilted more this than last year. A very bad hail storm struck our corn field in August, stripping the leaves and damaging the stalks; and I put the ensilage down at its actual cost in an unfavourable year, for the sake of comparing the result under unfavourable conditions with the favourable conditions of last year. I have put the prices here a little higher than the ordinary farmer would realize from the sale of the products I have mentioned. On the ration of hay, roots and meal the animals gained 266 lb. each, or 10 lb. less than the others. The animals on corn ensilage and meal gained an average of 332 lb. each. That is, they gained 56 lb. each more than the animals on corn ensilage, hay and meal, and 66 lb. each more than the animals on hay, roots and meal in the same length of time. There was the same quantity of meal in the ration mixture given to each animal, but some consumed more of the mixture than others, and therefore consumed rather more meal per day.

Our method of feeding is, that if an animal leaves any quantity of its feed it gets less in the next feed. If it eats that up clean, it is given the former allowance.

By Mr. McMillan :

Q. With us, every animal that has not its food eaten in an hour and a-half has what is left taken away; but we seldom have any to take away?—A. The point I want to make clear is this: That the gain on corn ensilage and meal, with 5 lb. of straw, was highest by 56 lb. per steer. The second highest gain per day was from corn ensilage and frozen wheat. The next highest was from corn ensilage, hay, roots and meal. The lowest was from hay, roots and meal. I will make that clear in a moment.

COST OF RATIONS FURNISHED.

As to the cost per day on these different rations—figured at the rates I have mentioned—those that cost us dearest per day were on corn ensilage, hay, roots and meal; they did not gain by 56 lb. each as well as the best lot, and they cost 18·27 cents per head per day. Then the next highest in cost were on hay, roots and meal. They cost 18·19 per head per day. Those that cost us next highest were on corn ensilage and meal, and they cost 14·46 cents. Those fed on corn ensilage and frozen wheat cost 9·36 cents per head per day. I want to finish that for you in this way, as it is difficult to give the facts to the Committee without taking half an hour to make clear a test involving so many figures:

INCREASE OF FLESH FROM DIFFERENT RATIONS.

On corn ensilage and meal the animals gained about one-quarter more in weight in the same length of time than those on hay, roots and meal. They gained a quarter more in weight and cost about a quarter less in feed. That is the sum total of the whole matter. They looked better, and I think they were in as good condition for the butcher in every way. Two steers which had been fed on corn ensilage alone for five weeks were fed afterwards on corn ensilage and frozen wheat, to discover the value of that substance for making beef. As has been mentioned already, these steers cost an average of 9·36 cents per day, counting the frozen wheat at 35 cents per bushel. It was not saleable above that figure at either Brandon or Indian Head this year. We had a car-load brought down from the North-west in order to help the farmers of the west to discover whether the product could not be marketed to advantage in the form of beef and bacon. These animals cost 9·36 cents per head per day, and gained an average of 1½ pounds per day from the 9th January (when the experiment began) until the 5th April. That was reckoning the cost of the

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food only. In this connection, let me show you that as far as the actual gain per day was concerned the animals on corn ensilage and meal gained most per day with an average of 1·94 lb. each—nearly 2 lb. per day. The animals which gained the next fastest were on corn ensilage and frozen wheat—1·75 lb. each per day; the next were on corn ensilage, hay, roots and meal, 1·65 lb. each per day. We find that with corn ensilage and meal we get the largest gain per day, the next with hay, corn ensilage, roots and meal, and the poorest gain where no corn ensilage is fed.

By Mr. Edwards :

Q. The price for frozen wheat would only apply to the North-west. The freight would not be added?—A. No.

By Mr. Putnam :

Q. Was the meal the same in all cases?—A. The quantity in the ration mixture was the same in all cases, but the animals in some cases ate more of the whole mixture.

Q. How much straw did you give?—A. Five pounds of straw in every case with the mixture.

We make up a ration such as is suitable for the animals. Each of these rations contains 6 lb. of meal, but in some cases the animals eat more of the ration than in others, and consequently get more of the meal. Of a ration of 61 lb. containing 6 lb. of meal, one animal may consume 65 lb. per day and another only 55 lb. per day; so that in the latter case the animal that consumed the lesser quantity obtained a smaller quantity of meal than the other. We try, however, to make the rations of such a composition that we get the largest gain from them. You will readily understand that the details of these experiments would occupy the attention of the Committee an hour or two if I were to give you full particulars, and consequently I am compelled to curtail my observations and explanations. But to render the subject more readily understood, I submit the following tabulated statement of experimental rations :—

THREE-YEAR-OLDS.—Two steers which were dehorned were fed in a loose box (where the temperature is almost as in a shed with single board sides) on a ration of—

	Lb.
Corn ensilage.....	50
Straw.....	5
	<u>55</u>
	<u><u>55</u></u>

Two steers of the same age and similar quality, also dehorned, were fed in a like manner, on a ration of—

	Lb.
Corn ensilage.....	50
Straw.....	5
Oil-cake.....	2
Ground pease.	2
do barley.....	2
	<u>61</u>
	<u><u>61</u></u>

TWO-YEAR-OLDS.—Two steers were fed upon each of the following rations:—

No. 1.	Lb.	No. 2.	Lb.	No. 3.	Lb.	No. 4.	Lb.
Corn ensilage...	20			Corn ensilage...	50	Corn ensilage...	50
Hay.....	10	Hay.....	20				
Roots.....	20	Roots.....	40				
Straw.....	5	Straw.....	5	Straw.....	5	Straw.....	5
Oil-cake.....	2	Oil-cake.....	2	Oil-cake.....	2	Frozen wheat...	6
Ground pease...	2	Ground pease...	2	Ground pease...	2		
do barley..	2	do barley..	2	do barley..	2		
	61		71		61		61

YEARLINGS.—Two yearling steers were fed in a loose box, similar to those used for the three-year-olds, on ration No. 3; and two other steers of equal age were fed on the same ration in the ordinary stable.

CALVES.—Two steer calves—one Shorthorn grade and one Quebec Jersey grade—were fed on ration No. 2; and two steers of an equal age, and similar breeding, were fed on ration No. 3.

These experiments will furnish data, also, upon the number of pounds gained in weight, and the quantity of feed consumed per pound of increase in live weight, by *three-year-old, two-year-old, yearling* and *calf* steers, respectively, when fed upon the same ration.

RESULTS OBTAINED FROM STEERS OF DIFFERENT AGES FED UPON THE SAME RATIONS.

The next important thing I might bring before you is the comparative gain per day of calf steers, yearling steers, two-year-old steers and three-year-old steers on the same ration in the same length of time. The very best gain we realized per day was with the two-year-old steers on corn ensilage and meal. They gained an average of 332 lb. from 29th October to 5th April. The second best gain per day was with the two-year-old steers fed on corn ensilage, hay, roots and meal. They gained an average of 276 lb. each. But we had a better gain during the three months from those fed on corn ensilage and frozen wheat. The next largest gain was with the calf steers, which gained an average of 268 lb. each in the same length of time. They consumed an average of 30.73 lb. per day of the same ration (ration No. 2), against 53.84 lb. by the two-year-old steers. The next highest gain was by steer calves. One calf of each of these groups was a grade French Canadian, from our Canadian cows. In form they are certainly not adapted for beef-making, and did not gain as much as the Shorthorn grades in the same lots.

By Mr. Edwards:

Q. Have your experiments gone sufficiently far to determine whether it is better to feed steers loose or tied up?—A. In point of economy and labour, it is better to feed them loose by all odds. In point of gain per day, there is a little advantage in having them tied up.

By Mr. McMillan (Huron):

Q. Animals dehorned would go back on their feed for a little while?—A. Two of the steers which we dehorned were quite sick for a week, and lost a good deal in weight. Two of the others did not seem to suffer any inconvenience.

Q. Did they lose weight?—A. Perhaps for a few days, but not afterwards.

By Mr. Bain (Wentworth) :

Q. Did they discharge much?—Yes; the wounds on two of them discharged matter for a week. That was due, perhaps, to lack of forethought. I had made no provision for the immediate staunching of the blood. Sometimes the arteries are larger at the base of the horn in one animal than in another. When the operation is being performed, a farmer should have a piece of cloth covered with coal-tar to apply to the wound immediately.

Q. What age were those which you dehorned?—A. They were three-year-old steers. We dehorned a five-year-old bull also.

By Mr. Edwards :

Q. Would not the economy in feeding and the saving of manure overcome the difference in gain by having them tied up?—A. I think it would more than balance it. For an ordinary farmer, it is much more economical to dehorn his steers and feed them loose than to leave the horns on and tie the animals up in the stable.

By Mr. McMillan (Huron) :

Q. Do you think there is much more cruelty to the animal in dehorning and letting them go loose than retaining the horns and tying them up in the stable?—A. The dehorning operation lasts from a quarter to half a minute, and in twenty-five cases out of thirty there will be no appearance of inconvenience; and I think no more pain after the operation is over than a man feels when he has had a piece of skin knocked off his hand. I do not see any element of cruelty in the operation, when performed with care.

By Mr. Edwards :

Q. The severity of the operation would depend on the experience of the operator and the instruments he used?—A. A sharp saw in the hands of an expert man will take both horns off in less than half a minute.

Does it hurt afterwards?—A. I think it heals up quickly in most cases; and after the quick wound is healed, the stub of the horn does not seem tender.

By Senator Perley :

Q. What kind of a saw do you use?—A fine-toothed stiff-backed saw.

Q. Have you any fear of the gentleman from London?—A. None whatever. I have no hesitation in saying that I would dehorn steers from humane motives as well as from those of profit.

By Mr. Roome :

Q. Have you started to dehorn any young cattle?—A. Yes, some yearlings this year, and we are going to dehorn calves also.

By Mr. Carpenter :

Q. I would like to ask Professor Robertson, for the benefit of dairymen, to state whether he has found any means of removing the odour of turnips from milk?—A. Not from milk to leave it rich in flavour and wholesome, except by scalding it and adding a little saltpetre.

Q. The feeding of turnips has not much effect on milk?—A. Not much effect, except in imparting a turnip flavour and odour. The feeding of corn ensilage gives a better milk and a larger flow of it.

Having examined the last foregoing report of my evidence, I find it correct.

JAS. W. ROBERTSON,

Dairy Commissioner.

COMMITTEE ROOM 46, HOUSE OF COMMONS,
WEDNESDAY, 11th May, 1892.

The Select Standing Committee on Agriculture and Colonization met this day, Dr. Sproule, chairman, presiding.

Mr. J. W. ROBERTSON, Dominion Dairy Commissioner, was recalled, and addressed the Committee as follows:—

The branches of the subject which I had proposed to present to the Committee to-day were the fattening of swine, the growth of crops on forty acres of land, and the growing of fodder corn and the making of ensilage. I will not detain you with any unnecessary preliminary remarks. I think that the members of the Committee already well understand the importance of the swine industry to the country. I need not enlarge upon that aspect of the subject. There is no kind of stock fattened upon any farm which carries less off the farm than do fat swine. There is no kind of domestic animal which we fatten for food for man that assimilates a larger portion of the food it consumes and turns it to profitable account. There is no animal product to-day for which there is a larger demand in the chief centres of population than for fine bacon and fine hams. The magnitude of the industry on this continent is unsurpassed, and the possibility of the extension of it in Canada is very easy if our farmers only adopt the best methods. I might detain the Committee a long time on that general aspect of the subject, but I think it would not be prudent for me to do so.

EXPERIMENTS WITH VARIOUS FOODS FOR FATTENING SWINE.

Last year we undertook a series of experiments to determine the relative value of steamed and raw food. I presented most of the conclusions from those experiments to the Committee last year. They might, however, bear repetition in brief. The feeding of steamed or cooked food to swine will make them gain in weight much faster, but they eat so much more food that there is no return for the trouble and expense of cooking. The amount of food consumed for every pound of increase in the live weight is practically as much with food steamed and warmed as with food cold and raw. We had another experiment last year in the feeding of swine with grain and roots. I find that sugar beets are worth just as much per hundred weight for fattening swine as is skim-milk—that is, 100 lb. of sugar beets will give just as large an increase in weight in the fattening of swine as skim-milk; but skim-milk is much superior in the raising and feeding of young pigs. It gives them bone, muscle and growth, sugar beets being chiefly useful for feeding when they are being fattened.

LINES OF EXPERIMENTS AND RESULTS OBTAINED.

The lines of experiments taken up during the past winter were: (1.) To discover the effect of feeding two pens of pigs on whole grain, as against grain ground and fed in a wet condition. For this purpose we used five Poland China pigs. The results were these:—Two pigs, fed upon pease and barley whole, consumed 4.04 lb. of grain for every pound of increase in live weight. Three pigs of the same litter were fed upon ground barley meal, and they consumed during the same period 4.10 lb. of meal for every pound of increase in live weight. As a matter of fact, in this experiment the pigs that consumed the whole grain gave just as large an increase in weight for the food they consumed as did the pigs that consumed the ground grain. But apart from that, the pigs fed on the unground grain were not healthy longer than six or seven weeks, and if we had not sold them then I believe the whole pen would have gone off their feet in another week. They were not diseased, and we did not dispose of them because they were in ill-health. Their organs were found to be healthy, but I think they would not have lived in a healthy state long, on account of the accumulation of fat around the lungs and heart. I came to this con-

clusion from that experiment:—That there is always a risk to the thrift of the animal and to its general health from the feeding of whole grain, unless the pigs be very well advanced in maturity. I think full-grown pigs could be fed upon whole grain with little injury, but young pigs cannot be fed economically with grain that is not ground.

SELECTION OF STOCK FOR EXPERIMENTS.

Then we began another experiment with three sets of pigs, all of similar breeding, of the same age and of nearly equal weights. In this case we had five pigs in each pen. Three of them were grade pigs which were purchased, and two pigs cross-bred between the improved large Yorkshire and Poland Chinas. While we have not been yet able to undertake a comparison between the different breeds of pigs, I might say that these grade pigs between the Yorkshire and Poland China seemed to grow quite a quarter faster than the grade pigs purchased outside. During this season our plan is to make our experimental work that of a comparison between the pigs of different breeds. Up to now our work has been to ascertain the effect of different kinds of food, or food prepared in different ways. Let me give you a mental picture of these pens, so that what I say will be easier understood. We had three grade pigs purchased outside that seemed to show either Yorkshire or Chester White blood. With them we put two of our own cross-bred pigs, cross-bred by using a Yorkshire boar on Poland China sows. The next pen had five pigs of equal age and similar breeding; and the third pen had the same number from the same litters. So the pigs in each pen were equal as to breed, quality, age and size.

RATIONS AND RESULTANTS IN FLESH.

We fed one pen on a mixture of pease, barley and rye, whole—the grain being soaked for 48 hours to soften it. We fed the second pen on the same mixture of pease, barley and rye, ground and soaked. We fed a third pen on the same mixture of pease, barley and rye ground, for a half ration, and skimmed milk for the other half. We had a comparison between the whole grain, ground grain and half grain and half skimmed milk, fed to pigs of the same grade, age and size.

By Mr. Cochrane :

Q. What do you mean by half rations of grain?—A. That we allowed them half as much grain as we did the others, and all the skimmed milk they could drink, to discover how much grain was equivalent to 100 lb. of skimmed milk. The average weight of pigs in each case was 69 lb. when the experiments commenced. Of the whole grain, the pigs consumed 1,412 lb., and gained for that 300 lb. in live weight. I will make the comparison clear to you in a moment. The number of pounds of grain consumed for every pound of increase in live weight was 4·7 lb.—that is, when the grain was fed whole and soaked for 48 hours.

In the pen alongside, where the grain was fed ground to the pigs, the pigs gained in weight 395 lb. for 1,690 lb. of grain consumed. In this case the quantity of grain required for every pound of increase was 4·28 lb. A moment's comparison brings out this fact, that the pigs to which we fed whole grain consumed 10 per cent more feed for every pound they gained in live weight than did the pigs which were fed on ground grain. The pigs were also in a more wholesome condition on the ground grain than those that were fed whole grain. There is less risk of loss from death feeding grain ground than feeding it whole.

In the third pen fed on half grain ration and half skimmed milk the pigs consumed 948 lb. of grain and 5,808 lb. of skimmed milk. They gained 422 lb., and they consumed 2·25 lb. of grain and 13·76 lb. of skimmed milk to produce an average of 1 lb. in live weight. The pounds of grain required to produce a pound of increase in live weight were in the first place, where the animals were fed on whole grain, 4·70 lb.; in the next case, 4·28 lb.; and in the third case 2·25 lb. of grain and 13·76 lb. of skimmed milk.

The fourth lot of pigs of as near the same quality as I could select them were fed three-quarters of the ration of the same mixture of meal, and one-quarter of the ration of skimmed milk. They consumed 3.31 lb. of grain and 4.45 lb. of skimmed milk for every pound of increase in live weight.

Before I say anything more, let me state that in the results from the feeding of these four pens, 1 lb. of grain was equal to 6 lb. of skimmed milk; or, speaking exactly, 6.1 lb. of skimmed milk. That is rather high. I think our feeding experiments later will reveal that 1 lb. of grain is equal to 5 lb. of skimmed milk, but in the tests I have given you 1 lb. of grain was equal to 6 lb. of skimmed milk. I do not think, Mr. Chairman, there is any need to detain you any longer on these four feeding experiments, unless it be to answer some questions.

By Mr. Semple :

Q. How long did the experiment last?—A. It lasted for 12 weeks, when these figures were obtained.

By Mr. Sanborn :

Q. You spoke of feeding sugar beets. How did you feed the beets?—A. We fed them raw. I mentioned that sugar beets were nearly equal to skimmed milk for fattening swine; but they are not nearly equal to skimmed milk for young growing pigs.

By Mr. Semple :

Q. How many pounds did the pigs gain in 12 weeks?—A. In one case 60 lb. each, in another case 79 lb. each, and 84 lb. each in the third pen.

By Mr. Cochrane :

Q. How old were they when the experiments were commenced?—A. They would be nearly three months old when we started, weighing 69 lb. each.

By Mr. Semple :

Q. They would be, when the experiment was finished, 129 lb. in weight and six months old?—A. These were the pigs that were the smallest of the lot. The pigs that were the heaviest of the lot were 153 lb. The two pigs in each pen of our own breeding were much heavier and younger than the others, which were purchased.

By Senator Perley :

Q. They would not be six months old?—A. Our own pigs, bred on the Farm, were not so old as that. The pigs that we bought were pretty well stunted for two months before we got them.

By Mr. Cochrane :

Q. Would you think beets would be as good for a three months' pig?—A. Not for a three months' pig; and in all cases the skimmed milk would give the better quality.

By Mr. O'Brien :

Q. Have you tried the experiment of boiling mangels and grain together?—A. No, not yet.

By Mr. Carpenter :

Q. Did you give them a ration of sugar beets, or what they would eat?—A. We gave them what they would eat. In all pig-feeding experiments they are allowed to consume all they will eat clean each day.

EXPERIMENT WITH FROZEN WHEAT.

An experiment with frozen wheat was the next line of experimental work. We first undertook the test to discover the effect of feeding large-sized swine on frozen wheat for fattening them only. These pigs were bought, and put in at an average of 186 lb. live weight. We put four in one pen, and they averaged 185 lb. each; we put four in the second pen, and they averaged 186 lb. each; we also put four in a third pen, averaging 187 lb. each. They were a very even lot, in regard to their weights and appearance.

We fed the first lot on frozen wheat ground and soaked for 12 hours. We fed the second lot on whole wheat soaked for 48 hours. Between these two the results were:—Of the ground and soaked wheat they consumed 1,916 lb. and they gained 361 lb. in live weight, which showed that they consumed 5.30 lb. of frozen wheat for every pound of increase in live weight; or 11.3 lb. of increase in live weight for every bushel of wheat consumed. Then the other lot of pigs were fed with frozen wheat, whole and soaked for 42 hours. They consumed 2,282 lb., for which they gained 349 lb. They consumed 6.54 lb. for every pound in weight they increased, against 5.3 in the case of the other pigs. Thus, they gave a gain of 9.1 lb. for every bushel of wheat they consumed. The extra consumption of grain, when not ground, in this case, was 23 per cent more for every pound of increase than when the frozen wheat was ground and soaked.

By Mr. Semple :

Q. Was the wheat the same quality in both cases?—A. The same quality in both cases.

By Mr. Sanborn :

Q. Was it soaked in cold water?—A. Yes.

By Mr. Carpenter :

Q. Where did you get it?—A. From the experimental farms at Indian Head and Brandon, Man.

Then the third pen of these same pigs were fed upon a mixture of pease, barley and wheat, to see if the frozen wheat was nearly an equivalent for these grains. These were fed whole, and soaked for 42 hours, and in this case the pigs consumed 2,228 lb. and gained 367 lb. in live weight, thus consuming 6.07 lb. of grain for every pound of increase in live weight. That was rather better than frozen wheat fed whole, and not so good as frozen wheat fed ground. Then we had another experiment with smaller pigs. I might mention here incidentally, or by way of explanation, that in every test we have conducted, wherever we have commenced the test with very heavy pigs they have consumed a very much larger quantity of grain for every pound of increase than did smaller ones.

By Mr. Wilson :

Q. It is more expensive, then, to raise heavy pork?—A. Yes; it costs very much more in feed for every pound of increase.

Then, as I was about to say, we had a pen of smaller pigs of our own raising. They were cross-bred between the Yorkshire and Poland Chinas. They were put up to feed at an average weight of 71 lb., and were fed on frozen wheat ground and soaked for twelve hours. They consumed 1,013 lb. in eight weeks' feeding. That experiment is not closed; but the pigs presently seem to be gaining even faster than when I made these notes, which was when I came before this Committee the last time. I have not had time to examine the data up to this present date. The food consumed was 1,013 lb. and the gain was 277 lb., the consumption of grain being 3.66 lb. for every pound of gain in live weight. They gave an increase of 16.4 lb. for every bushel of wheat consumed. These other pigs to which I have already alluded were sold at 5½ cents per lb. live weight. If the increase in live

weight in this case be worth the same, it will make the frozen wheat worth 82 cents per bushel. That would be the return for the wheat at the rate of increase I have given, calculated at the price for which I have sold pigs within ten days.

Then we have another pen of pigs under test, feeding them a small portion of skim-milk with frozen wheat. They seem to make the best gain of any pigs we have fed this season, even better than the pen of which I have just given you the figures. That experiment began only a month ago, and I shall not speak definitely of results, because the first month's feeding is never quite conclusive in any way.

In concluding this part of the evidence which I have to offer to the Committee, I would like to emphasize this aspect of it:—There is likely to be a good deal of frozen grain in Manitoba and the North-west Territories which will be practically unsaleable as grain, being unfit for milling and without sufficient value for any other purpose to bear the heavy expenses for shipment. Now, if the farmers of Manitoba and the North-west Territories would get a really vigorous breed of swine and use the frozen grain, which they may have some seasons, in the fattening of swine and the feeding of steers, I believe that in most years they would net as much cash from frozen wheat as they have done from their good grain sold for milling purposes. They would find themselves also with a supply of the very best kind of manure, which, even with its much-lauded fertility, the land will need shortly. I have fed frozen grain this year to cattle and swine, and I am hopeful that farmers up there will be prepared to fortify themselves against possible or probable disaster by using frozen grain in the way I have suggested. As soon as men outside are convinced that the people of the North-west are not compelled to depend upon one crop only, they will go there more readily, and even if the season be unfavourable for grain, and it cannot be sold for flour, there is no doubt but that in this way they can sell grain which has hitherto been unsaleable. I attach a good deal of importance to this work, for the reason I have just given the Committee.

There is this also to be said, that in Manitoba and the North-west they were rather discouraged by a number of farmers going into pork-raising some eight or ten years ago and meeting with unexpected disaster. There was no sale for the bacon, because there were no packing houses erected. These men took no pains to keep the animals in comfortable pens, and they became unhealthy, and had what is commonly called swine plague—sometimes called swine fever. I have seen that three times, and I never saw it arise except where there was a filthy condition of the hog pen. Where the unsanitary condition has been removed, I have found a speedy disappearance of the disease. I think there is nothing insuperable to the people of the North-west and Manitoba in developing a large trade in the making of pork and bacon and hams. I think the people of Brandon should have a large trade in that respect behind them. And when our farmers there learn to export products in beef, butter, cheese and bacon, we will find the whole country responding to their prosperity. I have nothing more in my notes with regard to this branch of our work.

By Mr. Cochrane:

Q. The conclusion you have arrived at is, that pork can be produced cheapest from young pigs fed on ground grains?—A. Yes. The average of our five feeding experiments this winter is that it took 4.15 lb. of grain for every pound of increase in live weight. That includes the test which we made under unsuitable conditions for the purpose of comparison, as well as the best results we have obtained. We find it convenient to carry on mainly one line of investigation at one time.

DEVELOPMENT OF FLESH BY FEEDING PERIODS.

We have experimented with the feeding of pigs at the different ages, and the quantity of feed required per pound of increase in the live weight at different ages and weights. Last year the second month of the feeding period gave the best returns for the food consumed. For the third month 31 per cent more feed was

consumed for every pound of increase; for the fourth month 86 per cent; for the fifth month 110 per cent, and for the sixth month 125 per cent more food was consumed for every pound of increase in the live weight of the pigs than during the second month of the feeding period. This coming year our plans are to carry on experiments with pigs of different breeds, to find if there be any great difference in the gain in weight of pigs of different breeds on the same food.

By Mr. McNeill :

Q. How many pigs in a pen?—A. There were from four to five for fattening. Since potatoes have been mentioned, I would like to say one thing for the guidance of men who want to use them: that the practice of boiling or cooking potatoes will give them a very much greater value than feeding them raw. There is a decided advantage in cooking potatoes for pigs. The starch granules in potatoes are burst open by the cooking process, and the potatoes are more digestible when cooked than uncooked.

By Mr. Cochrane :

Q. They would consume more and fatten more rapidly?—A. Yes; and they would fatten more rapidly, for the same quantity, if the potatoes were cooked than if fed raw.

By Mr. McNeill :

Q. Do I understand you to say you do not think there would be sufficient advantage to make it worth while to cook grain?—A. The amount of grain required to produce a pound of increase in the live weight is practically the same in both cases, only the cooked grain will make the pigs grow faster. They consume so much more of the steamed grain per day that the consumption of grain to the pound of increase is the same in both cases.

THE STOCK-SUSTAINING CAPABILITIES OF FORTY ACRES OF TILLED LAND.

