REPORT

OF THE

FIRST ANNUAL CONVENTION

OF THE

ENSILAGE

AND

ECONOMIC STOCK FEEDING ASSOCIATION

OF CENTRAL CANADA

HELD IN "STAR HALL," IN MONTREAL, ON MARCH 17th, 1892

PRINTED BY ORDER OF THE LEGISLATURE

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CHARLES FRANÇOIS LANGLOIS
PRINTER TO HER MOST EXCELLENT MAJESTY THE QUEEN
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APPENDIX TO THE REPORT OF THE COMMISSIONER OF AGRICULTURE AND COLONIZATION, 1892.

To the Honorable Louis Beaubien,
Commissioner of Agriculture and Colonization,

Sir,

I have the honor to annex herewith the Report of the First Annual Convention of the Ensilage and Economic Stock feeding Association, to which I have added at your request a few foot notes.

I have the honor to be,

Sir,

Your obedient servant

ED. A. BARNARD,
Secretary of the Council of Agriculture and Director of the Journal of Agriculture.

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ENSILAGE AND ECONOMIC STOCK FEEDING ASSOCIATION OF CENTRAL CANADA

HELD IN "STAR HALL," IN MONTREAL, ON MARCH 17th, 1892.

OFFICE BEARERS FOR 1892:

President: WM. EWING. *Secretary:* C. D. TYLEE.

Vice-Presidents: A. J. DAWES, A. E. GARTH.

COMMITTEE: S. DORAN, T. A. TRENHOLME. M. DICKSON, REV. M. CHAREST

The meeting was opened by the president, Mr. Wm. Ewing, who spoke as follows:

GENTLEMEN—I am very glad to see so many here to-day, many more than we expected would come to the first meeting of an Association like this. Before commencing to carry out our programme this morning, I will, with your permission, give you some particulars regarding the formation of the Ensilage and Economic Stock Feeding Association of Central Canada, under whose auspices this meeting was held. Our secretary spoke to me frequently about the advisability of having a meeting of those interested in the question of ensilage, and from talking to farmers, when happening to meet them, found that there were quite a number anxious to have such a convention. A meeting was called which was numerously attended, with the result that this Association was formed. We want to have as many members as we can get, not only from the immediate neighborhood of Montreal, but from all over Central Canada, and we are sure that the topics that will from time to time be discussed at our meetings are of such importance to farmers, and in fact to the whole community, that our Association will become a strong one, both in numbers and in influence, and do a great deal of good.

Thinking that the printing of the proceedings of such a meeting as this would be of advantage to the agricultural community, we mentioned the matter

to the Commissionner, Hon. Mr. Beaubien, with the result that the Government have engaged stenographers to take a verbatim report, and publish the same. For this appreciation of our efforts, the Association sincerely thanks the Honorable Mr. Beaubien, and the Government of which he is Commissioner of Agriculture. Our association wants nothing, unless they can give an equivalent, and so we will try to repay this recognition, so far as it is in the power of the Association, by the discussion of important subjects and by the practical examples of our members, and we hope this to do good to the agricultural interests of the Dominion, and to the province we live in more particularly.

I am sure, gentlemen, that it will be a benefit to farmers joining such an Association as ours, and reading papers or joining in discussions as they arise. The study and research necessary to prepare a paper likely to have any educational effect is certainly of as much benefit to the reader as to the listeners; so you might say the action is twice blessed—it does as much good to the giver as to the receiver, and so I want to impress on you, especially the younger farmers, that more of you should do something in this way, and thus a great good will result to the agricultural community, and indeed to the community at large, for what benefits the farming class must of a necessity benefit all, agriculture being the mainspring of the commercial success of our country.

Time was, when amongst farmers, it was considered as a reproach to be what was called a "book farmer" and it settled the question of a man's usefulness, or rather of his knowledge of tilling his land to advantage, if that term of reproach could be directed at him, especially when accompanied by the appropriate sneer. Still book farming or something very much akin to it had some influence on men's minds long ago. In 1735, in Aberdeenshire, the first Farmers' Society was formed that I have read of (likely enough there were earlier ones), and in the modest preface to the first essay published, it is stated that "the essay contains nothing purely speculative, but a plain and genuine relation of our practice as we have learned from tradition and our own repeated experience put into method, to ease our memories and for the instruction of beginners." These worthy men were then content scrupulously to adhere to the mode of farming they had learned by tradition, instead of hunting after novelty in the way of improvement; but times are changed now and people realize that in agriculture, as well as in everything else, traditionary systems are not to be always solely depended upon. Men's minds are to be compared to the rootlets of the plants which farmers grow. Both reach out; the one assimilates all the ideas commending themselves to it, in order to increase knowledge, while the other extends in search of nutriment or sustenance, the result of which is profit-

able crops. Education helps to make the one possible; proper cultivation of the soil the other.