We had set apart 40 acres of land, mainly to ascertain and illustrate how many cattle could be fed on that area for the year. The main object of undertaking and carrying on this work was to encourage the farmers who have small areas of land, and to show them how they can keep a large number of cattle on a small acreage. Too many men on small farms are deterred from changing their practice, because they believe that a small farm is not adapted for keeping a large number of cattle. Taking the average farm in Canada at 55 acres of cleared land, the average farmer on that area keeps rather less than four full-grown cattle and four young animals; that is, the average farmer of Canada, on 55 acres of cleared land, keeps less than eight head of cattle, including calves. If that number can be doubled, you can at a glance see the very great impetus which would be given to our agricultural prosperity. We undertook, on 40 acres of land, to discover how many cattle we could keep for the whole year. I have not a very gratifying report to present in regard to our past experience. The crops were put in in first-class order, and I think the proper area of each class was assigned to it; but we had a most unfortunate hail-storm on the 13th of August, which crossed the forty-acre lot. The storm seemed to make a special effort to cover as much of those 40 acres as possible. I estimate that we lost more than 25 per cent of the total yield of the 40 acres owing to that one hail-storm. The crop of Indian corn was the smallest we have ever got on the Farm. Where the hail struck the corn on the 40 acres, the cornstalks were split and torn, just about the time they were in tassel. The grain also was beaten down in nine out of thirteen plots, and severely damaged in that way. However, notwithstanding the injury from the hail-storm, we have fed 25 cows, or rather expect to be able to do so, on the products of the 40 acres, for 10 months and 1 week. Had there been no misfortune such as I have referred to, we would have been able to keep 25 cows easily for 12 months. If we have no calamity like that this year,

with the extra manure we are able to use from these same 25 cows, we will have quite enough crop to keep 30 animals for 12 months. We will put 30 animals on the 40 acres on 1st July, and keep them for one year.

ALLOTMENTS—SUBDIVISIONS OF THE PLOT TO DIFFERENT CROPS.

The areas of crops were as follows:—(I shall not give the full details, as everything will be found in my annual report.) We had fourteen acres of ripened grain crops. These gave us 43,791 lb. of straw and 22,365 lb. of grain. Then we had three acres of root crops, which gave us 74,134 lb. We had one acre each of turnips, mangels and carrots. Again, we were subjected to unexpected injury last year, in so much that the turnips, for some ten miles around Ottawa, were attacked by some disease which caused them to be pulpy inside. I think those on the forty acres suffered less than those on any other part of the Farm, and a great deal less than neighbouring farms. Still, they suffered to some extent. The turnips became like jelly inside, and we had to leave at least three acres on other parts of the Farm untouched. The disease seemed to be confined to the neighbourhood of Ottawa.

By Mr. Cochrane :

Q. How were the tops affected?—A. The necks seemed to be longer than usual, and when the disease developed the bulb part became quite soft. Usually the outside looked sound, but it was filled with jelly like matter inside. It affected nearly all the varieties on every part of the Farm, although one or two varieties were not so badly attacked as others. We could not come to a conclusion, from an examination of the diseased turnips, that any varieties were altogether exempt. Then we had half an acre of cabbages and kohl rabi. I believe this is one plant which has been rather neglected, in regard to its value for cattle feeding. The Scotch and English have been feeding it in large quantities for many years to their cattle, but I hardly know a single farmer in Canada who has given it much attention. We had over seven tons off this half acre—7 tons and 1,296 lb. of cabbage and kohl rabi. They are a most excellent food in the fall, and can be fed for some time into the winter. We had two acres of rye; part was fed green and part was ensiled. We had fourteen acres of corn, of which eleven and a half were ensiled, giving us 130 tons 1,750 lb. of wilted corn when put into the silo. This was by quite one-third the smallest yield we have had on the Farm, and that I attribute to the leaves being torn and the stalks damaged by the hail-storm to which I have referred. The crops on the neighbouring part of the Farm, of varieties of corn not so good, gave some seventeen tons, on an average, to the acre. When you come to take this fact into consideration, I think you will see I have rather under-estimated than over-estimated the damage from that cause. One acre of corn was stooked in the field and fed from the field as fodder, to give a comparison with corn ensilage. One and a-half acres of corn were fed green. Then we had two and one-sixth acres of mixed crop. The crop from that area was fed green. We had four and one-third acres of pasture, making the forty acres in all. As I have already said to you, the full particulars in regard to yields and combinations will be found in the annual report of the experimental farms. I might mention this before I leave the subject, that we had wheat, barley, oats and pease sown in every possible combination. The combination which gave us the largest return was a mixture of wheat and pease. That gave us 1,871 lb. of grain to the acre, or a little over 31 bushels to the acre of 60 lb. per bushel. This is a good yield of strong food, and it would have been 25 per cent. higher but for the damage it sustained from hail. You see all through how we would have been able to keep the cattle I anticipated, but for this weather injury.

By Senator Perley :

Q. In what proportion did you sow?—A. A bushel and a-half of each to the acre; but we put with the grain 2 lb. of flaxseed to ripen with the grain, in order that it might be ground with the grain for cattle feeding. This year we put

3 lb. of flaxseed per acre, because the quantity was rather scant last year. We have put 3 lb. of flaxseed per acre this year with all mixtures of grain to be fed to cattle.

By Mr. Cochrane :

Q. You did not grow the flax seed on the 40 acres?—A. We sowed it with the grain. It was threshed with the grain and ground with the grain.

Q. Did it ripen?—A. Yes.

Q. How did the flax affect the straw?—A. There was not enough of it to have any perceptible effect.

Q. What proportion of flax did you use?—A. We did sow 2 lb. per acre, but I shall sow 3 lb. hereafter. The total cost of labour for the whole 40 acres, including the drawing of manure, of cultivation, of threshing and grinding—in fact, all the labour put together connected with having this crop fit for giving to the cattle, was \$574.49, or an average of \$14.36 per acre. That included all the experimental work done on the 40 acres. We had a great variety of experimental combinations, and in corn we had a number of acres planted by hand, which cost \$19, as against \$1.25 to \$1.75 if planted by the drill. We charged for the drawing of the manure. We drew a good deal from the city, and were charged with the cost of drawing.

Q. What condition was the 40 acres in when you commenced?—A. Rather poor, in regard to fertility or richness. It had not been well manured. I noticed that the \$574.49 includes \$100.62 for drawing manure, mainly from the city.

Q. Was that manure from the city put on these 40 acres?—A. It was, before we began the test. After we commenced the experiment we put back on the 40 acres the manure from the cows that were fed on it.

Q. Then you had the 40 acres of land in good condition before you commenced the test?—A. The cost of drawing that manure is included in the figures I have given you.

Q. It could not have been poor, with all this manure on it?—A. We put on about 8 to 20 tons per acre.

Q. How would that experiment apply to the ordinary farmer? He would not have the city of Ottawa to get manure from.—A. The land, even after the manure was applied, would not be in any better condition as to fertility than an ordinary good farm. The land had not received any manure until that application was put on it. Some 12 acres had not received any manure since it was owned by the Government until this spring. Some of it had not been manured for five years, and the most of the manure was put on the land where we grew the corn and cabbages.

By Mr. Cochrane :

Q. How did you utilize the pasture?—A. That was used mostly for the exercise of the cows, as well as giving them a small quantity of feed.

Q. You turned them out a certain number of hours each day?—A. Yes. Mostly at night.

By the Chairman :

Q. Were they kept in the stables during the summer as well as the winter?—A. Yes, except when they were out on pasture at morning and at night, for a little over two months.

By Mr. McNeill :

Q. You spoke about the difference you made between ensilage corn and corn when cured?—A. I have not the data worked out. We finished only this spring, but the evident teaching is this, that it costs more to handle the corn as cured fodder than to ensilage it. Corn stalks cured in the field will lose one-half of their weight; and corn wilted to go into the silo would lose 20 or 25 per cent. If you take a ton of

corn in its green condition and put it in the silo, you will find as much food in a ton of corn ensilage as in the cured corn from a ton of green corn of equal quality; but you have more labour involved in handling the cured corn fodder than the corn ensilage.

By Mr. McMillan (Huron):

Q. Will the cattle eat the fodder up clean?—A. Not quite as clean, as the ensilage.

By Mr. Carpenter:

Q. What about cabbage for feeding cows? What do you find about the milk?—A. We do not find any unpleasant flavour, but we do not feed many of them to cows milking heavily. I think corn is a better feed for them, but the cabbages are excellent for young cattle or steers put up to fatten in the stables in the fall.

By Senator Perley:

Q. Which is worth the most, a pound of turnips or a pound of ensilage corn?—A. I think a ton of corn ensilage is worth from 2 tons of turnips upwards. The corn should be cut at its glazing stage. I have some notes in regard to the experiments with corn on the Farm also.

By Mr. Cochrane:

Q. What kind of corn will produce the largest amount of fodder and will get to maturity far enough to make into ensilage in this section of the country?—A. We find the corns called Longfellow and Pearce's Prolific to mature sufficiently; and they give us a large weight per acre. These are the best of the common varieties we have tried. We find the Thoroughbred White Flint a most excellent corn. It is very leafy, but it does not mature here every year sufficiently to make the best ensilage corn. Another objection I have to recommending that corn here is that, so far, the seed is not obtainable in quantities. In southern Ontario and in western Ontario it will give a larger crop than the first two corns I have mentioned, and also come to the glazing state of growth in those districts.

Q. What is your experience of the Red Cob for ensilage?—A. It is much too late a variety for Ottawa district. It is too much stalk and too little leaf; the top spreads too much, and hinders the plant from getting enough sunlight. The Red Cob grows after the fashion of a palm tree, that bunches at the top and shades the stalk. The Thoroughbred White Flint grows bunchy at the bottom, and the space between the rows gets more light and air.

By Mr. Edwards:

Q. Do you try the system of planting in alternate rows?—A. Yes, we did that last year. In the growing of corn last year on the Farm we tested 68 varieties altogether, and the average yield was 17 tons 47 lb. to the acre. These were grown just adjacent to the 40 acre lot, where the yield was not quite as good, owing to the streak of hail which went over the place I have described. I need not give you the names of the varieties, because I think there is no service to the country through naming them. Two or three varieties of corn are familiar to the general public, and I would rather give the names of the three or four which can be easily remembered, are obtainable, and are suitable for the different districts.

We have some hope of getting very excellent service from some of the so-called Northern Dakota corns, which ripen here rather earlier than Pearce's Prolific, and last year gave us quite as heavy crops. They have done remarkably well on the Brandon farm, and through that district of the country where farmers will need to grow corn for ensilage purposes, I think some of these earlier ripening sorts, which

gave us such good service last year, will answer. Then we had corn planted in rows 3, 4 and 5 feet apart. We counted a considerable number of ears, in every hundred feet of length of rows, which were but partially developed where the corn was planted closely together. So much was this the rule, that we reached the conclusion that we could get just as large a number of ears per acre from corn that was put in rows 5 feet apart as from it in rows 4 feet apart. Each stalk carries a larger number of ears, when grown in rows or hills wide apart. We found the heaviest yield per acre was from corn grown in rows 4 feet apart, the next heaviest from rows 5 feet apart, and the least from rows 3 feet apart. The difference was not great, being only about 1,000 lb. to the acre. I am speaking of corn that was drilled in, and I am giving you the average of four different varieties.

By Mr. Watson :

Q. The corn grown wide apart was best?—A. It gave the largest weight per acre, but you are apt to have woody butts. With good cultivation and fair condition of the land you will have better service and more satisfaction from putting corn in rows or hills not more than $3\frac{1}{2}$ feet apart. That is the conclusion I have drawn from our experiments.

By Mr. Cochrane :

Q. Have you ever tried putting it 18 inches apart?—A. We tried it 2 feet apart in the season of 1890, and it did not give us as large a crop or a crop of as good quality as corn planted wider apart. When you get corn closer than 3 feet you exclude the sunlight so much that you are apt to have a larger proportion of nubbins or ears of inferior quality.

Q. I am speaking of corn for ensilage purposes.—A. For ensilage we like to have the corn come to the glazing state, or when it is almost mature. I will give you the figures now, showing you the yield per acre of dry matter. You will understand that you might have a large yield of green crop and not have much feeding value in it. Mr. Shutt, the Chemist, and I, jointly, carried on some investigations into the yield of dry matter per acre from the crop at different stages of its growth—"the tasselling stage," "the silking stage," "the early milk stage," "the late milk stage" and "the glazing stage." The amount of dry matter per acre in the corn at the different stages of growth, taking the average of four different varieties—Longfellow, Pearce's Prolific, Red Cob and Thoroughbred Southern White Flint—was as follows: The tasselling stage, 6,468; the silking stage, 7,770; the early milk stage, 9,138; the late milk stage, 9,467; and the glazing stage 11,298 lb. per acre. The total weight per acre, weighed green, was less at the glazing stage than at the tasselling, but there was a considerable difference in the amount of dry matter in the crop at these different stages. After corn gets to a certain stage the moisture begins to evaporate readily; but still it continues to appropriate matter from the atmosphere, so that at the glazing stage the crop is worth twice as much per acre for feeding purposes as at the tasselling stage, and it does not cost anything to have it gain that mature quality and additional weight of dry matter.

By Mr. Carpenter :

Q. Have you a record of the quantity of seed used per acre?—A. Yes; we used from 18 to 22 lb. We find that that gives us from two to three plants every foot, which is thick enough.

By Mr. Miller :

Q. What do you recommend for soiling?—A. I prefer having a crop of oats or pease, wheat and oats, or pease, wheat and barley for feeding in the early summer before the corn is ripe; but the cheapest way a man can soil cows is to have a large enough acreage of corn, and carry over ensilage into the next year. We are our-

selves in the predicament of not having any ensilage to spare for that purpose this year. That is the cheapest and best way of soiling, and I think it could be done on most farms.

Q. How do you feed wheat and pease?—A. Ground together and fed with corn ensilage.

By Mr. McNeill :

Q. What proportion of wheat to pease?—A. We sowed a bushel and a half of each per acre as a mixture.

By Senator Perley :

Q. If you used but a bushel and a half of wheat per acre for a wheat crop, why do you use more of other grain when mixed together?—A. You can sow more seed per acre with advantage by mixing different kinds of grain than by using one sort of grain.

By Mr. Carpenter :

Q. Is not your mixture very heavy?—A. I think not.

Q. Don't you find a difficulty in cutting the spring wheat and pease?—A. We found them broken down by the storm, but there was no trouble in ripening.

By Senator Perley :

Q. If I want to raise a hundred acres of wheat, then there would be no objection to my sowing pease with the wheat. I would have the pease to the good, would I not?—A. You would have a larger crop per acre by sowing the two together than one of them.

We tried the effect of planting different varieties of corn in alternate rows—two rows and two rows. We did not find any gain at all from mixing varieties in that respect. There is this that might be said in favour of it: That if one were trying to grow a crop of rather late ripening corn, that corn would ripen rather earlier by having a small-growing variety in the alternate rows than if the whole field were of a large-growing variety. The serrated top of the crop, by the short corn coming between, would allow more sunlight to be admitted than if the corn were of equal height; but I think the small-growing variety would suffer as much perhaps as the large variety would gain. It would be a sort of robbing Peter to pay Paul. You would gain in a favourable season; and in a season in which the large-growing and late-ripening variety would not ripen far enough, by having an early ripening sort with it you might improve the quality of the ensilage. Still, our experiments have not revealed any advantage from mixing corn in alternate rows or in the same row.

By Mr. McMillan (Huron) :

Q. Have you tried the effect of cultivating corn every week, and leave some rows uncultivated, so as to ascertain whether the cultivating hastens the process of ripening?—A. I have not made any systematic test of that. I have only made some general observations of it. I think the cultivating would give you a larger crop, but I do not think it would hasten the ripening very much.

By Mr. Edwards :

Q. You would be adverse to growing the large varieties at all, then?—A. I would, unless they would come to the glazing stage of maturity. We are growing this year on the Farm Pearce's Prolific and Longfellow for cattle feeding. I have made up my mind that we will discard all the large varieties for ensilage, except those which reach the glazing stage of growth. We want kinds only that will come to the glazing stage. The best ensilage I have seen this year was at Mr. Edwards' silo.

Q. That was a great success. We thought we got the greatest amount of feed, and good feed, by growing alternate rows. Of course, the question would be whether a smaller kind would not be more valuable than increasing the bulk.

By Mr. Featherston :

Q. What are the varieties of corn best for ensilage?—A. For this district I think Longfellow and Pearce's Prolific are about the two best varieties of corn we can have. They are both yellow and flint corn. I think the Compton's Early is a good corn.

Q. What would you recommend for western Ontario?—A. I think the Thoroughbred White Flint the best I have mentioned. It will give a larger yield.

By the Chairman :

Q. Did you try the Angel of Midnight at all?—A. It is a good deal like Longfellow, but rather later than Longfellow. It is from two to three weeks earlier than Red Cob in this district.

By Mr. Featherston :

Q. In any of the varieties that you are using, did you find any of them throwing out suckers at the roots?—A. The Thoroughbred White Flint has a habit of that kind more marked than any I have seen. In connection with the ripening of corn this might be said also: that you can vary the date of ripening by quite ten days by the preparation of the land and putting on a good deal of manure. I have noticed eight days' difference in ripening, owing to the land being well manured, compared with the part where no manure was applied. As far as my observation has gone, I have seen no appreciable difference in the yields of corn from using ordinary commercial fertilizers. My own observations do not lead me to see any advantage from using phosphates as compared to using barnyard manure.

Q. I found a great advantage in using salt on corn. It resulted in the best yield I ever had. Did you ever use salt, Professor?—A. No. we did not use salt.

I have some notes on the other qualities of ensilage, but I need not detain the Committee. We are trying a series of experiments in growing corn and pease in combination. We did the same last year and did not find it very satisfactory; but I think we can overcome what failures we had last year, and then we intend also to grow a combination of corn and beans. I think this capable of rendering the very greatest of service to the live stock interests of the country. I have been trying for a good while to get a combination of crops which would give a perfect and complete feed in ensilage. Heretofore the food has been deficient in albuminoids, and we are trying to get a kind of plant to grow with the corn to make a perfect ration. If we can get ensilage like that, it will reduce the expenses of feeding one-half. What seems to be the most hopeful combination is corn and beans or corn and sun flowers. I find in Russia the people have been developing the growth of sunflowers for three years with satisfaction. The sunflower seed is richer in its feeding value than oil cake, and the yield per acre is very large in the Province of Samara, which is said to be very much like the Province of Ontario. I had intercourse with a student from there some years ago, and he said the conditions of the soil and climate there, where the sunflower business is now a success, are much like ours here. We can grow them here certainly, and although we have no machinery for threshing them, I think by having sunflower heads cut up with our corn we will obtain the albuminoids lacking in the corn, and if the combination succeeds we will proceed in developing and combining a perfect ration of ensilage. When we have done that, we will have the cost of feeding cattle reduced a very great deal.

By Senator Read :

Q. What variety of beans do you intend to grow?—A. The sort called English broad beans, and we intend to grow the pole or climbing beans as well, but I fear the climbing of the beans on the cornstalk may lessen the vigour of the growth in the cornstalk.

Q. Do you not believe that the hot sun will destroy the bean?—A. We have had beans to ripen on the Farm. Even if the beans do not ripen, the pods and stalks are rich in albuminoids.

By Mr. Edwards :

Q. How would you plant them?—A. Dibble them in with a corn planter. We would plant some with the corn and some rather later.

By Mr. McNeill :

Q. How do you propose to deal with the sunflower?—A. Put them in alternate rows, and also let them grow and ripen by themselves. At cutting time we would mix some with corn and put them through the cutting box. It is a plant, I think that has great feeding value, and has been ignored. If we can get beans and pease to grow with the corn they will not deplete the soil, as some other crops do. That combination promises for the Canadian climate what we need for the long winters.

By Mr. McMillan (Huron) :

Q. Would you expect to get the same crop by growing these things with corn as by themselves?—A. I do not see why they should not do as well with corn as alone.

Q. Does corn take up nitrogen?—A. Yes; in the early stages of its growth. It takes in nearly all the nitrogen which it contains before it comes to the tasselling stage, and almost none after that.

By the Chairman :

Q. In growing the sunflower, would you use only the heads?—A. The heads only, most likely.

By Mr. Edwards :

Q. How would it do to sow rape with corn?—A. I think it would not be a success. I tried pease that way, and they were very thin and spindly, on account of the shade.

ECONOMICAL CONSTRUCTION OF SILOS.

I have only a few words to say with regard to silos, as I hope to have our report out upon that subject soon. This conclusion I have reached in the meantime:—That so far as the preservation of the crop is concerned in the silo, one ply of lumber on the inside of the studs is just as good as two thicknesses of lumber. Wherever farmers have to build silos I believe they can build them, and derive as much service from them, by putting up strong studs lined on the inside with one ply of tongued and grooved lumber, as by putting up four thicknesses, as at first recommended. I have been slow to recommend that method, until I could see the results from three years of experience. I had a silo constructed before I left the Agricultural College at Guelph in four different styles. When I went back this year I found that the side with the single lining of lumber had preserved the ensilage, up to the present, quite as well as the other sides. The preservation seems, then, to be as good with a single lining as with more, and the cost of construction is much less.

By Mr. Cochrane :

Q. How was the outside, covering where you had the inside tongued and grooved?—A. In putting a silo inside a barn I would sheet the inside of the barn with tar paper first and put the studs against that. The tar paper would keep out the frost and prevent it getting to the ensilage. Then I would sheet on the inside of the studs with one ply of tongued and grooved lumber, put on horizontally.

By Mr. Miller :

Q. In case you built outside what would you do?—A. I would put tar paper on the outside of the studs and sheet with lumber on it. I would finish the inside of the silo with one ply of lumber only.

Q. What is the object of the tar paper?—A. To keep the ensilage from freezing, although the freezing of ensilage is more of an inconvenience than a loss. The frozen ensilage is just as valuable after being thawed, and has no injurious effect on the cattle, provided it is thawed before being fed.

By Mr. Watson:

Q. What degree of frost would the silo stand without freezing?—A. I suppose if the temperature were below zero the ensilage would freeze for some distance in, unless the outside of the silo were protected with paper, as I have suggested. I have never seen the contents of a silo frozen for more than 2 feet. The frozen ensilage was taken and mixed up with the other portion, and was just as valuable for the cattle. If fed to the cattle in a frozen state it will cause them to scour.

By Mr. McMillan (Huron):

Q. I saw a statement recently about ensilage being 2 inches long. My experience is that half an inch is as good as you can get it. What is your opinion upon that point?—A. A few years ago, when I was seeking particularly to get the best flavor in the ensilage, I advocated cutting the ensilage into lengths 2 inches long, but I have found that corn ensilage cut 2 inches long is not so good as if cut shorter. In my report this year I state that our conclusions in reference to ensilage are that corn ensilage cut into lengths from a half to three-quarters of an inch is the best for the cattle. They will leave less in the mangers.

By the Chairman:

Q. Did you ever try putting fresh ensilage into the same pit on top of old ensilage? Will it keep?—A. It will keep all right; I have seen it done.

Having examined the last preceding report of my evidence, I find it correct.

JAS. W. ROBERTSON,
Dairy Commissioner.

COMMITTEE ROOM 46, HOUSE OF COMMONS,
FRIDAY, 13th May, 1892.

The Select Standing Committee on Agriculture and Colonization met this day, Dr. Sproule, chairman, presiding.

MR. JOHN CRAIG, Horticulturist to the Dominion Experimental Farms, was called, and, in response, addressed the Committee as follows:—

MR. CHAIRMAN AND GENTLEMEN,—Before speaking to you on the work of my own department, I would like to draw your attention to the samples of bread made from the Ladoga and Red Fife wheats, which are now on the table for your inspection. These loaves are made from the flour used in the milling test which is now going on in Toronto, and were only received yesterday. Mr. Saunders put them into my hands before leaving this morning, and asked me to draw your attention to them. The report of the baker is not yet out, but so far, the test seems to be very favourable, and the bakers speak very highly of the Ladoga wheat bread. The two loaves of bread represent the Ladoga and Red Fife wheats, and are here for sampling, and any body who wishes to compare the flavour, as well as inspect the texture, is at liberty to do so.

Now, the work which I wish to draw your attention to, as the chairman has indicated, is confined to that department known as Horticulture. The diversity of soil and climatic conditions found in the Dominion, which call for different methods and varieties, render it difficult for me, in the short period of an hour and a-half, to bring before the members of this Committee, representing widely-separated districts of the country, matters which will be of equal interest and importance to all. I will run hastily over the horticultural field, touching more particularly upon the lines with which I have been experimenting since our last meeting, and attempt to bring before the attention of the Committee the points which are of the greatest value to the country in general, though more particularly to the northern portions; because our experiments, as you know, from our climatic situation here, will be of greater service to the northern regions. The work of solving horticultural problems is, as you are probably aware, necessarily slow. We cannot always obtain results in a year, and frequently have to wait several years, while the work is continued from year to year, and the annual results carefully tabulated. Not only is this necessary, but the same experiments have to be conducted and repeated in different portions of the country, before we can reach conclusions which are reliable; and in this connection, I must speak of the great value and absolute necessity of co-operative work in horticulture. I cannot, alone, at the Experimental Farm, conduct experiments that will be of far and wide-reaching value, but by interesting and enlisting the interests of enthusiasts in similar lines representing the different sections of the country, and by co-operation and comparison of labour and results, I am able to reach conclusions and form opinions of much more value, and which may be applicable to wider districts in the Dominion.

Since my appointment to the position of Horticulturist at the Experimental Farm, I am very glad to notice the increasing interest which has been taken in the work of the department by the public. This is evidenced by the steady growth of correspondence. Last year the letters of inquiry of various kinds which I answered amounted to about 1,500. This year I have had considerably over 2,000, and besides these, a large number of samples of fruit have been sent in for identification. Farmers are often careless about labelling varieties when received, and do not trouble themselves about the name, until it proves itself a failure or a decided acquisition. But as soon as it begins to do well, interest is awakened in it, and they wish to know

what variety it is; but by that time they have forgotten the name and have lost the labels. Samples of fruit from such trees are then sent in for identification. It is my pleasure and my duty to identify these as far as I am able, and give them the proper names.

DIVISIONS OF WORK IN THE HORTICULTURAL BRANCH.

I shall divide the work of my department, and place it under five principal divisions: 1. Large fruits, which, of course, as you understand, comprise tree fruits, such as apples, plums, pears, &c.; 2. Small fruits, as strawberries, raspberries, and grapes; 3. Vegetables; 4. Forestry; and 5. A division whose work has been of recent development, but is now attracting much attention all over the country—the object is to prevent the spread of fungus diseases common to our fruit-bearing trees and plants. Considering the first head, that of large fruits, an important point was brought forcibly under notice during the winter of 1890-91, and a problem of much importance, in the colder portions of the Dominion, is the fact that in our northern districts we have a great deal of rot-killing of young trees in nursery. Certain varieties of apple trees will be injured in the tops and main branches by the frost, but apart from this, a great many are annually injured in the roots, especially during seasons of severe cold and limited snowfall, and this is frequently due to the method of propagation.

It is not a matter of very important moment to the fruit-grower of the milder portions of Quebec and Ontario whether the trees for his prospective orchard are propagated by grafting or by budding. In the north and west, however, where there is less snowfall, and consequently less root protection from winter frosts, this subject is worthy of more than passing notice.

A brief review of the different methods of propagating the apple, pear, and our principal stone fruits, may be of interest.

METHODS OF PROPAGATING LARGE FRUITS.

Taking the apple first, we have two principal methods in common practice, viz., budding and grafting. This last may be subdivided into top grafting, which is crown stock grafting, and piece-root grafting, or root grafting proper. The practice of budding is so well known that I will not refer to it, except in a comparative way. The practice of grafting on pieces of roots is a newer system, and originated in 1811 with Thomas Andrew Knight. Its use has become widespread in the United States, for the easy multiplication of various fruits, particularly the apple. At the last meeting of the Association of American Nurserymen, Professor Bailey, of Cornell University, after a careful study of the subject, submitted his conclusions somewhat as follows:—

The advantage of budding over the grafting of whole roots lies chiefly in the ease and cheapness with which the operation is performed. The disadvantages are chiefly two: budding does not allow of deep-setting in order to induce the emission of roots from the scion itself, and sometimes makes a crook in the base of the tree. In the old apple regions of Ontario the first disadvantage is hardly appreciable, but in the colder fruit-growing sections it is essential to procure trees on their own roots, by setting the scion deeply in the ground, that it may throw out roots. The advantages of whole rooted trees, whether budded or grafted, lie in the production of a deeper, finer and more symmetrical root system at first than is usually produced by piece roots. Again, these trees make a more rapid growth the first two or three years, owing to the better-developed root system.

The disadvantages of this method are two: the cost of the roots; they cannot be set deep enough to strike roots from the scion; and they show a greater tendency to throw up suckers from the seeding root.

In regard to the advantages of piece-rooted trees: they cheapen propagation by making two or more trees from one root; and second, allow of deep-setting, in order that roots may be emitted from the scion. Among the disadvantages, we find that the first year's growth is comparatively weak, and again the roots may be few and ill-balanced.

It would therefore seem that for the middle portions of Quebec and Ontario, where root-killing is unknown, budded trees (especially as we have no reliable data bearing upon the relative length of life of budded and grafted stock) will give the most satisfactory results. But for the colder portions of our country, the piece root would seem to serve an almost indispensable purpose, where extreme hardiness is desired; and when a variety of known hardiness is used—placed upon the piece root, which acts as a temporary support till roots of its own are developed. We thus obtain a tree upon its own roots, the most desirable of all kinds, and without doubt the one that will best withstand the vicissitudes of our climate. It has been my experience that good apple trees, for all situations, can be grown by using only the first and second sections of the root, which should not be less than $3\frac{1}{2}$ inches in length and the scion between 5 and 6 inches. These when properly joined together will, under ordinary conditions, make a growth which, if not equal to a budded tree the first year, will generally be quite satisfactory.

The pear is almost entirely propagated by budding. There are a few nursery firms in the eastern States who, to demonstrate conclusively, if possible, which is the best method of propagating the apple for northern sections, began last year a series of experiments in root-grafting. In this experiment whole roots and sections of roots are used and kept apart for the purpose of comparison. I have photographs with me, illustrating the development of these grafts at the close of the first year. I will not take the time to stop and explain them, but I will place them here for your inspection. They show the process of development of these trees propagated by the different methods. This work of root examination will be continued from year to year, as was done the past autumn, when a sample tree propagated by each method was taken up and the root system carefully examined, and by the photographs you will see the changes which are already apparent—the whole root graft making the strongest growth, but showing a tendency to sprout. The first section seems very satisfactory. This work will be continued till conclusive and reliable evidence is gained upon this.

HOW TO PROTECT ORCHARDS AGAINST FIELD MICE.

Another matter of considerable importance to fruit-growers, and which was brought to my attention very particularly during the past year, is the injury to young orchard trees caused by field mice.

Owing to the great amount of damage to young orchards throughout the country during the past winter, many questions have come in, relating to the best and cheapest means of repelling the attacks of these pests. As varying conditions often call for different treatment, the following preventives and remedies are suggested:—

Preventives.—1. Remove all rubbish that may lie about the orchard affording hiding places for mice.

2. Tramp the snow firmly about the trees after each snow storm.

3. Before the ground freezes, bank each tree up with earth to the height of 12 to 15 inches. This was done the past season to the 1,700 trees in the orchard of the Central Experimental Farm, at a cost of $\cdot 53$ of a cent per tree, or a little over a half of one cent.

4. Tarred paper, which has been allowed to dry for a few days after being cut into squares of the required size, is also very serviceable. It may be fastened round the stem of the tree with twine, or may be held in place by a single carpet tack pressed through the over-lapping edges into the bark.

Washes.—5. Portland cement of the consistency of common paint, to which is added Paris green in the proportion of 3 or 4 oz. to 3 gallons of the former. Apply with a brush, as a paint.

6. Slake 1 peck of fresh lime, and make to the consistency of paint, adding half a gallon of soft soap, half a gallon crude carbolic acid, and 3 or 4 lbs. of sulphur.

Remedial.—1. In all cases pare the wound smoothly with a sharp knife. If the wound is 18 inches or more from the ground, cover completely with a thin coating of grafting wax, and wrap with a cloth, to prevent wax melting and to assist in excluding the air.

2. When the wound is near the base of the tree, cover with grafting wax or green cow-dung, held in place by rough sacking; or the tree may be banked with earth to a point above the wound, which is preferable.

The main idea is to prevent evaporation by excluding the air, and keeping the tissues in a normally moist condition. Under such circumstances, when taken in time, trees will frequently recover, though completely girdled.

When the wound is near the ground, cover it up with earth. Trees completely girdled can be saved in this way.

By Mr. Carpenter :

Q. Will they entirely heal?—A. They will.

Q. You spoke of paring. Do you cut into the wound, or not?—A. The idea is to present a smooth surface around the edges of the bark where the mice have finished their work. Paring smoothly will cause the wound to heal more quickly and completely.

By Mr. McNeill :

Q. Have you saved trees completely girdled?—A. Yes; we had maple trees completely girdled on the roadside last winter, and by prompt attention and adopting this method just outlined, we lost very few.

By Mr. Carpenter :

Q. Do you ever try grafting or bridging over the wound?—A. Yes; I was about to speak of that in connection with valuable trees of new varieties which have been girdled, and which you are anxious to save—the method just mentioned can be practised—that of grafting or bridging over the wound with scions from the top of the same tree. Supposing a valuable tree has been girdled four or five inches, the first thing to do is to pare the bark smoothly, as I have already pointed out; then prepare a scion the same length as the wounded surface, and pare each edge to a wedge point. Then insert the ends under the bark, above and below. Three or four of these scions will be necessary for a medium-sized tree. Wax the wounded surface, especially at the junction of the scion and the bark of the tree, and then cover the whole with a bandage. Several of these scions will be needed, if the tree is of any size. The idea is, by means of these scions, to complete the system of circulation of the sap from the top to the root. If the work is well done they will unite shortly, and save the life of the tree. This is a method which takes some little time, therefore necessarily expensive, but in the cases of valuable trees it should be adopted. When badly girdled, trees may also be sawed off and scions inserted in the base, re-grafting.

With our constantly-increasing knowledge of fruits and fruit culture, and the growing interests of the masses, the area devoted to orcharding in this province and throughout the Dominion is constantly widening, and from present indications it would seem, at first sight, but a short interval before the time was reached when the various horticultural products adapted to our soil and climatic conditions could no longer be profitably grown. On second consideration, however, it will readily be seen that as our knowledge of varieties and their capabilities becomes more exact, so will our ability to produce fruit of a higher grade of excellence be correspondingly increased, so that skill assisting well-directed effort will place on the market, at a greatly decreased expenditure, an article of superior quality, thus more than offsetting the decrease in price on account of the largely augmented total market product. We may safely take it as an axiom in successful orcharding that the healthiest trees produce the finest fruit—fruit the best in quality, the longest keeping, and samples the handsomest in appearance. With this proposition sub-

mitted, let us consider the best means of attaining such a desirable end. Taking it for granted that we have healthy, well-grown, two or three-year-old nursery trees—the former are preferable in my opinion—and desire to plant an orchard: Select well-drained, loamy soil of good depth, with a northern exposure. Any treatment previous to planting which will bring the soil into a fair state of tilth is very desirable. A root or hoed crop is particularly useful towards securing this effect. Stake out the rows thirty to forty feet apart for such large growing varieties as Golden Russet, Fameuse and St. Lawrence; for varieties which come into bearing earlier, and are shorter-lived, 18 x 24 feet will be a sufficient distance. Duchess, Yellow Transparent, and Wealthy are good examples of this class. Be generous in digging the holes, give plenty of space for the roots, in addition to giving a thoroughly pulverized root-bed at the bottom, made by replacing the more or less infertile subsoil with richer material from the surface. You will pardon me for repeating one or two primary instructions: Pare smoothly all wounded or bruised root surfaces, cut the broken root extremities from the under side to favour the downward emission of roots. I am not in favour of severe top-pruning at the time of transplanting. If trees are dug with such care that the roots are not unnecessarily mutilated and shortened, the cutting back, so generally advocated, can in a large measure be obviated.

In replacing the soil, see that every space, no matter how small, between the roots, is well filled; and finally, see that the soil is firmly packed throughout—this is most important, as the minute and early starting rootlets will obtain a speedy hold upon mother earth, in proportion to the closeness or proximity of the contact. It is also important that the surface of the soil about the tree should be kept in a loose and finely pulverized condition, to prevent evaporation and subsequent drying out

By Mr. Carpenter :

Q. You recommend 30 feet as the outside in all cases?—A. Not as the outside. That is an average.

Q. A good many of them are 33 feet and 35 feet apart?—A. Yes; in the more favoured localities, where trees are longer-lived, and larger growing varieties are planted, 33, 35, and even 40 feet, is not too far.

By Mr. McGregor :

Q. When peaches are grown they frequently cultivate?—Yes, this plan is frequently practised in peach-growing districts.

Cultivation should be thorough and annual. There is no objection to growing any kind of a crop which will allow of cultivation, but it must be borne in mind that additional restoration in the matter of fertilizing materials will be needed by land thus doubly cropped.

Q. In cultivating would you go near the tree?—A. As near as the cultivator can be worked, without danger of barking the trunk. I say cultivation should be thorough each year, but it should not be continuous throughout the season. In order to bring out the reason for this practice, I will make the statement that trees, as a rule, withstand the cold of winter in proportion as the liquid matter in their structure has been converted into solids—in other words, as the twig is thoroughly ripened and matured, so will it resist frost. In order that the liquid matter be reduced to a minimum, it is essential, especially in our comparatively short northern summers, that the process of ripening should begin as early in the season as possible. This, of course, is dependent on the length of the growing period, which may be extended or shortened by the amount and character of the cultivation given. When cultivation is continued after the middle of July, a late growth is frequently induced, accompanied by imperfect maturing of the wood and followed by winter-killing: therefore, it is good practice to cease cultivating about the middle of July, except during seasons of exceptional dryness, when occasional surface-stirring will prevent the ill-effects arising from extreme evaporation. I am in favour, when circumstances will admit, of continuing annual cultivation as long as possible, after which

the orchard may be seeded down. If hay is taken from it, remember to top dress liberally and alternately with wood ashes and barnyard manure. This treatment will assist in maintaining an even balance between soil constituents necessary to a healthy and vigorous growth.

By Mr. Roome :

Q. How does cultivation affect these trees?—A. Cultivation helps to retain the moisture in the soil, by preventing evaporation. It favours a more abundant supply of surface-feeding roots, which may or may not have the power of absorbing fertilizing materials from the atmosphere. There are other advantages difficult to explain, but the fact remains, that if you cultivate a row of trees the whole summer it will hold its leaves and make much more growth than another row which has not been so cultivated. This, in cold climates, as already pointed out, is not desirable.

By Mr. McGregor :

Q. Would you manure just around the tree, or the whole surface of the ground?—A. I would manure the whole surface of the ground. It has been found that potash is one of the constituents that our fruit trees draw most heavily from the soil, and we must, therefore, in order to keep the balance even, return this to the soil in larger quantities than other fertilizers.

Q. In our country we use ashes?—A. This is one of the cheapest of fertilizers—I mean unleached hardwood ashes. In a bushel of average wood ashes there are about three pounds of potash, worth 4 cents per pound, or 12 cents for the bushel. Then we have about one pound of phosphoric acid, worth 4 cents, which will give us a total of 16 cents for these two constituents alone. Both of these are very valuable agents for orchard use. Besides these, in the wood ashes are lime, magnesia and iron, also important fertilizers. This makes a very valuable and almost complete fertilizer for orchards; but in addition, we need nitrogen, and this can be supplied by a dressing of barnyard manure every second year. That gives a complete fertilizer for the orchard.

A good artificial fertilizer, according to Prof. James, for an acre of ground, would be as follows:—Wood ashes, forty bushels; crushed bones, to give the phosphoric acid, 100 lbs.; and sulphate of ammonia, to give us the nitrogen, 100 lbs. This would cost about \$8.50 an acre, and be a very complete fertilizer, indeed. I would not advise that this should be all used at once, but spread over the first part of the growing season in different applications.

By Mr. Cochrane :

Q. Are you talking of bearing trees, or young trees, to which it should be applied?—A. The treatment will apply to either. Of course, as regards bearing trees in an old orchard, you will probably have to put on in the form of a top dressing, because the ground in some cases would be in sod.

By Mr. Carpenter :

Q. Surely you do not keep an old orchard in sod?—A. Certainly not, when it is possible to cultivate it. Cultivation is not always practicable; then the next best expedient must be resorted to.

Q. Do I understand that you apply one bushel of this to each tree?—A. I did not state it in that way.

Q. Well, there will be about forty trees to the acre?—A. Yes, that will be a very fair dressing if the land has been previously well treated.

By Mr. McGregor :

Q. Have you ever tried coal ashes?—A. We have not used coal ashes to any extent. Their principal effect on the soil would be a mechanical one. With a heavy clay soil it would loosen it up, and probably render it less tenacious.

By Mr. Bain :

Q. Is the old impression correct, that there is no fertilizing value in coal ashes?—A. It has a slight fertilizing effect, but this is very small. Considering, further, those factors which have an important effect on the life and health of the tree, let us take up pruning.

PRUNING TREES.

The saw and axe should practically have no function in the management and training of fruit trees. Treatment which calls for the use of these tools might fitly be designated as barbarous. Attention and well-directed thought, supplemented by easily-acquired skill during the earlier years of the existence of an apple tree, will, as a rule, obviate the use of more effective and formidable instruments than the pruning knife assisted by thumb and finger. So prune lightly and annually, as near that period when growth is beginning as possible, in order that the wounds may heal over with the least delay possible. Prune in winter, to encourage growth of wood; prune in summer, to discourage formation of wood and to induce fruitfulness.

Q. What time of the year would you prune?—A. A good time to prune is when the trees are making their first spring growth; wounds then heal readily. Another practice, having an important bearing upon the healthfulness of the tree, is that of washing the bark each year with an alkaline mixture for the destruction of scale insects, and as a borer preventive. That it is entirely effective in the latter respect is not claimed, yet there is no doubt that two applications during the months of May and June will give partial immunity. A useful wash is prepared by making a strong solution of washing soda in water, and thickening with soft-soap to the consistency of common paint. It is easily and rapidly applied to the stems and larger branches with a whitewash brush, at a cost of less than one-half cent per tree for the season.

•Considering, further, those factors which play an important part in contributing to the general health of the tree and the production of high class fruit, let us look into the matter of foliage. Leaves of plants can well be likened to the lungs and digestive organs of the animal. Viewed in this aspect, how important it is to preserve them in the healthiest condition possible, so that they may fully perform all their functions. The points already touched upon naturally have important bearings toward this end. In considering the most prominent causes of injury to foliage, we find them readily divisible into two classes:—

1. Injuries due to insects.
2. Injuries due to fungous enemies.

Taking up the first, which has already been treated by Mr. Fletcher, and studying the character of the injury, it is easily observed that it may be referred to one of the two main classes of injurious insects: those which are provided with jaws, and are leaf-eating; second, those having a suctorial organ, for the purpose of extracting the juices of the plant. The treatment of these two classes is essentially different, depending upon the structure of their mouth parts.

REMEDIES.

The masticating class are quickly and effectually checked by surface applications of arsenical poisons. These we find in the cheapest form in the mixtures known as Paris green and London purple. A good formula for most leaf-eating insects affecting the apple is 1 lb. of Paris green to 200 gallons of water. This is almost entirely effectual for codling moth and canker worm. The leaf-crumpler should be treated with a stronger mixture, say 1 lb. to 150 gallons, and this applied on the first indications of the presence of the pest. A delay till the larvæ are partially protected by the enfolded leaves renders the poison somewhat ineffectual.

Considering the second division, which I have designated as the Suctorial class, and to which belong various forms of thrips and plant lice, we find remedies effica-

cious in the first instance quite useless in the second, as the sucking tubes of the latter class penetrate the tissues, and the insects are thus unharmed by poisonous surface applications. Taking advantage, however, of the peculiar arrangement of the respiratory organs of insects, it has been found that by throwing over them an oily substance, which has the effect of closing their breathing tubes, they may be easily destroyed. One of the most effective remedies is that known as kerosene emulsion. In Bulletin No. 11, Experimental Farm series, Mr. Fletcher gives the following directions for the preparation of this insecticide :—

“ Kerosene.....	2 gallons.
Rain water.....	1 “
Soap.....	$\frac{1}{2}$ lb.

Boil the soap in the water till all is dissolved ; then, while boiling hot, turn it into the kerosene, and churn it constantly and forcibly with a syringe or force pump for five minutes, when it will be of a smooth, creamy nature. If the emulsion be perfect it will adhere to the surface of glass without oiliness. As it cools it thickens into a jelly-like mass. This gives the stock emulsion, which must be diluted with nine times its measure of warm water before using on vegetation. The above quantity of 3 gallons of emulsion will make 30 gallons of wash. Insects breath through small openings along their sides. The effect of kerosene emulsion is to suffocate them, by stopping up these breathing pores.”

The second large division, including enemies to the foilage, we must consider is fungous diseases. The great injury to our fruit trees, arising from the attacks of parasitical forms of plant life, has in the past been entirely unappreciated by fruit-growers throughout the country, and is only now receiving that attention which its importance deserves, and one of the most destructive of these is the disease known as the Apple Scab, of which I will speak later. More literature on experiments in the treatment of these diseases came into my office during last year than on any other subject under investigation by experiment at stations. Some 20 or 30 bulletins have been issued from experimental stations in the United States, within a few months, treating on this question of plant diseases. Last year I spoke to the Committee on some of the results of my own experiments. This year the work has been continued on new lines, and I think I have obtained more practical results. To give an idea of the importance of this work upon the fruit-growing interests, I may state that in some orchards in the Eastern Townships and in Ontario the crop has, within a few years, been reduced more than 75 per cent in value from the effect of the Apple Scab. Any one who has had experience with Fameuse apples, especially, will realize the truth of this assertion. The orchard upon which I have been working and of which I am going to speak has not given for the last ten years more than 20 per cent of apples which could be classed as No. 1. The variety selected was the Fameuse, the trees having been planted about 17 years ago. I selected the same number of trees for each of the mixtures which were used, the main idea being to obtain a mixture, and one easily prepared, which could be presented to the farmers in such a way that it would commend itself to their attention ; also, to learn the effect of using Paris green in conjunction with these fungicides, thus obtaining a combined fungicide and insecticide. The first mixture used was the ammoniacal solution—copper carbonate dissolved in ammonia. The fruit was carefully picked and graded into three classes, with results as follows :—This gave me the best returns : 42 per cent of first-class ; 47 per cent second, and 11 per cent third-class. On trees which were untreated the same orchard produced 18 per cent of first-class, 51 per cent of second, and 31 per cent third-class. You will see the proportion in the different classes is just reversed. In order that the Committee may better understand the effects of the treatment, I had some photographs taken of samples of the fruit.

The complete results may be briefly stated as follows :—

1. Paying results were obtained from the application of all of the mixtures.
2. In no case was the foliage injured.

3. The unwashed solution (a modification of eau celeste No. 4) gave the best results, and the same preparation in suspension (No. 3) the lowest returns.

4. The addition of Paris green to the fungicides at the time of the second application had no injurious affect upon the foliage, and increased the quantity of sound fruit 8·2 per cent.

SHOWING per cent of Fruit of First, Second and Third Quality, also per cent of Sound and Wormy Fruit.

Copper Carbonate.	Per Cent First Quality.	Per Cent Second Quality.	Per Cent Third Quality.	Per Cent of Wormy Fruit with Paris Green.	Per Cent of Wormy Fruit without Paris Green.	Per Cent in Favour of Paris Green.
1. Solution.....	38·8	46·6	14·5	21·6	26·6	5·0
2. Suspension.....	33·5	52·0	14·5	16·9	25·9	9·0
3. Unwashed suspension.....	33·	50·	17·0	10·5	22·3	11·8
4. Unwashed solution.....	42·5	46·5	11·0	8·5	15·0	6·5
5. Unsprayed.....	18·0	51·0	31·0	18·0	27·0	9·0

The mixtures just referred to were all prepared according to instructions given in Bulletin No. 10, issued last year. Paris green was added to each mixture when fully diluted at the time of second application, which was made after the blossoms had fallen and the fruit had formed.

By Senator Perley:

Q. Which of these mixtures containing Paris green gave the best results?—A. The individual results with Paris green did not vary much; an average of the whole was made. I found the Paris green did equally well with the whole of them. The only danger to be guarded against was injury to the leaves. When the Paris green was used with any combination containing ammonia undiluted, it is dissolved, and this arsenical solution is liable to injure the foliage. This difficulty is overcome by adding the Paris green when the mixture has been fully diluted.

By Mr. Carpenter:

Q. Can you give us any idea as to the quantities of those mixtures to be used per acre or per tree, and the method of applying them?—A. Yes; No. 1 is a solution of copper carbonate, made by dissolving $2\frac{1}{2}$ ounces of copper carbonate in one quart of ammonia diluted with 25 gallons of water. To this, after it has been diluted to the fullest extent, add one and three-quarter ounces of Paris green. The number of trees this will spray will, of course, depend upon the size of each tree, and the kind of nozzle used. In my experiments I found that by using a cyclone nozzle, 25 gallons would thoroughly spray 30 trees of the size referred to.

Q. What would that mixture be worth?—A. This mixture would cost about twenty-five cents, if the copper carbonate was made at home, according to directions given in the bulletin already mentioned.

Q. Then there is the work of application?—A. The time taken to make the application is very little, when the work is properly arranged and taken hold of in a systematic way. The cost of spraying an orchard of trees, say 20 years of age, for the whole season, making three applications, should not cost above five to seven cents per tree, including labour and the material.

Q. In your experiments, how many applications were made during the season?

—A. Three applications.

Q. At what time?—A. The first application was made just about this time (May 20), that is, when the leaves were beginning to unfold. The second application, to which Paris green was added, was made about two weeks later, after the blossoms had fallen. The third application was made about eighteen days later, and no further applications were made during the season.

Q. In some sections we are using nothing but Paris green, the first application being made when the blossom has fallen off, and the second two or three weeks afterwards. A. That would be too late when applied with a fungicide. One of the most important points to be remembered is that you must begin early. After the fungus has got a foothold within the tissues of the tree it is almost impossible to eradicate it, and any application is then only preventive in a slight degree; but if, while it is working on the surface, this fungicide is applied, it destroys the germinating spores of the fungus, and the disease is killed at the beginning. As I say, however, unless you start at the beginning it is almost impossible to eradicate it. You need only a barrel pump for a medium-sized orchard. It must also be borne in mind that you must have a nozzle that will apply the liquid in a very fine misty spray. This is done by a nozzle called the Cyclone Nozzle. The Vermorel Improved is an excellent modification of this.

A. Do you disapprove of the Boss Nozzle?—A. It is expensive, in that it uses too much liquid, which is laid on in the form of a drench rather than a fine spray.

By Senator Perley:

Q. What time in the day would you apply it?—A. It practically makes no difference, although bright sunlight might favour injury to foliage. The Cyclone Nozzle is one of the best instruments in the market to-day. The liquid is forced into a small chamber, and comes out in the form of a spreading cone and in a state of fine division.

The main points to be remembered in connection with this malady are that it is caused by a minute parasitic fungus, a low form of plant life, which, by living on the leaves and fruit of the apple, prevents assimilation in the former and the development of the latter. It is not so generally known that the same fungus attacks both the leaves and the fruit. A few facts to be remembered in connection with successful treatment are: 1. That it is perpetuated by spores, which take the place of seeds. 2. That these spores, formed in the autumn, live over winter upon the old leaves, fruit and young branches. 3. That these germinate in the spring as soon as conditions are favourable, which is usually about the time the young foliage is developing. The efficacy of the copper salt remedies have now come to be generally recognized, and the fruit grower who does not use these remedies is neglecting a simple precaution in direct opposition to his best interests. Ammoniacal copper carbonate and dilute Bordeaux mixture (half strength) are now the leading fungicides for apple and pear scab and grape mildew.

By Mr. Roome:

Q. Where did you say the spores remained during the winter?—A. On the dead leaves, on the bud scales of the young twigs of the trees and on fruit—in fact, any resting place; they are probably distributed by the wind and other agencies after growth begins in spring. The ammonia and copper carbonate, however, is a specific. The work is being continued this year, with the hope of obtaining cheaper fungicides and mixtures that may be applied with greater ease.

Many queries come to me asking the best kind of tree to plant in northern localities. In this connection I would say that they should plant only small trees, two-year-olds, and those trees should be cut back severely when they are planted, in order to induce a low bushy growth; by getting the head just as near the ground as possible, it assists in collecting the snow for the more complete protection of the

tree. Shade the tree on the south side, because it is found that in northern localities trees are more liable to injury on the south side of the trunk than on any other. This, of course, is easily accounted for by the fact that the warm sun in the spring affects that side more than the north side; and when the sap has started, if this period is followed by a sudden cold, the liquid matter is congealed, expansion taking place, the bark is burst, and serious injury ensues.

By Mr. Cochrane :

Q. Where is the northern locality? Where would you place this northern line?
—A. These instructions are in a general way to points north of the latitude of Ottawa. In Manitoba fruit trees should branch from or near the ground. Coming south and east can be headed higher, according to latitude.

Q. I would not agree with you at all, in Ontario, to put an orchard on a northern slope.—A. The experience of the oldest fruit-growers points to the fact that even conditions are secured by planting on situations having a northern aspect.

Q. I have an orchard alongside of mine, partly on a northern slope and partly on a southern slope. The northern slope has been a failure, and there is only a piece of gravel road between them, on the same piece of land, on Lake Ontario.—A. Exceptions to every rule may be found, but I was speaking more particularly for the benefit of planters in northern localities, and I should say that the statement that I have made will be found to be generally applicable throughout Quebec and the greater portion of Ontario, although minor influences, such as subsoil and drainage, often exert an influence not perceived.