In speaking thus, however, do not understand that I infer anything that could mean the placing of theory above practice, in agriculture. We all know theoritical farmers who are, as far as profitable farming is concerned, failures. We also know practical—too practical—farmers, that, to put it mildly, have not made their calling a success financially; representatives of the latter class, however, seldom come to absolute want, because their daily personal labor is of more value than what they eat, and they work 365 days in the year. Neither can be cited as examples to follow, but on the contrary to be avoided. What is wanted is theory combined with the proper mechanical application to carry it out to a successful ending. Now, in these days one can get, through the agricultural press and publications, at government experimental farms and agricultural schools and at conventions such as this, every new theory referring to cultivation, varieties of grain, feeding, etc, etc., weighed in the balance of utility; and theories that are found to be wanting—that are useless—are left to the theorists to theorize on, being valueless to profitable agriculture. It seems to me that amongst the wisest legislative acts effected by the statesmen of Europe or America, the founding of such schools and experimental farms should be counted, and it is a satisfaction to be able to claim that Canada has done its duty well in this regard.

Farmers, as a rule, can neither afford the time nor the money, even if they had the opportunity, to make any very extended experiments comparing the results obtainable from hundreds of different varieties of cereals or roots, the results from the many chemical or other manures, nor the combination of rations giving the most profitable returns in the production of milk or beef. It takes years of experimental work to prove the most profitable method, variety or combination, in any of these matters, and, as a matter of fact, there is no finality in agricultural science—no rest and be thankful for the student in agriculture. Now all these researches, and the results of these experiments, we are put in possession of through the agencies we have referred to, and practical farmers can choose for themselves what methods or systems will best suit their circumstances, and farmers as a rule are quite able to distinguish grain from chaff, and will choose the most profitable. Surely, then, it must be admitted that costly experiments, the results of which are obtainable by all, without either loss of time or direct payment of money, are of immense benefit to those who act on them. It has always been a question in my mind, when studying experimental statements, whether agriculturists were most benefitted by the showing up and recommending of profitable plans, or by the proving conclusively by facts and

figures the loss arising from the pursuing of some other system (and likely enough one in common use), and I am inclined to think that perhaps the latter does most good. It is only where rocks and shoals are, that beacon lights are needed; so in agriculture the beacon lights of experiment are necessary to prevent us making shipwrecks of our resources by pursuing systems either of cultivation or feeding, resulting in loss, and consequent commercial disaster.

Well, gentlemen, we read about all these things and we come to meetings like this, and we have new ways of working, or cattle feeding explained, and recommended by professors and others who know what they are talking about, and who are able and willing to give us the results of their experience, and as we read or as we listen, we are likely enough convinced thoroughly, either that some system we are pursuing is wrong, or that some method we hear advocated is right, and should be tried. The article is read and put aside, or the meeting is ended and we go back to our farms and we just keep on in the old ways, and another year comes round and we get another dose of conviction, but our practice we never alter a bit. Now this is surely not wise. It cannot be that all our methods of cultivation or of feeding are so correct as not to be susceptible of some improvement, or our system of farming so true that no advance can be made. In saying this I know whereof I speak, for I have acted thus myself many a time; it is not the want of conviction but the acting up to their convictions that troubles most men in agricultural and other matters as well.

What I want to impress on this audience is that if we desire at all this experimenting, and all this writing and lecturing, to do the good that it should do to agriculture and agriculturists, we should, when we are thoroughly convinced that any new plan or system brought before us is actually an improvement on our present methods, and is suitable to our circumstances, give it an intelligent trial, not expecting revolution at the very commencement, and if we find it profitable, to prosecute it with all our intelligence and perseverance, and if our Association in any way aids this good work, then assuredly it will be of advantage to all of us. I have spoken of theory and practice and how when a proper appreciation of both can be found in one man—a man constituted so that he can carry out his theories in his practice—that man is sure to be a benefactor to his fellows, as well as to himself. In agriculture, Sir John Lawes is a man of this latter stamp, and by his theories and experiments, has done more good to agricultural interests than the most practical of practical farmers, who never experimented or theorized on anything belonging to his occupation.