By Senator Perley :

Q. That applies to the North-west, according to my observation?—A. Yes, very particularly.

By Mr. McNeill :

Q. What is the reason? Why is it better to have them on a northern slope?—A. Because we are apt to secure the climatic conditions a little more even, and trees are less influenced by extreme warm weather in the spring. Every bright day in the spring affects the trees on the southern slope more than on the northern. It may readily be observed that vegetation begins on southern slopes much earlier than on northern.

By Senator Perley :

Q. Our wheat fields are affected in the same way?—A. Because the conditions are even. A number of fruit trees obtained from the South last year were added to the orchard. I find this spring that 30 per cent of them are injured by bark-splitting, and this nearly all on the south side. This was done about a month ago, when we had 18° of frost following three or four days of warm weather.

By Mr. Carpenter :

Q. Don't you think we are making a mistake in experimenting in sections where fruits cannot be grown successfully? Don't you think that it would be better to spend money where fruit-growing is more successful?—A. A discussion affecting the policy of the department does not come within my sphere. I have charge of the horticultural work at the Experimental Farm, and, as Horticulturist, it is my duty to do such as will be of the greatest benefit to fruit-growers over as large an area as possible. There is no doubt that a large field for good work is open to the north of us. While the whole inhabited country to the north cannot, by reason of climatic position, compete in fruit markets with southern growers, yet it is important that they should be able to grow fruits for home use, and as the difficulties are greater, so is the need for encouragement and instruction enhanced.

Q. I believe it is cheaper for them to buy?—A. Horticulture has other influences than those which come through dollars and cents. The ethical side of the question should not be overlooked.

By Senator Perley :

Q. I never brought a barrel of apples to the North-west that did not cost me five dollars?—A. We have now touched upon the principal points in closest connection with the production of fruits of the first quality.

THINNING FRUITS.

Before proceeding to the consideration of varieties, allow me to say a word upon the importance of thinning fruit in years of heavy production. As we have already seen, in discussing the development of new varieties, the perpetuation of its kind is the object in life of all plants. The production of a large number of seeds gives greater certainty to this object; but seeds, botanically the fruit, in the case of most fruits, are matured at the expense of pulp, so that he who would obtain the best results must use his judgment in regard to the amount of fruit each tree is capable of bringing to the highest state of perfection, always remembering that size and perfect development are secured in inverse ratio to amount of fruit upon the tree.

Let me now draw your attention to some of the new varieties which seem to be of coming importance. Constantly new varieties are being brought before the attention of the public, some worthy of introduction, others entirely unreliable. Last year one of the varieties came under my notice, and which I think will prove of much value to parties, not only in northern but in southern Ontario, in fact, I would commend it for trial in all the apple-growing regions of the Dominion. The variety I referred to is one known as McMahan's White. It originated in Wisconsin some years ago. It has been planted widely and has been fruiting for some years past. I saw specimens of the fruit grown in Minnedosa and Wisconsin last summer, and was very favourably impressed with its appearance and quality.

The tree is doing well in the Experimental Farm orchard. Thus far it is one of our best and healthiest trees, and altogether I think it is a variety that has come to stay, and indications at present are that it will be a profitable variety.

The fruit is large and oblong, somewhat ribbed and attractive, a yellow ground partly covered with a red blush, and last year I am informed that it brought the highest price of any apple in the Milwaukee market, at the time of its shipment.

By Mr. Carpenter :

Q. What are its keeping qualities?—A. It is an early winter apple.

By Mr. Ross :

Q. Where is it most largely grown?—A. In Wisconsin. It has been introduced into several places in Canada.

Another variety which should be more generally planted is the Mackintosh Red. This is an early winter apple of the Fameuse type, remarkably beautiful and of high quality. I had a basket sent me last February by a resident of Ottawa, who grew it in his garden, and it was then in very good condition. It is of the Fameuse type, and more beautiful, if possible, than that well-known variety, equally fine in quality and desirable for the market. These two are apples that it will pay planters to set out more of.

TOP GRAFTING.

Among other experiments this spring, I have begun some with a view of gaining definite information upon the subject of top grafting, to see what effect it actually has upon the quality of the fruit and constitution of the tree. Summer apples have been grafted on fall and on winter apples, and the experiment has been reversed by grafting winter apples on summer and fall apples. This work was instituted last year, and again extended this season. It is hoped that in a few years' time we shall

be able to determine more definitely the exact effect on stock and scion when top grafted and the ultimate benefit to our fruit culture. There is at present a great deal of theory on this question, but very little actual fact known.

By Mr. Roome :

Q. What is the general opinion about it?—A. It is quite a general supposition that the stock influences the constitution of the scion or top, and that it changes the quality of the fruit and shortens the season. It is said that if you put a winter variety on a summer apple, you will shorten its season, injure the keeping qualities of the winter apple, and *vice versa*.

By Mr. McNeill :

Q. If a winter apple is grafted on a summer apple, what effect does it have?—A. The theory, as I have just stated, is that it hastens the ripening season and lessens its keeping qualities.

A subject of growing importance is the value to Canada of the Russian apples. In order to get results more rapidly and arrive at reliable conclusions to be brought before our nurserymen and fruit-growers, I was authorized by the Minister of Agriculture, last season, to examine the oldest orchards of these fruits, which are found in the western States, having been planted about twenty years ago. After looking over the whole field carefully, the following conclusions have been reached:—

First, that the northern limits of apple culture can be materially extended by planting the hardiest of these varieties. Second, all fruit-growing districts of Canada may be benefited by adding a judicious selection of the best kinds. Third, that among them are many valuable summer apples. Fourth, experience seems to indicate that among them are winter apples of fair quality and superior hardiness. Fifth, that in the milder portions of Ontario these winter apples are not of sufficiently good quality to be recommended. It is difficult in many localities to get an unbiased opinion in regard to the Russian apples. Two schools or factions among apple-growers have sprung up, one of which maintains the supremacy of our native fruits, while the other endorses the Russian apples. Without personal examination it is difficult to get at the actual status of the case. No doubt, amongst them are many valuable summer varieties, but owing to unpronounceable names, many mistakes and synonyms, the work of selection has been very slow. It is also assumed that there are a few varieties of long-keeping winter apples of great hardiness, but I do not think they will rate high in quality. In my report for 1892 I have described about thirty of these varieties, and have recommended that nurserymen should propagate them, because I think the time has come when these should be disseminated. In this list there are ten summer varieties, six fall varieties and twelve winter varieties.

The following varieties are selected from those which have been recommended in this report, and which are deemed sufficiently promising to be taken up by nurserymen.

SUMMER.—Yellow Transparent or Thaler, well known; Breskovka, No. 52 of the Moscow importation; Borovinka, Duchess type, later; Blushed Colville, a little later than Yellow Transparent; Lubsk Reinette, a favourite in Wisconsin.

FALL.—White Pigeon, very hardy, first quality; Golden White, large handsome Zolstoreff, Duchess type, handsome, poor quality; Switzer, doing well in Quebec and Wisconsin.

WINTER.—Ostrehoff (4 M) fine tree, fruit mid-winter; Hibernial (378 Dep.), of value as a cooking apple for the extreme north, and a top-grafting stock; Red Reinette (316), tree fairly hardy, fruit large, handsome, a good keeper; Gipsey (1227 Dep.), tree hardy, vigorous, fruit large, fair quality; Arabka (Imported by Ellwanger and Barry), tree hardy, fruit of the Blue Pearmain type; Zusoff (No. 585), grades with Fameuse in hardiness, fruit large, handsome, fair quality, good keeper.

In order that nurserymen might have the opportunity of propagating as soon as possible, a small distribution was made this spring to representative nurserymen of the different provinces, sending two trees each, including, where practicable, the different varieties mentioned in the report.

In the north there is likely to be a demand for this class. Each fruit-grower throughout the Dominion is asked to co-operate in the work of sifting the good from the useless in this large collection.

The Ontario Fruit Growers' Association is doing very important work in the matter of revising fruit lists for the different districts. During the past year lists of fruits for the thirteen fruit districts of the province have been struck, and they will prove valuable guides to planters situated in the various portions of the province. As beginners frequently lose much valuable time, to say nothing of the outlay in cash, by planting varieties not adapted to the locality, they should consult such lists before making their selection.

In the matter of plums, most of the west European varieties, or those (Prunes Domestic) of southern Ontario are not hardy in the vicinity of Ottawa. Outside of the Lombard, Glass Seedling, Quackenboss and Reine Claude, very few succeed at all. A few sorts imported from east Europe are succeeding admirably, but have not fruited yet. Among these are Early Red and White Nicholas. Another line of work has been the collecting of the native varieties of plums of the American and Chicasa types. These are scattered across the continent, and vary much in quality of fruit and hardiness of tree. While the fruit is not equal in quality, as a general rule, to those of the European class, yet the trees are very hardy, and it will probably make a good crossing and top-grafting stock, and thus increase our possibilities in that direction.

By Mr. Ross (Lisgar):

Q. Have you tried many of the prune varieties?—A. The prunes do not succeed in this latitude.

Q. Well, they succeed in Ontario?—A. Yes, in the more favoured portions, with pears. I can say the same thing as regards pease. Flemish Beauty, Bartlett and Beurre d'Anjou succeed very well; the others, as a rule, are entirely tender and do not succeed. This year I am top-grafting them on hardy Russian stocks, with a view of testing the benefit of using a hardy stock to increase the vigour of tender varieties.

By Mr. McNeill:

Q. Will you name half a dozen of the best varieties of plums for western Ontario?—A. It is somewhat difficult to recall, out of a large list, six which may be termed the best, but I should say Bradshaw, for early; Pond's Seedling; Glass Seedling is a plum with which I am favourably impressed wherever I have seen it. It is, however, a new variety, and as yet not very well known. Then there is the Botan, a Japanese plum of recent introduction and promise, but which I would not advise the planting of, except in the Niagara and Essex districts.

MR. ROSS.—It has been grown in England, in some parts, for years, and has been successful.

Then the Genuü does very well in certain localities, and is a dark, handsome plum, following the Lombard, although it may not be a plum that can be grown very generally. The Lombard and Quackenboss are both standard varieties; with Peters' Yellow Gage and Coe's Golden Drop, a satisfactory selection will be secured.

PEARS.

In speaking of pears, we must view them at Ottawa and in the Province of Quebec entirely from the home use and amateur standpoint. In no district in the Province of Quebec do I anticipate that any of our present list can be profitably cultivated. In favoured locations and with special care, a sufficient supply for home use can be grown, but, as a general rule, the life of the average pear tree, even of the

hardest varieties, in the Province of Quebec, is only a few years, and full of trouble. Blight, bark-bursting and winter-killing, all contribute their quota to this end.

The best practice is to plant the hardest varieties, such as Flemish Beauty, Bartlett, Goodale and Beurre d'Anjou, in well drained soil, not too rich; refrain from high cultivation and heavy manuring. Summer prune to induce fruitfulness. On the first indication of twig-blight cut off the affected branch a few inches below the discoloured wood, and paint the cut surface and a few inches of the remaining stub with linseed oil. The practice of planting dwarfs instead of standards in city gardens is recommended, as being more easily managed in the matter of training and winter protection.

Among the new Russians I do not expect that we shall find pears of high quality—anything to compete with Bartletts or Seckels; their value will principally consist in their probable utility as a grafting and crossing stock. Experiments in both of these lines have been inaugurated at the Experimental Farm, and we hope before long to be able to point to some results. In the meantime, following out the proposition advanced in connection with the apple, tender on their own stocks, varieties of undoubted hardiness, as Bessennanka, Limber Twig, and Sapiegauka, can, I think, be safely used as a means of widening the cultivable area of finer sorts. The three pears just named have fruited at Abbotsford, Que., but not in sufficient quantities to demonstrate their probable future usefulness. Their quality is not above second rate. The best varieties for western Ontario, giving summer varieties, first I should say for profit, would be Beurre Gifford, Bartlett and Flemish Beauty, Clapp's Favourite and Doyenne Boussock; for fall varieties, Duchess and Sheldon.

By Mr. McNeill :

Q. Are those early pears that you have mentioned?—A. Summer and fall. For Winter I should recommend Beurre d'Anjou, Lawrence and Josephine de Malines.

By Mr. Carpenter :

Q. Have you done anything with pear blight?—A. I have not worked on pear blight, but up to the present no satisfactory remedy has been found. The affected twigs should be removed as soon as the disease appears, and a few inches of the remaining stub of the branch painted with linseed oil. Fruit-growers who have tried this plan testify to its efficacy in arresting the spread of the disease, which is of bacterial origin.

REMEDY FOR PEAR SCAB.

Pear scab has been successfully treated with Bordeaux mixture, which is made by dissolving 6 lb. of copper sulphate in 16 gallons of water, and slaking 4 lb. of lime in 6 to 10 gallons of water, then mixing the two and spraying this upon the trees. In using the lime, however, you must strain it, or it will clog your nozzle. This is the ordinary Bordeaux mixture. A modified form is now made, using half the quantities of lime and copper sulphate just given, and is said to be equally effective. The Bordeaux mixture, applied three or four times to pear trees, is almost a complete preventive.

APRICOTS.

In regard to the so-called hardy Russian apricots, these have all been selected from seedling varieties, as grown by the Russian Mennonites of Kansas and Nebraska. That they are harder than the ordinary apricot there is little doubt; that they are free from attacks of curculio there is very much doubt; that they are likely to be of much value in the Provinces of Quebec and Ontario is a supposition based upon unreliable premises. The fruit, so far as I know, is not equal to any of the older varieties.

SMALL FRUITS—GRAPES.

Turning for a few moments to our small fruits, I think our experiments with this class will be of value, not only to the northern parts, but to the whole of the

Province of Ontario. Of grapes, last year we fruited 125 varieties. The progress and rapid development of the grape-growing industry, I might say over the whole country, has been remarkable, because, practically, the cultivation of the grape in America dates back only about fifty years. Half a century ago some of the original types were introduced from the south and worked gradually northward, and as the art of crossing and hybridizing became known, the work extended very rapidly. To elucidate future reference, it may be well to say that all our cultivated grape vines east of the Rocky Mountains are derived from a few wild species by crossing or hybridization between our natives, or with representatives of the European species, *Vitis Vinifera*.

1. *Vitis Labrusca*, or Northern Fox Grape, native of the South New England and Middle States. The Rogers varieties are largely derived from this source.

2. *Vitis Riparia*, what is known in northern sections as the Frost Grape; distributed throughout Canada and the north-western States. *Clinton*, *Brant* and *Bacchus* are prominent examples of this class.

3. *Vitis Aestivalis* is the wine grape of the middle or southern States. Very few varieties of this species ripen as far north as any portion of Canada.

4. *Vitis Vinifera*, European or old-world species. Hybrids have been produced between this and a number of our natives, with many failures and some successes.

I will refer to a few essentials towards successful cultivation in the Province of Quebec and northern Ontario.

1. Select a warm, loamy, well-drained soil, with a southern exposure.

2. Plant well-rooted two-year-old vines in holes 15 to 18 inches deep, filling up as growth takes place.

3. Train on the two-arm or fan system, preferably the former, in each case starting the branches near the ground, for the purpose of easy winter protection.

4. Make provision for holding the snow on the ground, as well as covering in the soil, till the vines have become well established.

5. Judicious fall and summer pruning, together with liberal applications of potash and phosphoric acid, which can be probably most cheaply obtained in the form of wood ashes, largely aid in obtaining satisfactory returns. A careful selection of varieties is of prime importance in this district of limited summer heat. In our trial vineyard at Ottawa there fruited last year more than 120 varieties. For home use, I would recommend to the attention of amateurs, grapes, as follows, beginning with black sorts in order of ripening:—Florence, Cottage, Morse's Early, and Herbert or Worden. Red—Moyer, Delaware, Lindley, Norwood, and Salem or Agawam. White—Jessica Hayes, Lady, El Dorado, Rogers 34, Kensington. These, with the exception of Agawam, Salem and Kensington, are sure to ripen, and are—while they may not yield with Champions and Concords—in the main, grapes of good quality.

In regard to the methods of training, the system which a man finds the easiest is generally the best, as long as it contains the requisite demands of the grape. The two-arm system and the fan system are both satisfactory, and each have their advocates. I think for localities where vines are covered annually the two-arm system is usually to be found more satisfactory. In this locality summer pruning is very advantageous, so as to hasten the ripening process. In order to keep up the vigour of the vine it is necessary to manure the ground very considerably, and in doing so a rampant growth is induced. This has to be pinched back, so that the fruit will ripen. I may add that in the Experimental Farm vineyard, here, we have two systems: one, the French or the pole system; the other, the ordinary trellis plan. The pole system, I find, does not give satisfaction here with vines at this distance and in this locality, planted 4 feet apart and trained to a single stake. They have not sufficient light and heat to allow the fruit to mature properly; but on the trellises they get more sunshine and heat, which tends to bring about an earlier maturation.

A few varieties deserve special mention. One of these is the El Dorado. I think that is the finest flavoured grape that can be grown in this vicinity. I notice that

in the Ontario fruit list it is not rated of very high quality, although I cannot understand it, because last year and this year it was not only my own opinion, but the verdict of every body who visited the vineyard, that the fruit was the finest variety in the whole vineyard, and I wish to recommend it, unqualifiedly, for home use.

By Mr. Roome :

Q. Is it of good size?—A. The berry is of good size, bunch fairly compact, and the quality unexcelled. It is occasionally defective in pollen, and does not set well.

By Mr. Carpenter :

Q. You have also the Niagara grape?—A. It does not ripen here at Ottawa like the El Dorado, except in favourable seasons.

RASPBERRIES.

In speaking of raspberries, I will merely mention some of the newer facts ascertained, bearing upon their profitable and successful culture. Commercially considered, it will generally be found more advantageous to grow them in hills four or five feet apart and reduce hand-work to a minimum, by cultivating by horse power, both ways. This system keeps down to better advantage the large number of superfluous suckers. Summer prune once or twice, pinching back the sprouting varieties so that a uniform height of $3\frac{1}{2}$ to 4 feet is maintained. In the matter of winter protection, which is now almost universally in vogue throughout the north-western States, I have found that it pays with varieties grading in hardiness with Clark Hornet and Brinkle's Orange. Turner and Hansell, hardy varieties, have not given me augmented returns in quantity of fruit, but their earliness has been increased from four to six days. The amount of the annual snowfall will have an important effect upon the character of the results: in localities of limited snowfall and severe frost, winter protection of small fruits is now an important factor towards paying returns. Cuthbert is the best red raspberry for home use in the market. Schaffer is a profitable purple canning variety. Golden Queen, among yellow kinds, is prolific and of fair quality. But owners of gardens should not forget to give place and extra care to that leader in quality among raspberries, Brinkle's Orange. Last year I had tried some experiments in covering raspberries, to get at the cost and the actual results from a market standpoint. In brief, I found that the first result was that it hastened the maturing of the fruit from four to six days of the same variety; in the second, that with hardy varieties it did not more than pay the costs of this covering and taking up, although there was no loss from actual count. The Turner, for example, did more than pay, but the Cuthbert and Herstine, Brinkle's Orange and Clarke gave a return of from sixteen to twenty-two per cent over the cost of the protection; so therefore I would conclude that cultivators in northern localities leave their raspberry canes uncovered at an actual loss.

By Mr. O'Brien :

Q. I tried experiments in covering, in consequence of what you said last year. I left some of the crop not protected; and in a case of some new plants I bought, I covered the ends. The only difference I saw when I uncovered in the spring was that in the case of those that were covered the buds were a little more forward. In those not covered there was not the slightest injury done?—A. You had a pretty fair snowfall?

Q. I know a fruit-grower of Barrie who grows a large quantity of raspberries, and never covers them at all. It is not necessary?—A. It is not necessary in some localities, but where the canes are liable to be injured it is necessary, and also a paying operation.

GOOSEBERRIES.

We have been conducting some experiments in the treatment of gooseberry mildew. Last year, I tried a great many fungicides, and I found that by using

potassium sulphide, in the proportion of an ounce to three gallons of water—spraying was repeated frequently, say once in 7 or 8 days till the fruit was formed—the English gooseberries were grown successfully, and this treatment gave me perfect immunity from mildew. But it must be remembered that with this disease, like all the other fungous troubles, treatment must begin very early and be continued faithfully. Spraying has already been commenced on all our gooseberries this year. Potassium sulphide or lime of sulphur dissolves readily in water, one ounce in three gallons. It may be applied with a small hand-pump, or with a knapsack pump, or a barrel force-pump, placed on a stonebolt, which will be found more expeditious for a large plantation.

By Mr. McNeill :

Q. Do you find you could grow the best English varieties?—A. Yes. There is no difficulty if that fungicide is used. Copper carbonate is also useful and effective for the same disease.

Touching upon vegetables for a few minutes, I find that farmers all over the country pay far too little attention to the varieties of vegetables. They do not look into the fact that there are many kinds of beets, that there are many kinds of pease, beans and tomatoes, all differing in some more or less important characteristics, whether it may be in season, quality or productiveness, and that one variety is not equal to another in every respect.

The same thing may be said of cauliflowers, celery, &c. In order to bring out the best varieties for home use and gardening purposes, I have been testing a very large number each year, taking up a few classes and going over the ground thoroughly. As this work has been detailed in my report now in press, I do not here mention the best varieties of each, but wish to draw attention to the importance of selecting the best varieties.

By Mr. Carpenter :

Q. Have you anything on cherries? That is an important industry in my section of the country.—A. I have not touched on cherries on this occasion, for the reason that it was gone into last year pretty thoroughly after the cherry season. I did not intend to bring it up this morning, as I had so much else, and no new information gained since that time.

CULTURE OF VEGETABLES—ONIONS.

Returning to vegetables, I wish to say a word in description of rather a new departure in the way of raising onions, that is, by transplanting them. It has been demonstrated conclusively and clearly that the Spanish varieties of onions can be transplanted with paying returns, by starting the young plants in a hot-bed, a little earlier than they can be sown in the open, and transplanting them when they have attained a suitable size. The product was from 25 to 30 per cent more than from the same varieties not transplanted. These are also freer from attacks of the maggot. This plan is being adopted by market gardeners with the Spanish varieties, and the system is known as the "new onion culture." I am testing the system thoroughly this year. However, it may now be considered as having been demonstrated that for the class of onions mentioned it is the most satisfactory method. Another thing in favour of it, as already stated, is that onions transplanted are much freer from the attacks of the maggot than those grown in open field culture.

GARDEN PEASE.

Our experimental plots included 60 varieties of garden pease last year. "First and Best" and "American Wonder" are two good varieties for home use. In planting for a succession to cover the season, I found that it paid me, and was much more advantageous, to sow at the same time a succession of varieties, ripening at different periods during summer, than to sow the same early variety at different times. Take the American Wonder, for instance. Every one who wants a succession

of pease can take that variety and make sowings a week or ten days apart, so they will have green pease covering the season. After the second sowing, I found that the mildew became so prevalent that the crop entirely failed, but by sowing Daniel O'Rourke's American Wonder, and another variety, such as Saunder's Marrow, as well as the Dwarf Sugar, these ripened at different times covering the season; but germinating early and getting a good start, escaped mildew. A good yield was thus obtained.

BEANS.

In our experiments with beans for the past few years we have been troubled considerably with a disease known as *Anthrax Neris*, or spotting of beans. This is found to be remedied very much by soaking the seed for 20 minutes in an ammoniacal solution, the mixture mentioned in connection with apple scab. The soaking should be done immediately before planting. It seems to kill the germ or spora of the fungus that is dominant within the seed.

By Mr. Carpenter :

Q. How would that affect the bug in pease, for instance?—A. The pea-weevil is treated much more advantageously and readily with bisulphide of carbon in closed bins, and by subjecting the pease, immediately before planting, to hot water at a temperature of 140 degrees, for half an hour. That will kill the weevil and will not injure the germinating power of the pease. In tomatoes, I had 60 varieties in the experimental plots, and one of the principal experiments with these was to find what fertilizer would give the best results, in amount of fruit ripened. I used nitrate of soda, 300 lbs. to the acre; muriate of potash, the same; superphosphates the same; wood ashes, at the rate of 50 bushels to the acre; and barnyard manure, 20 tons to the acre. The barnyard manure gave me 18 lbs. of ripe fruit per plant for the season; wood ashes gave me 16 lbs.; the superphosphates gave me 16 lbs., while the muriate of potash gave 14 lbs.; and the nitrate of soda 13 lbs., and those unfertilized gave me an average of 12 lbs. per plant of ripened fruit.

Q. The barnyard manure seemed to have all the required ingredients?—A. Yes; it seemed to be a perfect fertilizer on that soil. It does not seem to be necessary in all cases to buy expensive artificial fertilizers.

FOREST TREE CULTURE.

Taking up, briefly, forestry on the Farm, you know something of our system of shelter belts planted on the Farm, for protection, as well as to point practically to the best varieties of timber trees as well as the most profitable. The belt on the west side was completed last year. Twenty-three varieties of forest trees were added, making a total of 3,000 trees planted last year. The measurements of the annual growth of each variety have been taken year by year, and the results are already becoming interesting. Thus far, the fastest-growing trees have been the Russian poplars and willows. The soft maple (*acer dasycarpum*) ranks next, the black locust next, although it is a miserable nuisance here; the Manitoba maple, the black cherry, the green orb and the yellow birch are about equally rapid growers. The belt was planted, as has been explained, with a view of testing the proper distance to set trees apart. Some of the trees are 10 feet, and others 5 feet. So far, those standing 5 feet apart have made the most rapid upward growth, and this, I imagine, will be more marked as they grow older. It is natural to suppose that being crowded they push up more rapidly than others, with more room to obtain light and growing space.

Among the conifers, the Scotch pine and European larch have made rapid growth. The white pine and Norway spruce stand next, followed by the native spruce, which is comparatively a slow grower. In the report of the Minister of Agriculture it will be noticed that an annual distribution has been made for the last three years to Manitoba and the North-west Territories. In round numbers, there have been a total of 400,000 forest trees, up to the present, distributed in Manitoba and the

North-west. This spring we have sent out 100,000 forest trees, including a large number of evergreens of hardy and fast-growing varieties raised from seed at the Experimental Farm; also 100,000 cuttings of fast-growing varieties of apples and willows, mostly importations from east Europe. Being guided by the reports received from Manitoba, I will give you a list of those varieties of trees which thus far have been most successful in that province. First, the native maple or box elder is one of the most reliable; the green ash, the white elm, the white birch, the white spruce and the mountain ash, both European and American varieties of which succeed very well. The cut-leaved birch is hardy, and is one of the best ornamental trees in the province.

Among shrubs, nearly all the lilacs (*spiraea opulifolia*), Douglass's and Van Houtte are promising. The Siberian pea tree (*carazana arboris cius*) and Asiatic maple (*acer quinnala*)—a beautiful dwarf form—are among the most hardy and desirable. Norway spruce, white and Austrian pine, are most reliable as a general rule. For the North-west Territories the selection is somewhat more restricted—box elder, green ash, the native elm of Manitoba, with the Russian poplars and willows, are the safest trees to plant. Nearly all the lilacs, such as the common lilac (*syringa vulgaris*), the white lilac (*syringa alba*), and the Russian lilac (*syringa Jasikea*) are hardy, and do well in the North-west Territories, as well as a small tree called the Siberian pea tree, a tall-growing form of southern wood (*artemisia abrotans*), while it kills back each winter, is a rapid and vigorous grower, desirable on account of its feathery green foliage during summer.

By Mr. Ross (Lisgar) :

Q. Have you tried the Linden tree?—A. The Linden is native, and grows very well in parts of Manitoba, principally about the lakes. The European variety does not succeed. This year the distribution consisted, in part, of cuttings and shrubs. The appended circulars explain what varieties were sent out, and attached to them is the list of trees that were included in each package.

The following circular accompanied each package containing cuttings of Russian poplars and willows:—

DOMINION OF CANADA, DEPARTMENT OF AGRICULTURE,
CENTRAL EXPERIMENTAL FARM, OTTAWA, April , 1892.

DEAR SIR,—I beg to advise you that a package containing cuttings of Russian poplars and willows has been mailed to your address. This distribution is being made under the Minister of Agriculture, with the hope that these hardy and rapid-growing species may be found useful in your district.

Your attention is called to the following instructions for treatment and planting, with notes on the varieties sent, prepared by Mr. John Craig, Horticulturist to the Experimental Farm. You will also please bear in mind the importance of your reporting the results of your experience with these poplars and willows, as such information will be a valuable guide for future planting.

WM. SAUNDERS,
Director Experimental Farms.

INSTRUCTIONS FOR TREATMENT AND PLANTING.

As soon as the cuttings are received, unpack and immerse them in water for a couple of hours. If unable to plant them immediately, store them in a cool cellar or bury them in the soil out of doors.

Situation.—When selecting a site for planting, if possible choose a loamy and friable soil on a northeru slope. On southern exposures, trees are liable to be injured by alternate freezing and thawing in the spring, and by hot winds in summer.

Preparation of Soil.—The ground should be thoroughly worked to a depth of 12 to 15 inches; mark out four rows, 50 feet long and 4 feet apart.

Planting.—In order to prevent the different varieties of poplars from becoming mixed, and to assist in keeping records, alternate as far as possible in the rows the willows and poplars. For example, begin with *populus certinensis*, following this with *salix* (willow) *laurifolia*, French, then *populus nolesti*, Riga, followed by *salix acutifolia*, and so on, as far as possible, till all are planted. The cuttings should be set 2 feet apart in the rows and down to the last living bud. This is readily accomplished by opening a cleft with a spade in the line of the row for insertion of the cutting. Care should be taken to press the earth firmly about them, leaving no air space at the bottom. The surface soil should be left loose and mellow, and kept in this manner throughout the summer by frequent shallow cultivation, in order to prevent excessive evaporation.

Mulch heavily, each year, in the fall, with straw, manure or prairie hay, which should be removed in the spring when cultivation begins. This treatment should be continued annually until the trees are large enough to shade the ground.

Remarks.—These cuttings are of promising hardy varieties which have been introduced from east Europe within the last few years. They have been selected for the reason that they have proved hardy on the experimental farms at Brandon, Man., and Indian Head, N.W.T., and are believed to be specially adapted to the requirements of those farmers residing on the plains of Manitoba and the North-west.

The ease and rapidity with which they can be multiplied gives them additional value. From their quick growth, they will be found most useful in providing the shelter needed for starting the cultivation of less hardy but more enduring varieties of slower growth.

The value of this work will be much enhanced if accurate records are kept of each variety by the individual recipients; the close resemblance of many of the poplars will necessitate careful labelling. Reports will be expected when sufficient time has elapsed and experience gained to give value to the conclusions reached.

Cuttings may be taken from the young trees at the close of the second season's growth. These should be buried in the ground and protected from severe frost during winter. They may be planted the following spring 4 feet apart, with a view to the formation of shelter belts. With a small amount of care and attention a large plantation can thus be readily secured.

JOHN CRAIG,
Horticulturist.

CIRCULAR ACCOMPANYING EACH PACKAGE CONTAINING TREES AND SHRUBS.

DOMINION OF CANADA, DEPARTMENT OF AGRICULTURE,
CENTRAL EXPERIMENTAL FARM, OTTAWA, April, 1892.

DEAR SIR,—I beg to advise you that a package of seedling evergreen trees and shrubs has been mailed herewith, to your address, in response to your request. This distribution is being made under instruction of the Minister of Agriculture, with the hope that a stimulus will thereby be given to trees growing in Manitoba and the North-west Territories.

Your attention is called to the following instructions for planting, and notes on the varieties of trees sent, prepared by Mr. John Craig, Horticulturist to the Central Experimental Farm. I also desire to impress upon you the importance of your reporting the results of your experience with these trees.

WM. SAUNDERS,
Director Experimental Farms.

The trees and shrubs mailed herewith are all of the hardiest varieties, and by carrying out the following instructions a fair measure of success may be attained, even in the most trying situations.

HORTICULTURIST.

INSTRUCTIONS FOR PLANTING.

The pines and spruces will require the greatest care to prevent the small fibrous roots from becoming dried. As soon as received, unpack and puddle or wet the roots, and place in a moist, shady position for a few days previous to planting. Plant the pines and spruces in well-prepared soil; if possible, in a partly shaded position (if much exposed, shade artificially), packing the soil very firmly about the roots. Plant closely for mutual protection, say from 12 to 15 inches apart; water liberally, and mulch the whole surface of the ground with straw, manure or prairie hay, to preserve the moisture of the soil as far as possible. The black walnuts and shrubs (lilacs, barberry, sweet brier, and caragana) are designed for lawn and garden ornamentation, and should be carefully planted in good soil, watered when necessary during periods of drought, and protected by covering completely with mulching material on the approach of the first winter, and each winter following, as far as circumstances will admit.

Please preserve the labels, and take notes on each variety, so that you may be able to give a full report of your successes and failures.

JOHN CRAIG,
Horticulturist.

To Ontario and Quebec quite a number of black walnuts were distributed—about 2,000 to various sections. These were sent in answer to special requests, and with them some new varieties of fruit trees.

In connection with preparations for the World's Fair, Mr. Shutt, Chemist to the Experimental Farms, and myself, have been working for the past two years on the subject of fruit preservatives—experimenting with substances in which to preserve fruits, not for table use, but for exhibition purposes. Up to this time we have used a great many different mixtures, and though, I must say, our results have, in many instances, been pretty largely negative ones, yet last year we succeeded in getting fluids which, I think, will be serviceable in preserving our fruits for the World's Fair next year. As the exhibition opens in May, 1893, these fruits will have to be put up in glass the present season, and it is important that we should obtain such light upon the subject as will enable us to advise the parties who have charge of the work what are the best methods and mixtures for this purpose. One of the most difficult things we have to contend with is that of preserving the natural colour. Quite a number of antiseptic fluids will preserve the form, but will extract the colour of our brilliant-hued fruits.

FRUIT PRESERVING.

To return to the subject of fruit preservatives, many difficulties surround the work which are not apparent at first sight. To find a fluid which will arrest the natural chemical changes taking place in fruits attendant upon approaching decomposition, as well as to preserve the natural delicate shades and tints of our high-coloured fruits, is a very difficult task. Another difficulty arises from the varying density of the juices of fruits. When a fruit is immersed in a liquid differing from itself in specific gravity, a sidic action—the law of equalization of fluids—takes place, and the fruit either absorbs till the skin is ruptured or loses some of its juice and becomes shrivelled in appearance. This may be overcome, for the most part, by adding glycerine to the preservative fluid until it approaches the specific gravity of the fruit, which is indicated by the latter remaining suspended in the liquid. By paying particular attention to these points, we have met with a fair degree of success. Without going into details, I will mention a few of the substances which are likely to prove of great service in making a creditable display of our fruits at the World's Fair. For red and black raspberries, boric acid and salicylic acid, using a 1 per cent solution, and zinc chloride, using a 2 per cent solution, have given fairly satisfactory results.

For preserving yellow and white fruits, such as pears, peaches and yellow raspberries, sulphurous acid, using a saturated solution, has given most encouraging results.

This was used at the Intercolonial Exhibition. Chloral hydrate for green-coloured fruits using, a 3 to 4 per cent solution, gave good results. In the matter of dark-coloured plums, grapes and currants, we had excellent success by using one-tenth of 1 per cent solution of mercuric bichloride or corrosive sublimate, in water. Our results in this particular were very gratifying. Distilled water was the diluent used in all cases.

By Mr. Roome :

Q. Have you tried salycilic acid?—A. Yes, in various proportions; while it is a good preservative, yet its bleaching power is so marked that for high-coloured fruits it is not satisfactory.

By Mr. Carpenter :

Q. These mixtures are only for fruits for exhibition purposes?—A. Yes, for exhibition purposes only. They would in most cases be poisonous and dangerous to use. This, Mr. Chairman, brings me to the end of the matter which I wished specially to present to the Committee this morning; but if there are other subjects in my line upon which I can give information, it will give me pleasure to do so.

By Mr. McNeill :

Q. You spoke of root-grafting. In what way is that done?—A. These root-grafted trees are made by grafting scions on seedlings one year old. The seed apple, for instance, is planted in the spring. In the autumn of the same year the young seedlings are taken up and cut into two or three sections of about $3\frac{1}{2}$ inches long. Then each section is spliced to a six-inch scion; this, when properly jointed and tied, makes the root-graft.

In propagating new varieties, we made about 8,000 of these last winter.

By Mr. Ross (Lisgar) :

Q. Have you been able yet, at your experimental farm in British Columbia, to do anything thus far, of which you can give us the results here, in the way of fruits?—A. No. It is too soon to speak of results there yet, because the greater portion of the fruits were only set out last year. However, judging from the rate at which the trees are growing, if the fruit is in proportion to the amount of wood the trees are making, we will get barrels of fruit the present year.

By Mr. Tyrwhitt :

Q. What has been the result of your experience on the Farm as to the best time for sowing turnips to escape the fly?—A. Field turnips, I suppose you mean. That is a little out of my line. We have had the best results sowing early in June, from the 8th to the 15th. Last year attacks of the turnip fly were treated with a mixture of Paris green and land plaster. This, I think, is the most practical remedy, but they must be attended to promptly on the first appearance of the insect.

I have examined the foregoing copy of my evidence and find it correct.

JOHN CRAIG,
Horticulturist, Experimental Farms.

COMMITTEE ROOM 46, HOUSE OF COMMONS,

THURSDAY, 2nd June, 1892.

The Select Standing Committee on Agriculture and Colonization met this day, the chairman, Dr. Sproule, presiding.

Mr. F. T. SHUTT, Chemist to the Dominion Experimental Farms, was called, and addressed the Committee as follows:—

MR. CHAIRMAN AND GENTLEMEN,—In bringing before you the work of the chemical department of the Dominion experimental farms, I shall, with your permission, pursue the same course I have adopted on former occasions when I had the honour and privilege of addressing you. It will be my endeavour to lay before you an outline—a very brief epitome—as time will not allow me to do more, of the analytical work and original research in agricultural chemistry that have been conducted in the laboratories of the experimental farms during the past year. I must of necessity pass over very many interesting data, referring you for details of the results of our experiments to my annual report, which is now in the printer's hands. I shall, therefore, confine myself to the more salient and important features of the work of the past season.

CHEMICAL SCIENCE IN RELATION TO AGRICULTURE.

Before, however, entering upon my special task to-day, I wish to speak briefly on the intimate and important relationship of chemistry to agriculture. In what I am about to say I do not wish to be thought as in any way lecturing the honourable members present, because I am aware that many of the members of this Committee are not only practical farmers, but successful farmers. I would not have it supposed for one moment that I am placing myself in the position of a teacher, but I wish particularly to-day to emphasize this thought of the relation, and of the great and fundamental importance of chemistry to agriculture, because I know it is the wish of the Committee, as it is of those at the Experimental Farm, that the farmers throughout the Dominion should receive that education in their work which will lead to better and more profitable farming. I feel that in bringing their needs in this way before you I shall enlist your co-operation and sympathy in the matter of extending this work. When you meet farmers, you can assist both them and us by impressing upon them the practical value and profit arising out of a knowledge of what chemistry can do for agriculture, and in this way do a vast amount of good to the farmers throughout the country. I said there is a great and fundamental relationship between chemistry and agriculture, and I would go a little further than that, and say that I consider that without the aid of chemistry no branch of farming can be carried on intelligently, successfully and economically. It is hardly necessary for me to point out to you how chemistry renders aid to all branches of farming, to stock-raising, to the producing of grain, to fruit-growing, and, in fact, to all branches of farming. Illustrations of this will, of course, occur to your mind at the moment. The relative nutritive value of different cattle foods, the food values of dairy products, the needs of a soil, the amount and value of fertilizing ingredients in a manure, and a host of other important questions, are answered by chemistry, and chemistry alone.

Without a knowledge of the fundamental or elementary principles of chemistry, I consider that the farmers of the future will not be able to compete successfully with their more intelligent neighbours who undertake to make themselves conversant with, and practically apply, those principles. We may say that improved and modern agriculture is both a science and an art. As a

science, we may consider it as a branch of chemistry, not wholly so, perhaps, but largely so, and receiving assistance from the sciences of plant and animal physiology. As an art, of course, it puts into practice for the growth of plants and the production of animal products the teaching of the science of chemistry. Every farming operation, whether performed by nature or the farmer, involves a chemical change, and therefore you will agree with me that it is highly necessary that throughout the land generally we should spread more and more, as opportunities permit, this knowledge of chemistry in connection with agriculture.

Agriculture at present in England and on the continent of Europe is on a very much higher plane than ours here. While this improvement in agriculture, amounting to a revolution during the last ten or fifteen years, is partially due to competition and kindred circumstances, yet it is principally the results of agricultural chemistry, as worked out by Liebig and his followers, down to the present time. The assistance rendered by the chemists of the agricultural stations of Germany, and by Sir John Lawes and Dr. Gilbert in England, has not only brought increased wealth and prosperity to thousands of farmers, but has been of untold value to the whole farming community, in raising the whole status of the farmer, by making his work an intelligent one, in which the brain as well as the muscles can be remuneratively employed.

In view of all this, I think it will be gratifying to you to learn that throughout the length and breadth of this land there has been awakened an ever-increasing and practical interest in the chemical department of the Experimental Farms. I feel sure that this interest will result in more intelligent and economic methods of farming than have been practised by many heretofore.

Now, as an indication of this interest of which I have spoken, allow me to state that the correspondence has very greatly increased; questions are continually pouring in upon me regarding the treatment of the soil, concerning the value of certain fertilizers, and the relative worth of cattle foods. These constitute a few of the different classes of questions. Last year over 1,300 letters passed between myself and correspondents on matters appertaining to agriculture. Again, I might mention, in connection with this growing interest in agricultural chemistry, which I think is now to be recognized in Canada, the fact that a large number of samples have been sent in by farmers for analysis. They are, you perceive, becoming aware of the value of the knowledge of the composition, not only of their soil and their fertilizers, but of their cattle foods, and their milk and other products. Last year we received 219 samples—looked at from one point, a very small number, but in another aspect, when we consider the large amount of work entailed in a chemical analysis, it is an exceedingly large number. These samples included soils, fertilizers, fodders, animal and plant products, and others appertaining to agriculture generally. By no means have all these samples been analysed. The time and assistance I have would not allow me to do it. Neither would it have been wise for me to have made an analysis in all instances. We have been obliged to use our discretion. Although a comparatively large number of those which we considered necessary to examine have been analysed, many have had to be laid over. These have been put on one side in proper condition, so that when opportunity permits their examination may be taken in hand. As all our work is done free of charge to agriculturists, we endeavour only to examine those samples the analytical results of which will benefit a large number of our community.

Now, what I have already spoken of is but one branch of our work, and that a secondary one. The main object in creating the Department of Chemistry at the Experimental Farm, I take it, was for original research, investigation and experiment in matters pertaining to agriculture—that is to say, the working out of those problems in agriculture concerning which it is thought chemistry may be able to give a solution. This constitutes the main part of my work. I deem such investigations and the results obtained to be of the greatest importance. We have in the past been able to accomplish something in this direction, as reference to the annual reports will convince you. In time to come I trust we shall go further, adding to

the staff of the laboratory skilled and expert scientists, since this work can only be undertaken and carried on by those who have given special study to the acquirement of analytical skill. When this is done we shall be able to prosecute these researches to a greater extent. For your information, I may state that the staff at present comprises myself and an assistant chemist, Mr. Lehmann, a graduate in agricultural science of Toronto University, who, since his appointment a year and a half ago, has devoted himself most assiduously to the work. By his analytical skill and general ability he has assisted me most ably in the work of the department.

I trust that we shall be enabled in the future to do a good and a great work for the farmers of Canada, providing them with such information as it is not possible for them to procure for themselves, and stimulating them with an earnest desire to make their profession one in which all the faculties can be used to the improvement of the mind as well as to the bettering of the worldly condition.

WORK OF THE YEAR.

With these prefatory remarks, I will now take up seriatim, as I have done on former occasions, the work of the past year, and indicate to you, in connection with those subjects, the proposed line of future work. I will speak, first, somewhat on the matter of soils. Twenty-four have been analysed in the Farm laboratories since the publication of my last report. These samples have been collected from British Columbia to the Maritime Provinces, and represent certain soils covering comparatively large areas in the different provinces. The details of those analyses I will not burden you with to-day, for they will appear in the report shortly to be placed before you. I spoke somewhat last year on what I considered to be the importance of this work. It will not be necessary, therefore, to state the reasons at length why I have undertaken this somewhat costly work. I showed that the fertility of a soil was dependent on a favourable climate, a good mechanical condition, and the presence of plant food in a readily assimilable form. The nature and amount of the ingredients which serve to nourish vegetation are ascertained by chemistry. Hence, the value of a careful and complete analysis, as an aid to the future rational treatment of a soil, both as regards the crops to be grown and the fertilizers to be applied.

ANALYSIS OF SOILS.

Soils differ very much, but we have given much attention to procuring thoroughly representative samples, the analysis of which would yield figures of value for comparatively large sections of country. The samples in the majority of instances were virgin (uncropped and unmanured) soils, and were taken from the surface and the subsoil.

Speaking generally, the analyses of the Manitoba and North-west Territories soils show them to be of great fertility and of an excellent tilth. For the most part, they are very rich in plant food, that is, that they possess the three essential constituents of plant food—potash, phosphoric acid and nitrogen—in comparatively large quantities. The same may be said of the soil in the valley of the Fraser River, in British Columbia. A sample from this locality proved on analysis to be very rich. We also examined soils from the district of Muskoka, as well as others from Ontario, Quebec and Nova Scotia. The series of Muskoka soils, obtained with great care, showed that in that district there are many comparatively light soils; that is, compared with those from the North-west, they are of a very sandy nature, and contain comparatively small quantities of organic matter and mineral plant food. It therefore appears that there are districts in Muskoka which will not be suitable for profitable farming without a great deal of intelligent treatment of the soil.

When we consider this, and the rocky nature and broken character of the land in many parts of that district, it seems evident that parts of Muskoka are more suited for forestry purposes and the production of timber than for agriculture proper.

MR. FRANK T. SHUTT, ANALYST.

ALKALINE LANDS.

Probably the most interesting feature of our work in this matter of soil analysis is the examination of certain alkaline soils from the North-west, of which I spoke very briefly on the last occasion of my addressing you. This work is still in progress. During the past year we made a very complete analysis of three alkaline soils, and I was surprised to find that in no case was there an excess of alkali, so called—that is to say, salts of soda. I was, however, at the same time, somewhat astonished to find that two of the three samples contained comparatively large quantities of sulphate of magnesium, commonly known as Epsom salts. I considered that this might possibly be the poison in the soil deleterious to vegetation. I therefore have commenced a series of experiments in pots, with varying quantities of this substance added to good soil. We are now examining the corn plant, the wheat and the pea grown under these circumstances. Knowing the composition of these soils, we are taking notes with regard to the germination and growth of the plants. This work will be tabulated, and when the experiments are concluded I trust we shall be able to arrive at some information with regard to the effect of Epsom salts in the soil. I also propose to try the addition of certain other chemicals to the soil, in order to neutralize and render insoluble this magnesium salt in the soil. That work is still in progress. I cannot report to-day any definite results. I have, however, a few general suggestions to make with regard to the treatment of alkaline soils. In the first place, this alkali is soluble in water, and therefore the most efficacious means to get rid of the salt is by a thorough system of drainage. This should be resorted to wherever practicable. This advice has been given to many North-west farmers, and deep ploughing also suggested. It has also been found beneficial to apply a heavy coating of manure, which affords the plants at an early stage of growth an abundant supply of food, so that they are able afterwards, by their vigour, to resist the action of the alkali in the soil. Gypsum creates a change in the composition of the alkali, converting it into sulphate of soda, which is not of that corrosive character to vegetation as the carbonate of soda, the most deleterious of all forms of alkali.

By Mr. McGregor :

Q. Would you not overcome that difficulty by summer fallow?—A. It is of great importance that the earth should be thoroughly cultivated, but I do not think that such treatment alone will be efficacious.

NATURAL FERTILIZERS.

With these few remarks, I must pass on to the next part of my work—that of fertilizers, including peats and mucks. In Prince Edward Island and other parts of eastern Canada, owing to the small number of cattle kept upon the farms, and continuous cropping, the fertility of the soil has been run down, and the farmers, in consequence, have resorted to muck, peat, oyster muds, &c., in order to restore this lost fertility.

It was with the object of assisting them in using these that this work has been undertaken during the past year. Some twenty samples are reported upon in our report for 1891.

Speaking generally, their composition is very similar to those analysed in previous years, and as I have spoken very fully on their use and value to this Committee on former occasions, it may not be necessary now to dwell at length on that aspect of the subject.

I may, however, say that many have derived great benefit from the results of this work. For instance, it is often the case that the farmers of a district have access to two or three deposits of this swamp muck. They have then sent a sample from each of these, wishing to know which was the more valuable of the two. By analysis we were able to tell them this with a comparative amount of certainty, and thus the farmers of the district have been enabled to procure the more valuable manure, and this from the knowledge of the composition, derived from chemical analysis.

By Mr. Dyer :

Q. Can you tell us the right way to handle those mucks which we find of such importance to our farmers?—A. Yes; I did not dwell upon that, because, as I had said, I have on former occasions gone somewhat fully into that matter; but with the permission of the Committee, I shall say a word to explain that aspect of the question.

THE APPLICATION OF MUCK.

These mucks consist largely of semi-decomposed vegetable matter, the accumulation of the remains of plants in past years. These remains are principally valuable for the nitrogen which this decomposed vegetable matter contains. Nitrogen is one of the three essential constituents of plant food, the other two being phosphoric acid and potash. I say essential, because the other elements of plant food are usually in sufficient quantities in the soil for the growth of farm crops. We have then, in considering these materials, first to pay special attention to the quantity and condition of the nitrogen in them. Mucks differ very largely in composition. In the first place, they may be very watery, or they may be comparatively dry. Comparing them, however, all on the same basis, air dried, that is, containing about the same quantity of water, there still remains a great difference in their composition. That is brought out by chemical analysis. Analysis shows us which of any two samples contains the more nitrogen. This nitrogen is not for the most part in a condition favourable for its immediate assimilation of by plants. It has to be converted into soluble forms. This takes place by a process of fermentation, which is brought about by the agency of bacteria. This process goes on more or less in the soil, aided by the action of the air, warmth and rain; but in order to render the nitrogen of the humus soluble in a short space of time, fermentation is accelerated by the compost heap. I would therefore advise that after the muck is taken from the swamp it is allowed to first dry well in the air, and then mixed in alternate layers with barnyard manure. The whole mass ferments, and by the fermentation the nitrogen of the muck is converted into a soluble form, which can readily be taken up by the plants. There are other ways of decomposing besides the use of farm yard manure; wood ashes and lime, and the ordinary farm refuse, may be used. The heap should be kept moist, and frequently turned after fermentation begins.

An average muck contains about 35 lbs. of nitrogen in the air-dried condition. Estimating this nitrogen at 7 cents per lb., the average value of a ton would be \$2.45.

By Mr. Dyer :

Q. Would it be practical to use that muck as bedding if it is dry?—A. Yes; I have advised its use for that purpose. A great many mucks, but more especially peats, are very good absorbants, and have been used with excellent results in the stable, in the cow-house and the pig-pen.

Q. Have you had any samples from the Eastern Townships?—A. Speaking on the spur of the moment, I think not. The samples have largely been from the Maritime Provinces, with some from Ontario. We have analysed several from Quebec, and possibly one or two of these are from the Eastern Townships. It would be necessary to refer to my reports to speak more definitely.

By Mr. Carpenter :

Q. You think very little benefit would be derived by applying muck directly to the soil?—A. A great deal would depend upon the character of the soil, whether it were clay or sandy soil. To the soil in which fermentation will go on more or less quickly its application will result beneficially. With heavy close soils, I think uncomposted muck would only improve the tilth. This, of course, is a very important service, and one well worth considering. An application of muck means the addition of much organic matter to a soil, and this in itself is very valuable, whether it decays slowly or quickly. Where possible, however, muck should first be composted.

By Mr. McMillan (Huron) :

Q. You spoke of the compost heap. Is there no danger of having too much fermentation with the manure?—A. Fermentation can go on too far; it is like the decomposition that takes place in a manure heap. It should be stopped at the proper stage. The nitrogen, by excessive fermentation, might be converted into ammonia, and in that case will be for the most part lost. As long, however, as the heap is kept comparatively moist, I am convinced there is small danger of loss from the escape of ammonia.

EXPERIMENTS WITH BARNYARD MANURE.

In that connection I am trying this year an interesting experiment, to answer the question whether there is any loss in fertilizing ingredients by exposing the manure upon the field before ploughing it in. In the spring farmers often spread their manure some days before they plough it in. The question has often been asked, whether during that interim there would not be some loss from the escape of ammonia. We have not data to enable us to answer that question definitely at the present time. I think a great deal depends upon the extent of fermentation to which the manure has arrived before being spread. Therefore, I have taken representative samples of manure at different stages of fermentation and analysed them accurately. I have also spread on panes of glass these two samples, and am exposing them to the sun every day for a month, taking the precaution that they should not be subjected to any rain. I shall then analyse these samples again, and ascertain if there has been any loss of ammonia during that three months' exposure.

With regard to the use of mucks as absorbants, I have emphasized their value as such on former occasions. I believe in many peats and mucks we have a valuable and an excellent absorbant for liquid manure. For this purpose the air-dried material should be used.

By Mr. Dyer :

Q. Have you done that successfully? You know it can be done without prejudicial results.—A. We are not using it as such at the Farm, as we employ gypsum for that purpose, but it is used by many farmers in Canada with beneficial effects. The great value from the use of muck for that purpose may be seen by observing the large amount of nitrogen they contain. The resultant manure after fermentation contains its nitrogen in an easily assimilated form. While the nitrogen of the liquid manure is retained, that of the muck is at the same time rendered more valuable.