In my opinion, meetings such as this do more to distribute agricultural knowledge than any other agency, and if what I have said will have the effect of making us all take more interest in what is being done for agriculture on the

lines I have mentioned, then my talking will be a benefit and should result in the accession of members to our Association. I am aware that the majority of farmers present take advantage of all the more modern systems of agriculture, and are men who keep abreast of the times in all their methods; to such my remarks generally have no application. We do not need to convert the converted; it is the doubters and the careless we are after, and whom we want to benefit by joining us, and thus aiding in the improving of the agriculture of our country.

In conclusion, I would mention that though ensilage is the subject most under consideration to-day, our Association does not consider it the "all-in-all" in the economic feeding of cattle. Without it, however, most of us believe that the most important factor in attaining this end would be wanting, and also that the system of saving green crops in silos should be more generally adopted. I trust, gentlemen, that we will to-day learn many things that we can turn to our advantage, and thus have a pleasant and profitable meeting. As it would be a waste of time to discuss the ensilage question, were we not convinced that it is a system that would put money in our pockets, I will now introduce to you Professor Robertson, who will prove this conclusively, I am certain. He has taken great interest in our Association, and as there is no one in the country better able to explain the whys and the wherefores of things agricultural, our Association feels proud to have him here to-day.

PROFESSOR ROBERTSON,

MR. PRESIDENT and GENTLEMEN,

When I was asked to assist at the first convention of an Ensilage Association, I had some doubts as to the propriety and wisdom of adding another Association to the many which exist in Canada to look after the interest of the farmers; but the more I have learned of the efforts of the men who have taken this in hand, the more convinced I am that there is room for this Association, to help on the good work of making farming pay better in our Dominion.

I am very glad to learn from the opening address of the President, that the aims of this association are so practical. A good many associations with very pretentious names are formed for the purpose of booming the popularity of a few men, or of enriching the pockets of a few men; but an association like this has the broad and worthy object of helping the ordinary farmer to do his work much better, so that he may be better off. I am glad that Montreal, in this year of grace eighteen hundred and ninety two, has taken some special interest in disseminating information through the agency of an Association located in its midst

for the benefit of the farmers. I want to tell you that Toronto has been ahead of Montreal in this respect, and I know you love Toronto so well, that you will be glad to hear that news.

After the Asssociation was formed and I was asked to give an address, I was told in confidence, that my address was not to be an apology for the existence of the Association, but an exposition of the intentions, objects, and capabilities of the Association to give the farmers information on a most inportant subject.

I think these meetings in themselves are full of great possibility for farmers. Farmers, more than most men, are very easily discouraged in their work and they have more to discourage them than most men. When they find their calling neglected by the men who have opportunities for wide observation, they begin to belittle its importance and to have scant respect for it. As soon as a man fails to feel an invigorating, almost indefinable enthusiasm for his work, just so soon are his powers to perform his work weakened. Every such association, supported by the business men and professional men, which looks after the farmers' interests, puts new hope in their hearts; and that is worth more to them than loads of information.

A convention like this is capable of furnishing information which we all need, and capable of engendering enthusiasm which most of us need. I can read on a printed page all the information which I may obtain at this meeting; but there is an enthusiasm in a meeting which does not come from a printed page; and the more these meetings are held, the more farmers will be able to do their work well with a hearty spirit.

There are few subjects relating to agriculture that have so much interest and carry in themselves such importance as the economical feeding of stock; and there are not many subjects with which farmers should be acquainted, of which they know so little, as the most economical way of feeding the cattle they keep.

My object in bringing so much dry-goods to the meeting, (charts) is only to give an object lesson on the most economical way of feeding the cattle on the farms of Canada.

A good many men farm without thinking clearly as to the objects of agriculture. Men farm as they follow business, to make money; so I have been told. Possibly in Montreal they do not want to make money; they come from the Scotch stock which has no inclination that way; but a few of the French people have set them an example in seeking the almighty dollar.

In following farming to make money, the farmer must remember that he has a three-fold object in view: first to make money by providing food for the people, second to make money by maintaining the fertility of his fields so that

he will have some stock-in-trade to go on with, in business, in future years, and third to make money by giving occupation to men for twelve months, and not for only six in the year. These three objects are the furnishing of food for the people, the maintaining of the fertility of the soil, and the giving of occupation at paying wages during the whole year. That system of farming implies the keeping of large herds of cattle on all the farms in Canada. To provide food only in the form of cereals, means the exhaustion of the soil, it means occupation, so far as pay is concerned, for six months of the year, with six months of living on the income of the previous six months.