Q. The muck would have to be dried before using?—A. On taking the muck from the swamp it may contain 70 per cent of water, and in that condition would not be a good absorbant. A sponge is not a good absorbant when filled with water, but if you dry it or squeeze it you can suck up water with it. That is the reason why it is necessary to expose muck to the atmosphere before using it as an absorbant, or in a compost heap.

ANALYSIS OF CATTLE FOODS.

Considerable work has been done during the past year in connection with fodders, but it has been restricted, I may say almost entirely, to the examination of fodder corn and roots. The work in connection with fodder corn I deem of great importance, and therefore I shall speak of it at some length. It has been a continuation of the work begun in 1890, and was undertaken in conjunction with the Dairy Commissioner.

Four different varieties of Indian corn for ensilage purposes were experimented with. These were the Pearce's Prolific, the Red Cob Ensilage, the Longfellow and the Thoroughbred White Flint. These corns were analysed at different stages of their growth. In the former experiments we took samples at two periods of the year; but

last year we preferred to cut them at certain stages of their growth rather than at any fixed period. Those stages were the tasselling, the silking, the early milk, the late milk and the glazing stage.

The product per acre was weighed at the different stages, and representative samples of the whole were analysed.

We have now, therefore, data as to the amount of the yield per acre, and also the composition of the corn plant of those varieties at the different periods of growth mentioned.

Time to day will not permit me to discuss these data in detail.

Briefly, however, I will summarize them, by showing the averages of these four varieties, as depicted in the following table:—

FODDER CORN, 1891.

COMPOSITION, yield per acre, and dry matter per ton and per acre. Averages of Pearce's Prolific, Longfellow, Red Cob Ensilage and Thoroughbred White Flint.

Stage of Growth.	Water.	Dry Matter.	Yield per Acre.				DRY MATTER.	
					Per Ton.	Per Acre.		
			Per cent.	Per cent.	Tons.	Lbs.	Lbs.	Tons.
Tasselling	85·73	14·27	22	1,329	285	3	468	
Silking	83·83	16·17	24	52	323	3	1,770	
Early milk	80·05	19·95	22	1,806	399	4	1,138	
Late milk	77·86	22·14	21	759	443	4	1,467	
Glazing	73·82	26·18	21	1,154	524	5	1,298	

In the first place, it appears that from the tasselling stage there is an increase in the total yield per acre. From the early milk stage to the glazing stage there is a decrease in the total weight per acre. However, this decrease does not in any way represent a diminution in food value. On the contrary, we find a constant and regular increase in the amount of real cattle food, as the plant advances in growth during the summer until it reaches the glazing condition. That is very well brought out by the figures in the last column of the table. We may consider the corn plant as consisting of two parts, water and dry matter. The latter, for our purposes, we will call cattle food. The water is of no commercial value. It makes the food succulent and palatable, but we cannot place any monetary value upon it as a constituent of cattle food. Therefore, granting that the loss of water does not impair the digestibility of a food, that sample of corn fodder will be the most valuable which contains the smallest quantity of water, and consequently the largest quantity of dry matter or real cattle food. We found that the yield per acre increased in weight to a certain stage, and decreased after that period. That decrease in total weight does not mean, as we have seen, a lessening in value; it betokens only a decrease in the percentage of water. During the whole period of growth of the corn plant until it reaches maturity it is laying up material that can be termed cattle food. It is the richest in its glazing condition. This, of course, points most emphatically to the value and necessity of allowing the corn to approach the glazing condition before cutting, for preservation in the dry condition, or storage in the silo.

Let us examine more closely the table for one moment. First of all, the yield per acre at the different stages of the four varieties is as follows: In the tasselling stage, 22 tons 1,329 lbs.; silking, 24 tons 52 lbs.; in the early milk stage, 22

tons 1,806 lbs.; in the late milk stage 21 tons 759 lbs.; and in the glazing stage, 12 tons 1,154 lbs. Now we see there was an increase from the tasselling to the silking condition of nearly 2 tons per acre. It went from 22 tons 1,329 lbs. to 24 tons 52 lbs., but from the silking to the early milk condition there was a decrease from 24 tons 52 lbs. to 22 tons 1,806 lbs., and a still further decrease when we come to the late milk condition. That at first sight might indicate that the best stage to cut that corn would be the silking condition. But that would be altogether a wrong inference, because when we turn to the amount of dry matter, we see that it is increasing throughout. For, let us examine the pounds of dry matter per ton present in the different stages of growth. In the tasselling condition there were 285 lbs.; silking condition, 323 lbs.; early milk, 399 lbs.; late milk, 443 lbs.; and in the glazing 524 lbs. Therefore, these figures bear out my statement that the real cattle food increased in pounds per ton throughout the whole period of growth. Coming to the calculation of dry matter per acre, we have the following figures for the different stages of growth: Tasselling, 3 tons 468 lbs.; silking, 3 tons 1,770 lbs.; early milk, 4 tons 1,138 lbs.; late milk, 4 tons 1,467 lbs., and glazing 5 tons 1,298 lbs.

By Mr. McMillan (Huron) :

Q. Do you think there is any gain, after it reaches the glazing stage, in leaving it for seven or eight days?—A. I consider that it is not advantageous to leave it after it reaches the glazing condition, even if there is no risk from frost, for I believe vegetation for the greater part has become arrested, and there is not that development of dry matter that there has been previous to that stage of growth. The chief objection I have, however, is that the corn becomes more and more indigestible after this period of growth. At the glazing condition I do not think that the fibre has increased to any extent in indigestibility.

Q. Would not the fact of leaving it a little later give you sweeter ensilage?—A. Perhaps so, but that may be overcome by allowing it to wilt after cutting, and I think it can be better overcome in that way. I agree with you that a sweeter ensilage results from putting in the drier corn. For the exact time of cutting, of course you must be guided a great deal by the weather and season. For sweet ensilage the corn should be somewhat dry before putting it in the silo, but if there is danger of frost it would not be good practice to leave it to dry out uncut.

By Mr. Carpenter :

Q. You did not give us the relative value of the different varieties of corn you considered the best for ensilage purposes. Have you tested that? That is of great importance. Our object is to get information from you for our benefit.—A. In the first place, I can assure you that between one variety of Indian corn and another there is very little difference in the chemical composition, if we consider them at the same stage of growth. I have satisfied myself that the corn to grow for ensilage purposes is that which yields the largest weight per acre, arriving at the glazing condition before there is danger of frost. That is the whole thing in a nutshell. The climate of the grower's locality must be considered. We have found here that Pearce's Prolific and Longfellow came to this glazing condition before there is any great danger from frost. The other two are later corns, and give a much larger yield, but in the vicinity of Ottawa do not mature sufficiently early, as a rule, to make good ensilage.

MR. CARPENTER.—I am glad you have stated that, as a great many believe that there was a large difference between the varieties in their food value.

ROOT FOODS.

I have yet to say a few words regarding another branch of fodder analysis. Samples of carrots, turnips, mangels and sugar beets have been analysed to ascertain their relative value for feeding purposes. Roots form a very important ingredient of all cattle rations. Though exceedingly watery, and consequently not

equal to hay or meal in feeding properties, they serve a very useful purpose in supplying a succulent and palatable food during the winter months. They are very easily digested, and, moreover, possess certain medicinal properties which assist in the digestion and assimilation of other foods. Roots are not rich in albuminoids (flesh-formers), and therefore are not a complete ration in themselves; for a properly balanced and economical ration their use must be supplemented with other and more highly nitrogenous fodders.

THE SUGAR BEET.

In regard to the matter of sugar beets, work has been done not only in connection with the prospective industry of manufacturing beet-root sugar, but also with the view of ascertaining the value of sugar beets for feeding purposes. The sugar beet, of course, is a much richer cattle food than carrots, mangels or turnips, and is at least 50 per cent more valuable on account of the large quantity of sugar they contain. The average analyses of the varieties analysed will be found in the following table; the details appear in my report.

TABLE showing the average Composition of Carrots, Turnips, Mangels and Sugar Beets, 1891.

Fodder.	Water.	Dry Matter.	COMPOSITION OF DRY MATTER.					Dry Matter in lbs. per ton.
			Albuminoids.	Fat.	Carbohydrates.	Fibre.	Ash.	
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Carrots	90.49	9.51	7.73	.21	72.88	9.81	9.37	190.2
Turnips	90.34	9.66	10.47	.52	68.31	13.40	7.30	193.2
Mangels	91.29	8.71	10.83	.28	68.06	8.72	11.33	174.2
Sugar beets.....	84.24	15.76	9.52	.31	77.01	7.12	6.04	315.2

By Mr. Carpenter :

Q. How is it as compared with the difference in the yield per acre? Of course, a turnip or a mangel will produce a larger weight per acre?—A. I am speaking now of the relative food value of equal weights of roots. I have no figures with regard to yields per acre. That will vary somewhat, in accordance with the season.

By Mr. Featherston :

Q. Would not that same rule apply to sweet corn as compared with ordinary corn?—A. We have not analysed the fodder from sweet corn, but I do not think its composition would differ much from that of other varieties of corn.

Q. You say the beet-root is a better food than other roots, on account of the sugar. Would not the sweet corn stalk be a better food, on account of the sugar in it, compared with ordinary corn?—A. I don't know about the extra amount of sugar in the sweet corns. I don't think that it amounts to a large percentage; but I have no analytical data on that point.

Q. You have not experimented on it?—A. No. Sugar beets, when grown for fodder purposes, that is, having ordinary field culture, differ from those grown for the production of sugar, not being so rich in that constituent.

By Mr. Roome :

Q. Would not the sugar cane be more valuable—would it not be worth more?—A. I presume you refer to sorghum. We analysed some which we grew on the Farm.

It was not very rich in sugar. I think the stalk is too indigestible. After the sugar is taken out of the sorghum the stalk would be of comparatively small value for feeding purposes. In the matter of sugar beets grown for the production of sugar, we undertook a series of experiments, which resulted in showing the value of keeping the roots thoroughly covered with earth. We took twenty-four varieties and planted them in contiguous rows, half of which were earthed and half left unearthed. In the latter experiment the roots were allowed to grow as an ordinary field crop, while in the former they were carefully kept covered. We found that there was in the same variety an average difference of 2 per cent of sugar in favour of keeping the roots thoroughly covered up with earth during this growth.

Q. In that case, would it not be advisable to keep all roots thoroughly covered up?—A. Perhaps so, but the cost of the labour must be taken into account. I do not think if you grew sugar beets for cattle-feeding purposes, according to the culture necessary for the production of the largest amount of sugar, you would get as heavy a yield per acre as by growing in the ordinary way. For the sugar factory the beets have to be grown quite close together, and they must not exceed in weight one and a-half pounds. The expense of earthing would be considerably more than ordinary field culture. For the manufacture of sugar, however, it is exceedingly necessary that these points have special attention paid to them.

By Mr. Bain (Wentworth) :

Q. The difference is an increase of 2 per cent?—A. Yes; that is the result of our last year's experiment.

Q. What is the average percentage of saccharine matter?—A. From the analysis of the twenty-four samples last year, it was 14 per cent. A very interesting experiment was the analysis of two beets of the same variety, one of which weighed 17 lb. and the other 3 lb. Now, I have already stated that sugar beets for the factory should not grow larger than from 1½ lb. to 2 lb. In the case of the beet which weighed 17 lb. we had 6 per cent of sugar only, and in the other beet of the same variety, and sown on the same soil, we obtained 10.6 per cent. So it is well demonstrated that by growing large roots you decrease the percentage of sugar.

By Mr. McMillan (Huron) :

Q. Does the same hold good in growing mangels? You can grow a fair-sized crop of mangels. Will the large ones give the same food as the small ones?—A. No. It is very often the case that the larger the root the greater the quantity or percentage of water.

By Mr. Bain (Wentworth) :

Q. Will that apply to turnips?—A. I think it will hold good for all classes of roots. The medium-sized root, having in view the yield per acre, will be the best.

MILK TESTS.

In connection with the aid I have been able to give the dairy department, I shall now speak somewhat on the Babcock milk test, which I brought before the notice of this Committee last year. We saw that it was a reliable and ready method for ascertaining the percentage of fat in milk in cheese factories and creameries. We endeavoured to prove that the best way to value milk was upon the percentage of fat. It was shown that if this basis were adopted for the buying and selling of milk we must have some ready, cheap and accurate method for estimating the amount of butter-fat. We found such in the Babcock test. It is not a process which requires the assistance of a chemist, but can be worked by any intelligent person in a creamery or cheese factory. We established the accuracy and reliability of the test by comparing it with chemical processes.

The chief objection to the introduction of the Babcock test was the amount of work that it entailed. Although it was a ready method, yet as it was then defined it

necessitated the daily examination of every sample of milk, and it can be readily understood that that meant a considerable expenditure of time, which means money, in the creamery. We have, therefore, been endeavouring this year to so modify the process, that the work of the examination of the milk in creameries might be much lessened, and I am glad to report that we have been successful in our efforts. It is now possible for composite samples to be analysed once a week. A portion, amounting to one-sixth of the usual quantity, of each patron's milk is taken daily. These successive portions are preserved in the same bottle and the composite samples tested at the end of the week. From the one analysis the composition of the milk throughout the whole week is ascertained and a valuation thereupon put. This means the lessening of the labour very considerably. The whole matter is an extremely simple one, and as now modified will, I think, meet with general acceptance. Special pipettes for measuring the milk for composite samples are now obtainable. A bulletin on this process is shortly to be issued.

By Mr. Bain :

Q. We are interested in knowing how you preserve the milk?—A. In the States they have been advocating the taking of a sample of the fresh milk daily, adding to it corrosive sublimate to preserve it, and testing the composite sample at the end of the week. That method introduced a poisonous chemical into the creamery, which, to say the least, is inadvisable. I thought it quite possible that no deleterious decomposition would take place in the milk within a week, although it might become curdled; and further, that if this assumption were correct we could, with accuracy, take a small quantity (one-sixth the usual amount) of the milk delivered daily, and at the end of the week obtain the percentage of fat representing the average composition throughout the week. We therefore procured measuring glasses or pipettes one-sixth of the size advised by Dr. Babcock. These we accurately graduated. Our results by this modification have been the same as by making the daily test.

By Mr. McMillan (Huron) :

Q. Do you keep it in ice water?—A. No, in the ordinary temperature of the laboratory. The milk by the end of the week is soured and curdled, but that does not seem to affect the accuracy of the test. The fat is apparently unchanged in this time. We continued the work of testing the method for many weeks, and have a large number of figures showing the results of our experiments. The results of these composite tests, compared with the averages taken from the daily tests, show very small differences, indeed, and are not such as would enter into any calculation as to the value of the milk.

By Mr. Bain (Wentworth) :

Q. The souring does not affect the fatty matter?—A. No, it does not appear to decompose in this time. This is, I deem, a very important modification of the process, because we are advocating buying and selling of milk on the principle that its chief value lies in the percentage of fat it contains. It will result in better feeding, better cattle, and altogether a more equitable interchange of commodities. It will also do away with the great inducement and the encouragement there is at present to add water to or abstract cream from the milk, because milk will be paid for according to the value, as shown by the Babcock test.

The only other important work in connection with milk production that I wish to refer to this morning is the analyses of certain samples of condensed milk. This work was undertaken because it was thought that at some time in the near future the manufacture of condensed milk might be so developed as to build up an export trade in this article. We analysed the brand from Truro, N.S., and compared it with those made in Liverpool and Limerick, Ireland. I am glad to be able to report that our own brand made at Truro, by the Condensed Milk and Canning Company, stood somewhat ahead of those from other countries. The details of the analyses are to be found in the report now being issued.

By Mr. Roome :

Q. The butter fat is taken out?—A. That made in Limerick, Ireland, was found to be from skimmed milk. The others were made from whole milk.

WELL WATERS.

The work of examining well waters for farmers has been continued. In very many instances the analyses have proved the impure character of the water. It is gratifying to notice that greater attention is being paid to the matter of obtaining pure water, but it is a subject for regret that so many of the samples examined were of such a polluted character. Health in man and beast cannot be expected with an impure water supply.

SMUT PREVENTIVES.

The experiments in connection with the prevention of smut on wheat by treatment of the grain with solutions of sulphate of copper and sulphate of iron have been continued. The effect on the vitality of the wheat germ has again been noted; the results of the past year have corroborated those of previous years; that is to say, shortly, that the action of the sulphate of copper has been somewhat more deleterious to the life of the wheat germ than sulphate of iron. I was not able to report last year on the relative effect of sulphates of iron and copper in the prevention of smut, on account of the failure of the experiment. This last season, however, Mr. Mackay, the Superintendent of our North-west Farm, very carefully conducted the experiments with the treated seed for me, and counted the number of smutty heads in equal-sized plots sown with treated and untreated seed. We tried the effect of sulphate of copper and sulphate of iron and a mixture of the two. We have now one year's data as to the relative efficacy for the prevention of the development of smuts, of sulphate of copper and sulphate of iron. The solutions were of the strength of 1 lb. to 8 gallons of water. We found that while the sulphate of iron does not destroy the life of the wheat germ, it is not efficacious in preventing the development of smut. On the other hand, the sulphate of copper gives excellent results in preventing smut. The mixtures of sulphates of copper and iron are of value in proportion to the amount of copper it contains.

By Mr. Carpenter :

Q. You have set that forth in your report?—A. Yes. The tested wheats that we tried were weighed out and equal quantities sown in plots of the same size. On these plots the smutty and good heads were afterwards counted. In that way we obtained our results. The beds were 10 feet square, and sown at the rate of one and a quarter bushels to the acre. The treatment was to momentarily immerse the wheat in a solution of the material to be tested, made of a strength of 1 lb. to 8 gallons; the wheat was then allowed to dry in the air. Untreated Red Fife gave smutty heads 164; copper sulphate over the same area showed but one smutty head. That treated with agricultural bluestone—a material I have spoken of in my report as being sold in the North-west as a substitute for sulphate of copper, and which is really a compound of sulphate of iron and copper—showed that there were seven smutty heads; with iron sulphate there were 168 heads smutty. Sulphate of copper reduced the number of smutty heads from 168 to 1. The number of good heads were, untreated, 3,189, and copper sulphate 4,420, so there were more wheat heads in the experiment with copper sulphate than in the case of the untreated. With White Fife the untreated number of smutty heads was 10; with copper sulphate there were none; with agricultural bluestone none, and with iron sulphate 2. With Judket wheat there were 49 smutty heads in the untreated sample; that treated with copper sulphate gave 1, and that treated with iron sulphate 1. In every instance the number of smutty heads from the untreated and that treated with iron sulphate were practically the same, and in the case of agricultural bluestone and copper

sulphate we found the number very much reduced. This, of course, points to the value of the treatment of the wheat, before being sown, with this solution of blue-stone or copper sulphate.

Q. What has been your experience of the destruction of the weevil in pease?—

A. That is not a matter I have taken up in my department. It belongs rather to that of the Entomologist.

Q. That is a matter of importance. In our section we have to give up growing pease altogether.—A. I believe that the most successful treatment for the pea-weevil is in the use of sulphide of carbon. This destroys the weevil in the pea.

By Mr. Bowers :

Q. What about well water? Is there any simple way of telling whether well-water is good for drinking at all, without having it analysed?—A. I fear none. If the water were exceedingly bad, certain simple tests in the hands of experienced people would prove the pollution; but in ordinary cases a chemical analysis is necessary to establish the nature of the water—that is, whether it is seriously contaminated or not.

Q. If well water is hard, is it bad drinking water?—A. Not necessarily so; not unless it is too hard. Very often we find a water of ordinary hardness to be tolerably pure. Organic matter, especially the result of drainage from privies, stables, &c., is the most dangerous form of contamination, and the only way to ascertain its presence is to subject the water to chemical analysis.

Much laboratory work has also been done in connection with experiments carried on in the Entomological and Horticultural departments; but time will not now allow me to enter into the character of these investigations. They have been chiefly related to the working out of problems in the manufacture and use of insecticides and fungicides.

SPRAYING APPLE TREES.

I may, however, with your permission, be allowed to exceed my time by speaking very briefly of a matter of considerable importance to the Canadian apple export trade. Some time ago statements received publication in England to the effect that Canadian apples were poisonous, owing to the fact that they were sprayed in the spring with Paris green for codling moth. I made a careful analysis of some sprayed apples, and did not find a trace of arsenic. The report on this work was published in all the larger papers in Great Britain, and I am now informed that the fears of the English consumers have been allayed, and that the market for Canadian apples is once more firm. In view of the fact that our exportation of apples has now assumed very large proportions and represents a considerable revenue to Canadian fruit-growers, this information is extremely gratifying.

Having examined the preceding transcript of my evidence, I find it correct.

FRANK T. SHUTT,

Chemist, Dominion Experimental Farms.

THE EVIDENCE
PART II
IMMIGRATION AND COLONIZATION
FOR 1891.

COMMITTEE ROOM 46, HOUSE OF COMMONS,

TUESDAY, 21st June, 1892.

The Select Standing Committee on Agriculture met this day, Mr. Sproule, chairman, presiding.

Mr. JOHN LOWE, Deputy Minister of Agriculture, was asked by the Chair to make a statement regarding immigration to Canada for the year 1891, and, in response, addressed the Committee as follows:—

MR. CHAIRMAN AND GENTLEMEN,—It will not be necessary for me to occupy the time of the Committee very long. I have brought with me some notes in the line of the questions accustomed to be asked me before this Committee.

TRANSFER OF THE IMMIGRATION BRANCH.

I may state, in the first place, that on the request of the Minister of Agriculture, concurred in by the Minister of the Interior and the Government, the subject of immigration has been transferred from the Department of Agriculture to the Department of the Interior, for the reasons, mainly, of associating that subject with the settlement of Dominion lands; and also for economy of administration, one set of officers being quite able to do the two services. The amount of saving to the Dominion, therefore, will be very considerable, both in officers and offices. There is one further point in connection with that transfer which it may be well to mention. It has happened in the past, and particularly at times when there have been unusually large immigrations, that the two departments have not always been in touch. It happened quite a number of years ago when Colonel Dennis was Deputy Minister of the Interior. I brought that subject up and made a memorandum on it, my object being to obtain an amalgamation of two divisions or branches of the two departments, one having immigration and the other settlement of Dominion lands. Nothing, however, came of it, until this more perfect fusion that has taken place by the action I have mentioned.

THE IMMIGRATION AND COLONIZATION OF 1891.

In so far as relates to the number of immigrants who have come to the Dominion during the past year, the facts have been already published in the report of the Minister, and therefore it may not be necessary that I should dwell on them. It may be, however, well to state that the immigration of the year shows an increase as compared with the previous year. The total number of immigrants proper reported to have settled in the Dominion during the year was 45,000, against 41,000 for the previous year, and we, therefore, appear from that fact to be in a cycle of increase. It is found both here and in the mother country that immigration moves in well defined cycles. There are maximum and minimum years, and from the point of the maximum year there is a decline to the minimum, and *vice versa*.

In addition to those immigrants reported by our own agents, there were 37,000 in round numbers reported with entries of settlers' effects—that is, people who crossed the frontier from the United States and made a declaration or affidavit that they were settlers, and so got their effects in free as settlers' effects. The greater part of those, however, are returned Canadians; that is, 23,000 out of 37,000 are returned Canadians, in round numbers. The remainder are of the different nationalities. I think it is important to preserve the distinctions between these two classes of immigrants, for the reason that in any considerations or arguments to account for the immigrants, the Canadians who went over and came back again can scarcely count in a decennial census. The classes I first mentioned, therefore, I think should be considered as the immigration proper.

THE IMMIGRATION BY NATIONALITIES AND EMPLOYMENTS.

The nationalities of the immigrants who arrive can only be taken to a limited extent—that is, at the ports of Quebec and Halifax, where there is an actual regis-

tration. Of those who came to Quebec last year the English were by far the largest number, being 11,700, and next to them were the Scandinavians, 5,300. The other nationalities were comparatively small in amount. At Halifax the same facts generally prevailed. There were over 6,200 of English at Halifax and 896 Scandinavians. The numbers of other nationalities were smaller. The same facts appertain with regard to the classification of the trades and avocations. We have only registrations at Halifax and Quebec. We had registered 9,300 labourers. I refer to the annual report for details of figures. I don't know whether the Committee desires me to give for the last year all the points as regards the settlement in different parts of the Dominion, as these figures are all contained in the report of the Minister.

DEPARTMENTAL EXPENDITURE FOR THE YEAR.

I may state that the expenditure for the calendar year for the service of immigration was \$179,778, a very limited sum for the extent of the service. The number of publications during the year was 491,400, or in round numbers it may be stated 500,000. The efforts of the department and also of the High Commissioner were confined to making known the resources of Canada as a field for immigration and the guiding of immigrants after their arrival. I think that the latter, which is one of the most important interests, may be more effectually done by the officers of the Department of the Interior, who are now immigration officers, than would have been possible formerly.

ASSISTED PASSAGES, WHEN ABOLISHED—SETTLEMENT BONUS.

There are no assisted passages of any kind now, nor have there been since April, 1888, but there is an offer of a bonus to settlers on landing in all parts of the Dominion west of the eastern frontier of Manitoba. A commission is also paid to the booking agents of the steamship companies for all immigrants and families of immigrants who settle on lands west of the frontier of Ontario, that commission being paid only on the certificate of the settlement on lands by a Dominion Lands Agent.

PREPAID PASSENGER TICKETS.

In relation to the movement of immigration to the continent—I mean to the United States—I may state that the United States commissioners who last year visited Europe have reported that no less than 60 per cent of all immigration to the United States was on prepaid tickets. That is a fact of the greatest importance to consider. In other words, 60 per cent of all those who went to the United States did so on tickets which had been prepaid for them almost wholly by their friends in the United States. That movement differs largely among the different nationalities. I have a statement from Mr. Ennis, the general passenger agent of the Allan Line, in Liverpool—a man of the very largest experience on the subject of immigration. He states that with regard to all those immigrants who come to Canada, about 10 per cent of the English are prepaid, and that from 30 to 40 per cent of the Irish are prepaid; but when they came to Germans and Scandinavians, from 70 to 80 per cent of those who came are prepaid.

Nothing can show more clearly the importance of establishing the beginning of colonies and settlements which always go on annually growing from that influence. The fact is that not very many of the labouring classes, either of the United Kingdom or of the continent of Europe, can afford to pay out of their own earnings the expenses of a voyage to America and to the western portions of this continent. The amount of money required for a family is undoubtedly very considerable; and any means, therefore, which can be adopted to facilitate that movement by means of advances, would undoubtedly strengthen that of the settlement of the country.

THE IMMIGRATION FROM 1881 TO 1890, INCLUSIVE.

It may, perhaps, be as well that I should make a short statement in relation to the figures which have been published by the department during the last 10 years. I will take the 10 years of the census from 1881 to 1890, the census date being at the beginning of 1891. According to the figures which have been published in the report of the Minister of Agriculture—these figures being based on the reports of the agents of the various stations, and of the general accuracy of which I have myself not the slightest question—the number is 578,846. But it is to be remarked that those figures, as stated in the reports of the department and the Minister, are simply the annual figures of immigration. We have not the figures of emigration. I have no doubt that emigration makes a very considerable figure per contra. We can see by looking at the facts in other countries—at those, for instance, which appear in Australia, where there is a sea line—a position which makes it very much easier to obtain emigration statistics than is possible with a frontier similar to that which divides Canada from the neighbouring republic.

In addition to those 578,000 in even numbers of the ordinary immigrants, there were 307,000 of entries by Customs houses with settlers' effects, of the nature which I explained. If these were added—and two columns are published in the Minister's report, one with those figures and one omitting them—it would make the gross nearly 886,000. Well, those were the figures of the gross immigration, counting those Canadians who had left the country, probably during the 10 years, and who had come back with their effects as immigrants. In one sense they were properly classed as such, but the figures representing them cannot properly be counted in the census returns, and I think that fact is important to be borne in mind by those who wish to appreciate the situation as it is.

By Mr. McGregor :

A. Why not?—A. If a Canadian goes away in 1885 and returns in 3 years afterwards, going out and coming back would balance each other in the two decennial enumerations of the census. The man who went away during the 10 years would have been counted in the previous census. There are 300,000 in round numbers in that way.

AUSTRALIAN IMMIGRATION AND EMIGRATION.

Well, in connection with that figure, it might, perhaps, be interesting to the Committee that I should submit a brief statement which has been compiled from the official returns of the Australasian colonies. The compilation is for 12 years, from 1879 to 1890, inclusive. The total figures of immigration during those 12 years were 2,563,279, but per contra of that there was an emigration which amounted to 1,844,852, making only a net immigration during the 12 years of 718,427. In other words, less than one-third of all the immigrants reported to have entered there stayed in those countries. It may, however, happen, and I have no doubt such was the fact, that those who went then were not the same persons as those who went away; but there was that balance of population in the difference between immigration and emigration.

COMPARATIVE COLONIAL EXPENDITURE.

We come to the total expenditure. The total expenditure of the Australasian colonies for immigration during that period was over \$25,000,000. Very large debts have been incurred to raise money for immigration expenditure. It was incurred in keeping up very extensive establishments in the mother country, and in paying very large sums for assisted passages of various kinds. If we make a comparison of the corresponding figures of Canada for the same years, we find that we had a gross total of over 700,000 of immigrants in round numbers.

By Mr. Carpenter :

Q. Are you speaking of 10 or 12 years?—A. I am speaking of the corresponding 12 years. That is only the immigration. The extent of emigration we

DEPUTY MINISTER OF AGRICULTURE.

have not obtained, and it has not been accounted for, but I am aware of the fact that there is an emigration by the ocean steamers to the mother country, and there is a large emigration over the frontier to the United States. We have no means of ascertaining exactly what that figure is, but every 10 years we can obtain from the United States census the number of Canadians in the United States.

By Mr. Roome :

Q. You keep a record of those coming in with their goods bonded through?
—A. Yes.

Q. They count as Canadian immigrants?—A. We have counted them in a separate category. In the figures I have just given I have not included them.

Q. I mean those who pass through Canada to the United States?—A. I did not take these. Those figures you will find in the report of the Minister of Agriculture for every year for a number of years past.

By Mr. Wilson :

Q. Those who pass through our country to another country?—A. Yes, they are not immigrants proper. They are simply passengers using our route, on account of its character, convenience or cheapness, or the facilities which it affords.

By Mr. Earle :

Q. They are not included in your returns?—A. No; not in those returns I am speaking of.

By Mr. McGregor :

Q. I notice a few families arrive by the Allan line and go through?—A. They are not included in our returns as immigrants. We only take those whose destination is Canada and not the United States.

Q. There is another point. About how many arrived from northern Dakota and southern Dakota and have settled in the North-west?—A. That is a question on which I have no means of giving you a perfect answer. I went over that point only a few days ago with Mr. Burgess, the Deputy Minister of the Interior, to see if we could from the records of that department find the figure, but we could not. We are, however, aware that there has been for some time past, particularly during last year and the present year, a very active movement.

Q. The number of homesteads would not assist you in any way?—A. No; that does not show it. I endeavoured to obtain that fact from Mr. Burgess only a few days ago, for the purpose of giving information to this Committee.

By Mr. Wilson :

Q. Haven't you a report from the agents out there working?—A. Yes, we have their reports, but the reports we have from the agents are not such as to furnish the precise information desired.

Q. I have understood that there was quite a large number?—A. Yes, quite a large number. The number might be stated at one thousand, two thousand, or more, but the material fact for the consideration of the Committee is that there is a movement inwards.

By Mr. Earle :

Q. Do not those people coming from Dakota and the North-west report at the Custom house?—A. Not necessarily. We get some of them in that way.

Q. How do they get their effects in?—A. They may report. Some of them come over and make entries of their effects. We, of course, get the entries at the Custom house, but that would not cover the question.

Q. But these people do not enter regardless of Custom house regulations?—A. No; but they may not have sufficient baggage or effects to make what is called a

Customs entry of settlers' effects. It is the custom, when a train-load or ship-load of immigrants arrive in Canada or the United States, to have their luggage examined and passed, and no further record is kept of it.

By Mr. McGregor :

Q. These people coming from north and south Dakota, they get clear of the Customs when they are going for actual settlement?—A. Yes; they might get their luggage examined and passed without an entry of settlers' effects. I do not think we can obtain the figure with sufficient accuracy to make a statement.

By Mr. Wilson :

Q. Was not some special arrangement made whereby they could with facility get their goods through—their cattle, etc.?—A. With regard to their cattle, there is a special arrangement made in the North-west to allow settlers' cattle through on an inspection, when we know the part of the country from which they come, and when we know that that part contains no contagion.

By Mr. Earle :

Q. In British Columbia, where we are not in contact with diseased cattle, the quarantine is enforced?—A. The quarantine is enforced.

Q. And there, evidently, it is not?—A. Those regulations allow the settler to bring his cattle; and they are the same as in the North-west.

MR. EARLE.—There must be some Customs regulations by which a record of the people coming into the country is kept, as well as here. If settlers are coming from the State of New York here they cannot come without a proper entry being made.

By Mr. Taylor :

Q. The head of the family makes the entry, and there is no record of the number of the family?—A. All individual members of the family are put on the paper, but large numbers come in who are simply what is called "passed," by the Customs officer, without any entries being made, and of those there is no record.

By Mr. Earle :

Would it not be well that something be done in that direction—that a record be kept?—A. A record cannot be kept of all persons passing the frontier. The same regulations prevail in British Columbia as in the North-west.

MR. TAYLOR.—There are hundreds of them that drive across the line and do not pass the Customs at all. They just enter the country.

By Mr. Carpenter :

Q. Don't your department recognize the necessity of trying to get at the exact number?—A. We have made great exertion, but the difficulty seems to be greater than our desire. To complete my statement to a former question: The Canadian expenditure during those corresponding 12 years of Australian immigration, to which I referred, was \$3,119,109, against the figure of over \$25,000,000 in the Australian colonies. There can scarcely be any comparison of these two sets of figures.

Q. Give us the results now?—A. I cannot estimate the figure of the emigration, but it is a very considerable part of the immigration. Our gross figure is about the same as the Australian net figure for the 12 years named—in round numbers, 700,000. The Australian net figure is only about one-third of the gross figure. I feel the greatest difficulty in venturing to state our net figure, but I am sure there has been a large emigration. The last census return of the United States which we had showed that the number of Canadians in the United States in 1880 was 710,547. I have no doubt the figure is about 1,000,000 now in round numbers. That would represent an emigration of, I think, not far short of 38,000 a year.

By Mr. McGregor :

Q. Were you not considerably surprised when the census returns did not agree with your former figures at all?—A. If the Committee will allow me, I will make a short statement on that point. It is interesting in this connection to look at the facts of immigration in the United States. Well, they had during the decennium an immigration of 5,571,613. If we try to account for this augmentation in the census figures of the United States, we shall certainly find results which are more disappointing than ours. The fact is, the census figures both in England, in Canada and in the United States, have not met expectations of increase. The natural increases have not probably been as large as commonly supposed, and in addition to that there has been a large outward movement of emigration.

By Mr. Roome :

Q. You have no way of getting at the natural increase?—A. Not positively. But I propose to take United States authorities. I have put a few figures together which I would like to show to the Committee, if they will permit me.

By Mr. McGregor :

Q. There is one point. We all realize the position we are in. We are all anxious to see that our country fills up as rapidly as possible, because the future of Canada depends largely on our western country. We have reached that point. What I desire is this, to see if the Deputy Minister could not in some way recommend to the Government to be in real earnest in reference to the immigration movement?—A. I cannot now answer on that question of policy. I desire, however, if the Committee will allow me, to complete my statement of figures.

THE IMMIGRATION OF THE UNITED STATES UNACCOUNTED FOR BY THEIR CENSUS.

I picked these out from the official returns last night, with a pencil, on this slip of paper. The United States immigration, according to their returns, is 5,571,613 in round numbers. Their census showed 62,622,250. That is a ratio of 24·86 per cent increase, including immigration. Mr. F. A. Walker, who was the superintendent of the United States census of 1870-1880, and one of the recognized statisticians of the United States, has shown that the natural increment of the United States ought to have been during the ten years stated 18,246,673, and when we add the immigration of 5,571,613, it would make the total increment, with the immigration added, to be accounted for, of 23,818,286. The actual increase found was only 12,466,467, the loss or not accounted for of 11,351,810, or nearly two to one. Well, these are very disappointing figures. I give them to establish a simple, comparative statistical fact, without any kind of reference to any argument which may be based on it on one side or the other. Mr. Walker further shows that in the United States during the last ten years, which was a period of the greatest immigration for the United States, —a phenomenal immigration—it was also a period when the natural increment fell enormously short of former years.

The increase of Canada was 11·66 per cent, against 17·31 in 1881, showing a decrease of percentage of increase of 5·70. The United States in 1881 was 30·8. In 1891 it was 24·86, the decrease in the percentage of increase being 5·22, that is, almost exactly the same percentage as our own. The United Kingdom showed an increase of 10·8 in 1881, but only 8·2 in 1891, showing a decrease of 2·6, so that in all these three countries there have been these decreases. I cannot say how they can be accounted for. The enormous deficiencies in the United States figures are the most striking.

By Mr. Carpenter :

Q. I think you stated the expenditure for 1891?—A. \$179,000.

Q. Did you give us the total number of immigrants brought in for that amount of money?—A. Yes. I stated that, and it is published in the report of the department. The expression "brought in" is rather misleading, as we do not bring in any immigrants whatever.

Q. What is the result of the \$179,000 expended?—A. The result was a total in round numbers of 45,000 immigrants entered from all parts. I should also say that the immigration agencies in the United Kingdom are also commercial agencies. The several agents perform similar functions to those of United States consuls, in the way of getting and diffusing information in relation to commercial matters, and some of this has been in the very last degree important. In fact, the beginning of the cattle trade to the whole continent of America was moved by a Canadian immigration agent in the capacity I have mentioned.

By Mr. Roome :

Q. I understand you give a bonus of \$10 to actual settlers. How many have received that bonus?—A. I have not with me the total figure of the expenditure for that service, but I can state that so far it has not been very large, and is not a guide to what the figure in the future may be.

Q. I have always been of the opinion that this bonus should be given the settler on his arrival?—A. It is mainly intended as an assistance to a settler, to aid in covering the expenses of the passage. He may have made a calculation of receiving the amount.

By Mr. McMillan (Huron) :

Q. Does that 45,000 include all the people that came into the country and those that might have gone to the old country and returned? Is there any means of knowing who are coming to Canada for the first time?—A. I have before explained that point. We have also put the explanation in all our returns. The figures given are those of immigration simply. We have no means of obtaining the emigration, or of distinguishing particular immigrants.

By Mr. McGregor :

Q. There is another difficulty? A large number of young men leave British Columbia in the winter and come to this part of the country, and after returning they are given credit as being settlers. There ought to be some way of making a discrimination?—A. We have no means of ascertaining that.

Q. I mean on the Canadian Pacific Railway?—A. We have no means of distinguishing them on the Canadian Pacific Railway. There would be a possibility of obtaining the figures of the movement, if we could obtain the ins and outs of every railway and transportation company at every point at which the route of travel crosses the frontier. The difference between the people coming into the country and those going out would be the net immigration or emigration at that point. It is the system that I applied some years ago at Port Huron.

By Mr. Roome :

Q. How do you collect the statistics,—is it the Customs?—A. We have the passenger lists of the steamships.

Q. Supposing I went to Manitoba and settled there, and went by train and paid my fare?—A. We have not collected that information, except by reports of immigration agents at particular points, principally at Port Arthur. Mr. Johnson, the Statistician of the Dominion, has just sent me a figure from the census compilation which at this moment has been completed. It is to the effect that the total number of the foreign-born in Canada by the census of 1891 was 645,705. That figure will represent the immigrants to Canada who were found in Canada and enumerated by the census of 1891.

Q. These are not born in Canada?—A. Born outside of Canada, and must have come to Canada at some time. It is the total number found on that date; the net residue at that date, after allowing for the death rate, without increment for birth rate on all immigrants to Canada, the figures would be very considerable. I haven't had time to make any examination of that figure. It represents some points of interest.

By the Chairman :

Q. Have you any knowledge of the number of children who came to Canada?—A. Yes. I can give you the figures. The number of children who came to Canada during the year was 3,418—that is, children brought in under the auspices of benevolent persons, such as Miss Rye, Miss Macpherson, Dr. Barnardo, Mr. Stephenson, Mr. Millmore and others.

Q. These are not included in the 45,000?—A. Yes; they are separated in detail.

By Mr. Carpenter :

Q. Would that be a falling off from the previous years?—A. It is about the same. Of these, Miss Rye brought 221, Dr. Barnardo 625. He has also establishments in the North-west which are reported very successful. There are 109 from Dr. Stephenson and 322 from the Rev. Father Seldon and staff. Those represent the Catholic children, who are cared for by the Catholic institutions throughout the Dominion. Then there are 349 by Miss Macpherson; and some others.

By the Chairman :

Q. Have you any knowledge of the class or quality of the men who have come in, and their pursuits—whether they were a good class of immigrants or not?—A. The reports of all the agents have concurred in declaring that the class has been exceptionally good.

Q. I think you said there were 9,300 labourers brought in. Have you any knowledge of where they located principally, or have you any means of knowing?—A. They went all over the Dominion; and there is this to be stated, that no immigrant labourer applied at the agencies without finding work.

Q. Was there a demand for more than those who came in?—A. Yes; many more, and especially those of the agricultural classes. In certain seasons there is constant demand for more female domestics.

Q. In what province did you find the demand the greatest? In what portions of the country?—A. There has been a demand for female domestics in Quebec, and a specially large demand in Ontario and the North-west. Probably the most acute demand has come from the West and British Columbia.

By Mr. Carpenter :

Q. Does your report show the actual number of families to whom you have given \$10 each?—A. I stated that I had not that figure, but it can be obtained. The number, however, I may repeat, is not very large, so far.

Q. Now, supposing a man comes to Ontario and remains here for four or five years, and gets \$400 or \$500, and goes west and settles, would he be entitled to the \$10?—A. No. It is only given to those from beyond the sea. It is not given to those who come from the United States. The object is to lessen the expenditure for an ocean and a very long inland voyage.

Q. I know of a good many instances in my own neighbourhood where men came out five or six years ago and remained there, and had then gone to the North-west and taken up land. I suppose they would get the \$10 as well as the others?—A. No.

By Mr. McGregor :

Q. I say, if possible, it would be well for this Committee to recommend something to the Government.

By the Chairman :

I may state that it is the intention to have Mr. Burgess before the Committee, to give us an outline of the intentions of the Government regarding immigration, and perhaps it would be well to have that question brought up afterwards, when we get that information. Mr. Lowe can only talk with regard to the past.

MEANS TO EFFECT A LARGE IMMIGRATION.

MR. LOWE.—There is just one note in reference to a point which I have put down, which may be of interest to the Committee. In considering what will move a large immigration, we have to look at the facts. The first consideration is an objective interest sufficient to attract the immigrant. You will see that during the last 25 years, in the settlement of the western United States, that attraction has succeeded in establishing almost a new civilization, and has led to the filling up of the country. The best way to give effect to putting those who desire to come in contact with this objective interest will be found in the most effective means of propagandism—that is, that which best promotes the circulation of information which will command confidence; and confidence is the key-word of the situation. If an immigration agent were sent to preach on the advantages presented by the country, he would be met with disbelief among the people among whom he would go. The object is to command confidence, and facilitate, if possible, the finding of the means to enable the parties who desire to move to do so. If the Government undertakes to do that by means of direct payments, it must be prepared to face very large figures. I have just given you the figures, over \$25,000,000, expended by the Australasian colonies for moving a not very large immigration.

By Mr. Carpenter :

Q. The result of the English delegates' visit—has that been satisfactory?—A. Yes; that has been of the very greatest importance. The reports of these delegates command confidence, and they are written in a way likely to do so. They have been very largely spread, and the result is, as we have seen and we are now seeing, a very largely increased immigration. The immigration market is exceedingly sensitive, and the least thing in the shape of bad reports will incite a very important drawback. One bad report will do a great deal more harm than fifty good reports will do good.

The foregoing report of my statements is substantially correct.

JOHN LOWE,
Deputy Minister of Agriculture.

COMMITTEE ROOM 46, HOUSE OF COMMONS,
THURSDAY, 23rd June, 1892.

The Select Standing Committee on Agriculture and Colonization met this day, Mr. Sproule, chairman, presiding.

Mr. A. M. BURGESS, Deputy Minister of the Interior, was present, by call of the Committee.

THE CHAIRMAN.—We have Mr. Burgess before us this morning to give us what insight he can as to the proposed carrying on of immigration in the future. I understand that the matter of immigration has been changed to the Department of the Interior, instead of being, as heretofore, connected with the Department of Agriculture. I presume we had better have Mr. Burgess follow the usual course of other officers who have come before the Committee, and make a statement as far as he can regarding the outline for carrying on immigration in the future. It may be anticipated that he cannot give us very much information, seeing that the change has only been made very recently, and I presume he is not in a position to give away Government secrets. Any information he can give we will be glad to have, and afterwards the members of the Committee can ask Mr. Burgess any questions that might be suggested to their minds.

MR. BURGESS, on invitation of the Chair, addressed the Committee, as follows :—

MR. CHAIRMAN AND GENTLEMEN,—The transfer of the business of the Department of Agriculture to the Department of the Interior took place only on the 1st of April last, and of course it is the sort of thing that has to be done gradually, and it can hardly be said to be completed yet. I expect it will be perfectly completed by the end of the present month. In the meantime, the administration has been in the hands of the Department of the Interior since the 1st of April. So far, the attention of the Minister of the Interior has been devoted almost wholly to questions of administration. The immigration for the season was of course well commenced, and had well proceeded before the transfer of the business, and it would have been useless to think of any new policy, or of trying to apply it if it had been thought out, in the middle of the current season. As to the method of administration—

CHANGE OF EXECUTIVE ADMINISTRATION OF IMMIGRATION.

I might mention—and it has been published in the newspapers—that the immigration agencies, as such, have been abolished, except such as are necessary for the reception of immigrants at the Atlantic and St. Lawrence shipping ports. The immigration agencies in the older provinces were engaged in what would appear to be almost purely provincial work, outside of the collection of statistics; and their means of collecting those statistics seemed to be so insufficient that the system has been abolished. The Government has come to the conclusion that the decennial census affords a sufficient means of numbering the people in the older provinces; the statute enables the Government to enumerate the people more frequently in the North-west, if they see fit; and accordingly the collection of immigration statistics has been discontinued. In this way, of course, the work which the immigration agencies in the older provinces were doing, so far as it was federal in its character, is put an end to. In the North-west all the Dominion lands agents have been made immigration agents, and the whole of the business, land and immigration alike, placed under their charge and under the supervision of the Commissioner of Dominion Lands at Winnipeg, who is the chief officer of the outside service of the Department of the Interior. In this way a saving of between \$26,000 and \$27,000 a year has been effected.

By Mr. Roome :

Q. How many immigration agents were there altogether?—A. They are very easy to give. There is Sherbrooke, in Quebec; Ottawa, Kingston, Toronto, Hamilton, London and Port Arthur, in Ontario; and Winnipeg, Brandon, Moose Jaw, Calgary, Vancouver and Victoria, in the west.

Q. They are all abolished?—A. Yes.

Q. How do you propose to distribute immigrants in the provinces, then?—A. The Dominion lands agents, who are more numerous than were the immigration agents, and who have better facilities for doing that work, have now been charged with it.

Q. In the older provinces?—A. The Government has come to the conclusion that this is a work that belongs to the provincial authorities—that is, the distribution of immigrants. The Government of Canada will continue as in the past to publish in the most effective possible way, according to suggestions they receive from the provincial authorities, the advantages which they conceive their respective provinces can offer to intending immigrants, and in this way carry out the important resolution of the immigration conference of 1868, confirmed by the conferences between the Dominion and the provinces that took place in subsequent years—1869, 1870, 1871 and 1874, I think.

Q. Why not allow Manitoba to distribute its immigrants as well?—A. Because the Government of Canada owns the Crown lands of Manitoba.

By Mr. Wilson :

Q. They have a lot of land agents there?—A. Yes, a large number of land agents. Then the system of employing land guides by the year has also been put an end to. Instead, what is intended to be an improvement has been adopted, that is, employing local men to guide parties of immigrants as they arrive and as the necessities of the circumstances call for them, the conditions applied to their employment being that the guides shall be acquainted with the locality in which the immigrants are going, that they shall be familiar with the system of survey and the marks of survey, so that they can tell them their lands when they reach the place to which they are going, and that they shall be able to speak the language of the party they are guiding. The expectation is that in this way the salary of a permanent guide distributed over quite a number of local people will enable us to get better service at no greater than the existing cost.

Q. This does not interfere with the agents you have in Dakota, Michigan and other American States?—A. No; they are being continued as usual.

ANTICIPATED SAVING OF EXPENDITURE.

By Mr. Roome :

Q. How much of a saving is there?—A. Well, making no allowance for superannuation payments which may be made, there will be a gross saving of between \$26,000 and \$27,000 a year. If you deduct the largest superannuation allowance which can be given these people, there will be a net permanent saving of over \$21,000 a year.

By Mr. Wilson :

Q. They are all old people?—A. Most of them are old. There are a few exceptions. Some of those who are comparatively old, and whose services have been dispensed with, did not contribute to the superannuation fund, and therefore are not eligible for superannuation.

By Mr. Carpenter :

Q. Do you mean that the superannuation allowance won't exceed between \$5,000 and \$6,000?—A. It cannot exceed a little over \$5,000. Of course, it may be that this year the saving will be less than the sum named, for it would appear equitable

that some arrangement should be made to give a gratuity to those who have not been paying into the superannuation fund and who have been for a considerable number of years in the service.

By Mr. Carpenter :

Q. Has the Province of Ontario been carrying out the agreement to contribute \$5,000 annually towards the expenses?—A. No, that has not been carried out. Quebec also undertook to make a contribution, but this also has not been made.

By Mr. McGregor :

Q. Has the department settled on any system of immigration?—A. I have just explained to the Committee that taking hold of the business in the middle of the immigration season it was not thought advisable to apply any new principle to the work this year, and it was also considered advisable to take more time and give more consideration to the subject than would have been possible during the sitting of a session of parliament, so no decision as to the future has actually been arrived at up to the present time.

Q. Don't you think we could make a desperate effort to move immigrants from some one country and put that in some shape, so that we can have it come up before the Committee in another year, so that we can then go to the House with something tangible?—A. I think that would be a mere question of money.

Q. You see that the statistics are not always borne out. What we want to show the House and the country is, that we are getting the immigrants for the money paid out?—

PROPOSED SYSTEM OF REGISTRY OF ACTUAL SETTLEMENT.

A. Well, I may say that about a year ago, and without expecting that the Department of the Interior would have anything to do with immigration, we devised a system which I think will give very material information in regard to the people who actually settled in the North-west, and where they came from, and in addition to the information which was contained in the weekly returns of the Dominion Lands agents, we asked them to furnish us with a statement of the nationality of every person who obtained a homestead entry. For instance, if he were a Canadian, from which province of Canada did he come? If he were a German, or a Frenchman, or a Scandinavian, did he come direct from Europe, or did he come through the United States or one of the older provinces of Canada. If he were a citizen of the United States, what State did he come from? If he were a Canadian coming back from the United States, what State did he come from? A statement of the number of his family is also called for. That system has been in operation since the sixth of June of last year. Of course, it covered but a very small period of last year's immigration, and may be said to be fairly in operation only from the beginning of this season. In this way I hope next year the Minister of the Interior will be able to lay fairly reliable statistics in regard to settlement in the North-west before the Committee. I might mention that the railway companies have also undertaken to give us the same kind of information with regard to the people who buy their lands.

Q. What arrangement is the Canadian Pacific Railway making with the Government in reference to the taking of immigrants to the North-west?—A. They have established a very low rate for colonists. I can furnish the Committee with a statement of what that rate is, but I did not bring it with me. I have it in the department.

By Mr. Carpenter :

Q. It is very much less than the ordinary rate?—A. Yes.

By Mr. McGregor :

Q. Have you any large amount of free lands yet for immigrants in Manitoba?
—A. Yes; quite a large area.

Q. Also in the North-west Territories?—A. Also a large area in the North-west. Only about one-half of the Province of Manitoba has yet been surveyed.

Q. There is a good deal of land in the north you won't survey?—A. There is a great deal of very valuable land unsurveyed in Manitoba. Take the Lake Dauphin country, for example; that had not been heard of till within the past year or two, and very little of it is yet surveyed. The country between Lake Winnipeg and Lake Manitoba is also a very fine country, especially for grazing.

Q. There is lots of good wood, too?—A. Yes. In fact, the northern country is better in respect of wood and water than the southern.

By Mr. McNeill :

Q. Have you any knowledge at all—I mean personal knowledge—as to the condition of the agricultural population of the old country?—A. I lived in the old country until I was a man.

Q. From the knowledge you have, do you think there are a large number of people there who would make desirable settlers who could not come out here without assistance?—A. I know from my own personal knowledge there are a very large number. I have some knowledge of the greater part of Scotland and the northern counties of England, and I know that there are a large number of men—well educated, in the sense that they can read and write and cast accounts, and who have a good knowledge of agriculture, the scientific treatment of soils, the rotation of crops, and the care and breeding of live stock—who are practically only farm labourers, and all so poor that I think it can be safely said that they are unable to emigrate without assistance, who would make the very best of settlers.

By Mr. Wilson :

Q. What would you do after you got them here?—A. Let them take up homesteads.

MR. CARPENTER.—That is just the class we want.

By Mr. Roome :

Q. You do not propose to change the system during the current year?—A. Not during the current year, the business having come over in the middle of the immigration season.

Q. It is your intention to change that offer of ten dollars to settlers after settlement?—A. I am not authorized to make any statement to the Committee as to the policy of the future.

By Mr. Chairman :

Q. Can you give us any approximate idea how much will be saved by doing away with immigration agents?—A. I have mentioned already that the present actual saving is between \$26,000 and \$27,000 a year.

By Mr. Carpenter :

Q. You did not point out the additional salaries to Dominion land agents?—A. They are not allowed anything extra for the immigration service. I may say that I think the salaries of land agents, taking them as a rule, are very low, and it would be but reasonable that some increase should be made. They all handle large sums of money for the Government, and must be well informed as to the land law, so that no settler may be misled. Twelve hundred dollars a year is a small salary for an officer of that class, especially in a country where living is more costly than it is down here. We find a good deal of difficulty in getting good men to fill the positions.

By Mr. Roome :

Q. You will find lots looking for it?—A. As to whether they are capable after you find them is the question.

By Mr. McGregor :

Q. At Winnipeg, Calgary and those other points they get better salaries. Mr. Rowe gets \$2,000, does he not?—A. He gets \$1,200 as a Dominion lands agent, and a small allowance of \$300 or \$400 a year as sub-collector of Customs. I don't think he gets any more than \$1,500 or \$1,600 a year from the Government.

Q. At Winnipeg they get more than that, don't they?—A. Yes, the Winnipeg agent gets \$2,000 a year. The agents at Brandon and Regina get \$1,500 each. They got an increase from \$1,200 to that amount from the beginning of this fiscal year; but there are a number of important agencies outside of those mentioned where the salary is only \$1,200.

By Mr. Davin :

Q. That is not enough, considering the importance of the position?—A. It is not enough.

By the Chairman :

Q. You said you intended to do away with the immigration agents, except at the Atlantic and St. Lawrence ports. When you get the immigrants here, do you propose to keep trace of them until you get them settled in the country?—A. We are carrying out what we conceive to be some little improvement on former methods at the present time in this respect, taking a little more care of the immigrants after their arrival, having them met at the St. Lawrence or Atlantic port, as the case may be, by some officer of the department who speaks the language of the party, whatever that may be—whether Scandinavian, German, French or English—and taken charge of from the time of landing, until they reach their destination in the North-west. There they are put in the hands of the land guide—some farmer in the neighbourhood who knows the system and marks of survey, and the characteristics of the soil in the locality to which the immigrant goes. He will also have to speak the language of the party he is guiding. In this way we hope to contribute a little to the comfort and content of the people from the time they arrive in the country until they get settled on their homesteads in the North-west, or get employment, as their circumstances call for.

Having read the foregoing transcript of my evidence, I find it correct.

A. M. BURGESS.

COMMITTEE ROOM 46, HOUSE OF COMMONS,
TUESDAY, 28th June, 1892.

The Select Standing Committee on Agriculture and Colonization met at 10 a.m., Dr. Sproule presiding.

MR. A. M. BURGESS, Deputy Minister of the Interior, was present by request, to discuss the question of immigration.

THE CHAIRMAN,—Mr. Burgess is before us again to-day, to continue the same line of discussion as at last meeting regarding immigration. I do not know whether Mr. Burgess has any further evidence to give, as I have not asked him, or whether it is the wish of the Committee to continue questioning him. If not, I think it would be well to introduce the subject by resolution. Mr. Burgess is here, and if any gentleman present desires to ask him any question, he might do so first.

COMPOSITE FORMATION OF SETTLEMENTS.

MR. BURGESS.—Just a word in regard to the discussion which took place at the Committee meeting the last morning I was here. I take this opportunity of telling the Committee that I have no very pronounced preconceived notions on any par-

ticular question relating to immigration. It is one in reference to which I acknowledge myself to be vastly in need of information and advice, and therefore I listened to the discussion which took place the other day with a great deal of interest and obtained much information from it. There was a difference of opinion amongst the members which, I think, was only an apparent or seeming difference. Some fear was expressed that the class of people from the other side of the Atlantic, to whom I referred in answer to a question from Mr. McNeill, when they came to the country, might settle in a body and suffer in consequence of their poverty. I might mention that we have had a good deal of experience with that class of immigration in the past, induced, not by the Government, but by bodies in the old country which are organized for the purpose of assisting poor people to come to this country, and we have taken the very greatest care to segregate them, if that be possible. Of course, you know that people usually come to the country with set conclusions as to where they are to go and how they are to settle, and it is difficult to get them to change their minds. So far as possible, the Department of the Interior, with which department the distribution of the immigrants after their arrival in this country has rested in the past, has endeavoured to induce them take up land in localities already fairly well settled, so that they may be in a position to obtain employment from their neighbours. Take the Scotch crofters, for example. Notwithstanding our endeavours to induce them to do otherwise, some of them, as you know, settled in a body at Saltcoats. These people, during the first year or two, had very hard times indeed, because at the period of the year when, if they had gone into a locality where there were settlers already, they would have been able to find employment, they could find nothing to do, being all equally poor. They therefore had to work upon the railroads and township roads, and work of that description, which made it necessary for them to leave home. Another body of the same class were induced to settle down in the Killarney Lake country. They took lands here and there throughout the locality, were thus surrounded by people of other nationalities, and have made very much greater progress than the people further to the north, who had settled in a body. If I were to show you the correspondence we have had with various parties on the other side of the Atlantic who are promoting immigration, you would see that we have invariably advised them not to put their emigrants in one compact settlement, but separate them as far as possible; and we have pointed out the advantages if our advice was followed, namely, that they would be able to obtain remunerative employment from the older settlers who would be their neighbours, as well as to profit by their experience in the agricultural pursuits and method of treating the soil most likely to produce satisfactory results. As to the class of immigration which might be induced under certain conditions, from the other side of the Atlantic, there appeared to be an idea entertained by some members of the committee that because the people were poor they might not be very desirable people to settle in the North-west. I think it might safely be laid down as a general rule that emigration will take place only as the result of more or less discontent on the part of people in European countries, either with their condition or their prospects. That discontent is usually induced by more or less actual poverty. You take the class of agricultural labourers referred to at the last meeting of the committee, and who, as I said then and think still, would form the best class of settlers if you had them on this side. The young among them could no doubt save enough from their earnings to bring them to this country if they desired. But they have enough to meet their wants, and really do not feel the pinch of poverty; and it is only after they get married and have large families, for whom it is necessary to provide clothing, food and education, that they feel the need of emigrating. Then they have reached a stage at which I think it may be safely said that it is quite impossible for them to save enough money to enable them to emigrate. The result is, that they move into the towns, where their children get work in the factories, and in this way they go to increase the congestion in the manufacturing centres. If we could get hold of these people at the point of movement into the towns, bring them to this country, and find employment for them

for a year or two, until they can go on farms of their own, I have no doubt that a very good thing would be done for them and for this country as well. (Hear, hear). Of course, I clearly recognize that there is a certain danger in assisting people to come from the other side, because after you have brought them here you have no positive assurance that they are going to remain here, if they are so poor that they are unable to go on land of their own immediately. They might in that case be in this country to-day and in the United States to-morrow, and I am told by Mr. Lowe, of the Department of Agriculture, that the experience in the past was that the assisted immigration did to a certain extent come through this country on its way to the United States. These are difficulties which have to be considered in connection with any scheme that may be proposed. I may recall the recollection of the committee to the fact that there is a provision in the Dominion Lands Act which enables any person or company desirous of assisting immigrants to settle on land to take a lien upon the homestead as security for any amount which may be advanced for the purpose, under the conditions specified in the Act, up to \$600. That provision is being very largely availed of, chiefly by foreigners. The Germans, the Hungarians, the Russian Jews and the Scandinavians have been very largely helped in that way. Unfortunately, nobody seems to have gone into this work expressly for the benefit of the immigrants from the British Isles, and we are at the present moment depending almost wholly on what might be called voluntary emigration from there, or else emigration that is assisted by charitable bodies.

By Mr. Roome :

Q. Have you prearranged or come to any conclusion as to what you propose to do during the coming year?—A. No; not yet.

By Mr. McMillan (Huron) :

Q. Do these people who send out farmers purchase the land?—A. They simply get a lien upon the land and upon the homestead.

Q. You mentioned about spreading the immigrants in localities fairly well settled. Is the Government in a position to give free lands in those localities?—A. I referred to localities of that description—that is, we endeavour to induce them to take homesteads in districts where homestead lands have been taken up to a considerable extent, but of which some still remain. There is an impression in the minds of most people, that on the principle of "first come first served" the best land is gone before they arrive in the country. Experience shows that they are very often mistaken about that. A second-class homestead in a locality where the holder has neighbours and where he will have the advantage of the experience of those who have tested its agricultural capacity for a considerable number of years, so as to enable them to know how to treat the soil, what sort of a crop to put in, under what conditions to put it in, and when to put it in, etc., is better than a first-class homestead in a district where the holder has to acquire that sort of information by his own experience. Then there is another advantage: such prejudices as a man may carry with him in regard to methods of farming, good under the circumstances and conditions to which he has been accustomed, but unsuitable to this country, and also other prejudices, would be rubbed off sooner than if he were settled in a community consisting wholly of people from his old home.

By Mr. Wilson :

Q. Is it not so late this season that you won't be able to do much in forming an opinion?—A. The Government came to the conclusion, when the immigration business was handed over from the Department of Agriculture to the Department of the Interior, that the work for the present season was in operation and had proceeded so far that it would be useless to think of making any change this year.

Q. You will be prepared with a new scheme next year?—A. I have no doubt the Government will give the subject very great consideration.

By Mr. McNeill :

Q. Did I understand you to say that the Icelanders had been assisted?—
A. Except the first batch, brought out at the expense of the Government in 1876-7, they have been assisted almost wholly by the savings of Icelanders already in the country. They are gradually bringing in their relatives and friends.

Q. Men who are not able to come west?—A. People who would have been unable to come out but for the assistance given by friends already in the country.

Q. These men who have been able to come over—have they turned out well?—
A. Splendidly; no better on this continent.

By Mr. Wilson :

Q. They have been assisted by their friends and relatives?—A. Yes; but I do not think it matters by whom they are assisted. The first batch of Icelanders were assisted by the Government.

By Mr. Roome :

Q. When a man assists his friend, before he assists him he knows the man will do well. The Government does not know whom it is assisting. The Government does not know anything about him?—A. That is perfectly true.

MR. LARIVIÈRE.—Experience has proved that people who come out to the Manitoba and North-west very poor have almost invariably succeeded in creating for themselves good homes, while people who had money, spent their money lavishly, and came there with their own ideas and wanted to carry out those ideas without consulting their neighbours. Such people, having spent their money, are poor to-day, and they damn the country, and say that this is a poor country, while at the same time it is their own fault.

MR. INGRAM.—Of the two classes of settlers, which do the people of Manitoba prefer, men with means or men without means?

MR. LARIVIÈRE.—We would prefer the man with means, if he had the experience, and if he would himself study the country and adapt himself to the requirements of the country. But coming here with ideas of his own, he knows a great deal more than the people living out there. He spends his money and says the country is no good, because he himself does not succeed. I may say we prefer poor people with a will who will work when they get there. You don't see any paupers in Manitoba and the North-west. You do not see anybody going about the streets begging. Even in the towns there are no beggars. I have not seen one.

MR. MCNEILL.—No doubt the most satisfactory class of immigrants that we can have would be the class brought out by friends in this country, because, as my friend there has just stated, these people are only brought out because those assisting them feel satisfied that they will do well when they come out here. But unfortunately all the good settlers have not got friends in this country to help them. There are hundreds of thousands of hard working men who would make admirable settlers who have not got the means to come out in that way at all; and it is that class of men we want to assist.

MR. McMILLAN (Huron).—There are two extremes in my experience of forty-nine years. A good deal of what has been stated is true. A good many people with money have not succeeded, but the settlers who have succeeded best are those who spent their last shilling in bringing themselves to this country; and I am certain that the best class of settlers are those who have been assisted by friends in this country. No person in this country is going to assist a friend whom he knows would not do well in this country. I am perfectly convinced that there are large numbers in the old country who would like to go to some other country, providing they were perfectly certain of their position; but I am as well convinced that a large number of those whom a government would assist would not make desirable settlers. Many state that in the West, around Seaforth, Stratford, and around there, there were a large

number who were assisted to come out. They came out and had to be helped all winter by the municipalities, and their passages were paid home. This is not the class of settlers we desire. I am perfectly aware there is a class that would be very beneficial; but how to get them and keep them in this country, that is the great question.

MR. McNEILL.—There is no question at all but that there are a great many people who get assisted to this country who would make undesirable settlers. I don't mean to say that every poor man is necessarily a good settler, but I say there are hundreds of thousands of the best class of settlers who cannot come here by their own means and who have no friends here to help them out. One of the great disadvantages we labour under, if compared with the people of the Republic to the south, is that for every one man we have here who could assist a friend out, they have hundreds on the other side of the line, and our numbers can be multiplied by 10. They have a very much stronger magnet drawing towards their country than we have drawing towards ours. It is necessary, therefore, to adopt some other additional means for the settlement of our country.

MR. CARPENTER.—I don't think poverty, to my mind, is any strong objection to an immigrant coming to this country. One of the best men I ever had was a man assisted to this country. He remained with me for five or six years and rented a farm. He now owns 75 acres of good land and is doing well.

MR. BURGESS.—One of the things that has enabled the western States to increase their population rapidly has been the extent to which the railway companies have been interested in their public lands. And as to the assistance sent by settlers in the United States to their friends in Europe, I may say that the railway companies have to my knowledge organized an extensive scheme having that purpose. Some one in the country who has not got money enough never himself to send to the other side of the Atlantic to bring his friend out, but, nevertheless, wishes to bring the friend, gives a promissory note to some local monetary institution working under the auspices of the railway company. The note is usually payable in one, two, three or four years, and is endorsed and discounted by and for the benefit of the steamboat companies and the railroad companies together. Thus they advance the money necessary to bring the friend from the other side of the Atlantic, and the maker of the note is committed to the repayment of this money, which the companies get in due time. I am told by those in the business that one-half of the pre-paid tickets sold in the western States are procured in this very way. As to bringing well-off people into this country, I would ask the Committee to remember that the chief consideration that moves a man to leave the other side of the Atlantic is the fact that he is poor. Well-off people don't, as a rule, want to emigrate. They are satisfied with their present position and prospects, and contented people are not emigrating people. We in Canada do not comprehend what a heart-wrench it is for Europeans to leave and come over here. We are accustomed to moving a great deal and also to travelling long distances. These generations one after the other live in the same parish, often never leaving its boundaries. It is very trying for them to break up all their old associations and connections, leave family and friends and home, and come to this new and to them unknown country.

By Mr. Wilson:

Q. Is it not almost impossible to bring out a lot of these poor people without any means?—A. They should be distributed in settlements already partially formed so that they can acquire the means of livelihood immediately after their arrival, and in due time save enough to enable them to take up lands on their own account.

Q. Then you want a lot of others who have means?—A. That is true, if we can get them, but the question is, if they are well off and contented, how are we to get them?

MR. LA RIVIÈRE.—The farm hand becomes a settler at once, he takes a home-stead and does a little improving once in a while, and after a short time when he puts a little house on the farm he is a settler.

MR. WILSON.—How do they work without means?

MR. LARIVIÈRE.—They borrow them and have bees and are loaned implements by neighbours.

MR. WILSON.—The discussion on this matter arose at the last meeting of the Committee by a gentleman here being anxious that we should rush this matter and get in a lot of immigrants right away. The question arises what would you do after a large number came into this country without means, if you settled them on the prairies by themselves. How are they going to make a little for the first year or year and a half? I cannot understand how those who have no money and no employment can live in large numbers without means.

MR. LARIVIÈRE.—Of course, if they have large families to look after it is difficult for them, but single people take their homesteads and they go away from time to time where there is work. There is always work, more or less: if not in the immediate vicinity they can go a distance. They get free tickets on the railroad. They can always get work to earn money. Of course, you cannot expect that the whole township will be settled by paupers. Some of the men will have means.

MR. WILSON.—That is the point.

MR. LARIVIÈRE.—They will be mixed up, and those who have means will keep the others, and the people are very open-handed, as I said a little while ago. When they have very poor settlers among them, they keep one another. They work like brothers. It is a good spirit, that which exists in Manitoba.

MR. ROOME.—I think we are all agreed that we want immigration in the west, and the question arises, shall we give assisted passages or not? I oppose the Government advocating paid passages, and I think the majority of the Committee will bear me out. We are not opposed to poor men, but we are opposed to the class of men who won't make good citizens after they come here. We don't propose paying them a bounty for coming here. We are willing to assist good men to make good citizens. How are we going to reach them? My idea will be to advertise our country well. I believe a good deal can be done in the old country, but I believe a lot of the immigration agencies in the older Provinces, which are now done away with, were useless. Let us advertise the country, and when immigrants come out here let us take care of them. It is the duty of the Government to see that these immigrants are properly placed, and we will encourage them. Then they will correspond with their neighbours in the old country, and knowing that they will be taken care of when they get here, they will strive to get the means to land on this shore, and those who will strive to pay their passage, when they get here will make good citizens. Shall we advertise and bring out that class, or all kinds? I am opposed to paid passages to all kinds of immigrants.

MR. DAVIN.—There is no difference of opinion between us, apparently. We all want desirable settlers. Out in the North-west we don't want clerks or mechanics. We only want farmers and farm labourers. That is the only class we care for, so we are all agreed on that.

MR. ARMSTRONG.—As I understand the matter now the Government are anxious to adopt the best policy to encourage and induce immigration; and the reason why this committee meets and expresses its views on it, is simply to endeavour if possible to aid the Government in formulating a policy. That is one reason why I am anxious that Mr. Burgess should be here to-day. There was a very interesting discussion at the last meeting of the Committee, and for that one reason I wanted to have the discussion carried on, as to the best mode of inducing immigrants to come to the country and as to the class of immigrants that ought to be induced to come to the country. My own view of the matter is simply this: The first and most essential point is to see that you get the right men. The next thing is to see that after you have got him you keep him and settle him and induce him to stay, and I say without hesitation it will pay the country to pay a high price to get over some of the men I speak of. I think we can appeal to our own experience.

Q. You say the loan that was made to the Mennonites, principal and interest, has been repaid ?

MR. BURGESS.—Every dollar, principal and interest, has been repaid, and not a dollar of principal or interest was asked to be remitted.

MR. ARMSTRONG.—If you get the right people to come to this country and settle on our land it will pay the country. It has been stated by Mr. LaRivière that the best men you can get are not always the men who have money. In my own neighbourhood, I know, the most successful farmers, the men who became independent and left their children independent, are men who came to this country with nothing to begin with. I can give you the most wholesale evidence of it. Dr. Roome knows East Williams well. Away back in 1840 the Duke of Sutherland evicted many of his tenants on the west coast of Scotland. They were dumped down in Montreal and they trudged up through the country on foot all the way from Montreal, and in our neighbourhood the kindly hearted farmers who had frame barns threw them open and provided them with assistance. They went to West Williams, a new township, and, would you believe it, these men are there to-day, and they and their descendants are independent farmers. And they have paid the Government for their land, although not all at once. There is not a man of them indebted to the Government to-day. If we can get the right sort of men, and get them to remain in the country, it will pay the country to do something to help them to sustain themselves until they can support themselves.

MR. LARIVIÈRE.—There is one thing that has to be looked after, and I am glad to be able to call the attention of Mr. Burgess to it. There is a movement just now that ought to be checked. While we are receiving in Manitoba a large number of Canadians who have settled in Dakota and in Minnesota, in one month this spring 250 people left Ontario, coming through Manitoba to go and settle in Dakota. Remember, Mr. Chairman, that was in one month only. They had \$23,000 worth of household furniture and cattle and horses, and were leaving the Province of Ontario to settle in Dakota and Minnesota. There must be some agency in Ontario from the United States and the American railway companies. There must be some agencies in Ontario working amongst the farmers and directing them to leave the country.

MR. WILSON.—How many did you say ?

MR. LARIVIÈRE.—Just 250 people in one month, in the spring, having \$22,000 or \$23,000 worth of household furniture, cattle and horses with them, leaving the Province of Ontario, passing through Manitoba, and going right straight south and settling in Dakota and Minnesota, while over 400 or 500 people from those places came from that district completely ruined, Canadians coming back to Manitoba.

MR. WILSON.—Those people are making a mistake in going to Dakota and Minnesota.

MR. LARIVIÈRE.—I think there should be something done to prevent this thing.

MR. BURGESS.—There are, I understand, some 30 agents of American railroads operating in the various cities, towns and villages of Ontario at the present time, and it is a rule that the railroads will not continue them in their employ or pay them unless they are able to show a certain specified number of settlers as having been placed on the lands of the companies interested every month. The Federal Government is in this difficulty. How far is it justified in inducing people to move from one province of Canada into another? On this account, the officials engaged on behalf of the Dominion Government in promoting the settlement of the Northwest have conducted no operations in the older provinces. What the Committee might fairly consider is: Is it not reasonable that the Government of Canada should be in a position to do the same thing in any province of Canada that the United States railway companies are doing? If it is a fact that some 30 agents of United States railways are operating in Canada to-day on conditions which make it necessary for the agents to send a certain number of settlers to the companies' land

every month, otherwise their engagement comes to an end—would it not be advisable for the Federal Government in some way or other to meet those people on their own ground?

MR. INGRAM.—Last fall, during the London exhibition, there was an agent there from the States with circulars, which he was distributing on the show ground.

MR. MCGREGOR.—I think we ought to try, now that Mr. Burgess has got charge of the department, to induce Mr. Burgess to come to this Committee at our next meeting, which will be some time early in the winter, with some policy whereby we can go to the House, and have it in such a form that we can say to the House that we really are in earnest in filling up that country. There is no people on earth with the heritage that we have. We have the finest land, and the farmer goes there under advantages that he can get in no other country on earth to-day. He has the right climate and the very best soil, with hay already grown, where a farmer who gets a yoke of oxen can get 80 acres ready for the next year's crop, and with a heritage like that, and the quantity we have, why should we not fill it up? Why should we not be in earnest in filling up that country? Every dollar we expend in filling up the older provinces with immigrants is somewhat lost. Let our aim be to fill up the North-west, every part that can be filled, and we will get more than three or four fold from it, and that quickly, too. I would not be particular about the old people; bring them from any country, but it is the young people who will take their places in that country and fill it and make their mark. In looking over the statistics of Kansas, Nebraska and Texas, and those other new countries, it is amazing to see the amount of people put in there yearly; and here we are standing quietly and allowing our lands to go. I feel that we ought to have a special committee to confer with the parties in charge of immigration, and that we ought to have the greatest ability in that department that the Government have. If we are in earnest we can fill up that country.

MR. DAVIN.—I am very glad to hear Mr. McGregor speak in the way he has done. I think that this Committee ought, now that there has been a change in the management of the department to a department characterized by energy in its own business, to do what within us lies in the direction pointed out by Mr. McGregor. If we can fix on a Committee, as he states, to confer with the Department of the Interior, it might be a good thing. We might be able to make some suggestions. What we want, Mr. Chairman, is some large scheme that will crowd that country. Mr. McGregor has taken a statesmanlike view of the matter. The department that deals with immigration is the most important department in the country. What is the good of a Finance Minister if you have a country in a stagnant condition? Crowd the country with immigrants and you will give him the material upon which his financial friends can work pretty quick. What we have always wanted is something big. Now that the change has been made Mr. Burgess will have a great deal to do with it. He has had a good deal to do in shaping the policy of his own department and he will have a good deal to do with shaping this policy. It is quite clear Mr. Burgess is not in a position to give us the information now. He says he has as yet no plan well formed. I think the steps hitherto taken are good steps. The changes made are wise changes, but we want some big scheme. It is ridiculous that immigrants should go into the United States when we have a far more attractive country in Manitoba and the North-west.

MR. ROOME.—I approve of a great deal that has been said by the last two speakers, but not as a whole. I think the policy of reducing the expenditure is a move in the right direction. Going in with a gigantic scheme to settle the North-west in a few years at the expense of the older provinces is not what this Committee or Parliament wants. The United States Government has not for years given a dollar towards settling up those new States. It has been done by the people themselves, by advertising and by the railway companies. We cannot go to the expense of filling up that country at the expense of the older provinces. The farmers of the older provinces were paying for sending farmers to the North-west to compete with them. I say we should start carefully. I believe the time has come when we should

advertise the North-west well, as the United States is now filled and the tide of immigration must turn in some other direction. As we have such a grand country, let us advertise it and let the people be induced to come in but not by money grants. You will find the labour committees all over the country opposing the sending of money to compete with them in the labour market by bringing labourers and mechanics here. I am in favour of opening up the country as best we can by advertising.

MR. McNEILL.—I must say that I cannot agree altogether with the principles laid down by Dr. Roome. I cannot think there is a conflict of interest between the North-west and the older provinces. I think such a proposition as that, if it were acted upon, would burst up Confederation. It seems to me we are all one country, and what will benefit the North-west will benefit the older provinces. It is admitted by all that it would be a good thing to have the country filled up. It does seem to me that there is something radically wrong somewhere. We have in the mother country hosts of men, as Mr. Burgess has told us he knows from personal experience, and I know from personal observation, having lived among them for many years—we have hosts of men who would make farmers of the very best character, men who have been accustomed since their childhood to hard work, men who look for nothing else but hard work, who would only be too delighted to get a chance to do hard work which would be likely to give them some return. What is the condition of things? In the old country we find these men really in the position of agricultural labourers. They are abandoning agriculture, and they are leaving the agricultural districts and flocking into the cities of the mother country. In the face of this, we have hundreds of thousands of acres lying idle, and it does seem to me that there is something radically wrong, and there should be some effort made to right that wrong. I agree with every word Mr. McGregor has said with regard to this.

MR. WILSON.—The question I would like to ask is this: If you fill up the country with the kind of immigrants Mr. McNeill speaks about, men with families, who have to be assisted to this country, what are they going to live on while they take up this land, while settling? I am as much in favour of immigration of the right kind as Mr. McNeill, but I am entirely opposed to assisting people to this country who are so poor that they cannot get here themselves, because I do not think they are a desirable kind of immigrants for the country. I think any industrious, prudent man can save enough in any country, if he is desirous to get out to another country, to do so. A man who has no thrift about him I don't think will make the kind of a settler we want in the North-west.

MR. ROSAMOND.—I think we ought to do something towards assisting people to come out here. I do not think we ought to content ourselves with simply advertising the country. It is a question of the greatest importance to Canada that the North-west should be filled up as rapidly as possible. We have had the same thing in Ontario, when the settlers were assisted out; but they were furnished with implements and blankets, and with rations for a certain period. Many of the settlers afterwards became well-to-do, and were of great benefit to the province.

Having examined the preceding transcript, I find it correct, in so far as my own statements are reported.

A. M. BURGESS.