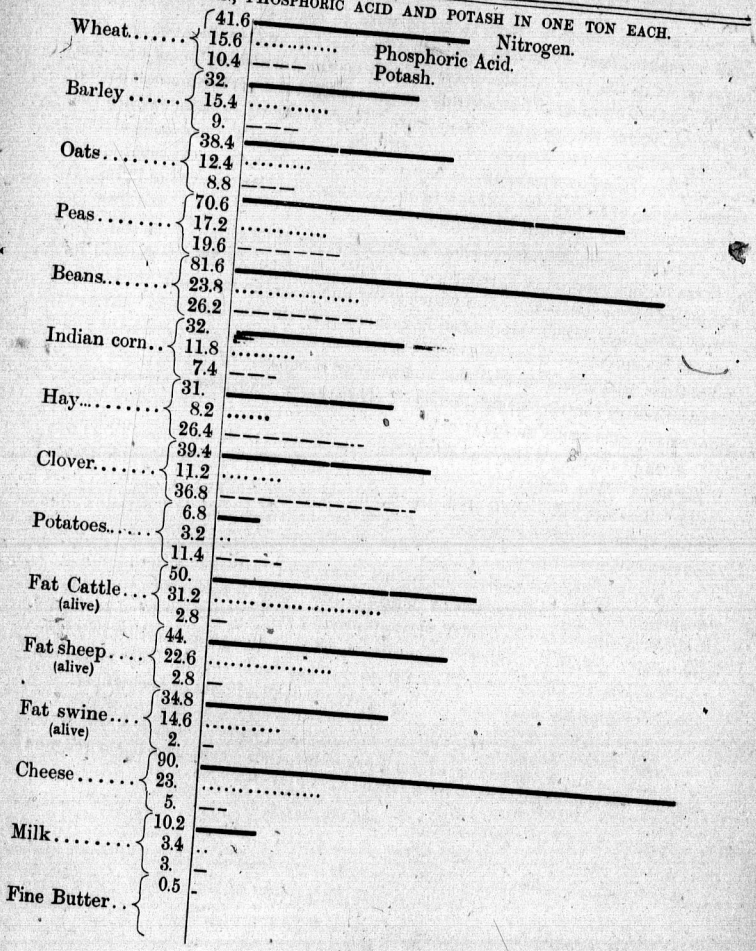
Now let me show you one chart to illustrate the exhaustion of the soil consequent on this method of agriculture. In all farming-cultivation of the soil for the obtaining of food—the crops which grow on the fields take out of the soil three substances, which are becoming rather scarce in our Dominion. As soon as land is depleted of these substances, it becomes a barren waste; and as it contains these substances in available condition, it is capable of giving back large crops in return for the smallest outlay. These three substances are Nitrogen, Phosphoric Acid and Potash (1).

A man in selling crops, and products, sells portions of these three things out of his fields. The drift of this address is to prove to you that feeding stock with ensilage does not take these from the farms in large quantities, and still does furnish these things for human food in large quantities:—it is a paradox but capable of demonstration.

Every ton of wheat carries forty-one pounds of nitrogen, fifteen pounds of phosphoric acid and ten pounds of potash. Pease and beans belong to the class of plants which have the faculty of appropriating most of the nitrogen from the atmosphere, therefore while the sale of them carries a large proportion of nitrogen off the farm, the growth of them fixes nitrogen from the air. That is the advantage of growing pease as a fertilizing crop instead of oats or buckwheat.

(1) Lime is also indispensable; it is not generally found in abundance in our soil, and therefore needs to be supplied on most farms in this province.—Ed. A. B.

NITROGEN, PHOSPHORIC ACID AND POTASH IN ONE TON EACH.



Every two and a half tons of hay, will carry more off a farmer's land, than two tons of fat cattle; and for two and a half tons of hay he will get, on an average, twenty-five dollars, while for two tons of fat cattle he will get two hundred dollars. By the hay method of farming, he gets twenty-five dollars from the same quantity of these elements of fertility, that he gets two hundred dollars from when he grows and sells cattle.

If he be content with eight hundred dollars a year from his farm, he will have to sell four times two hundred dollars worth of cattle to get eight hundred dollars; and if he wants to get eight hundred dollars by selling hay, he will sell eight times more of these elements of fertility.

In selling swine, cheese, milk, or fine butter, he sells a less quantity of valuable constituents out of his land than in selling hay. Hay is worth ten dollars a ton, good butter in winter time is worth five hundred dollars a ton, the ton of hay takes some eighty seven times more of the elements of fertility out of the soil than the butter does.

A Farmer can make butter through ensilage with the largest profit at the smallest cost: and instead of growing hay, he can grow corn, sell butter and get a far larger income. That is all I have to say in regard to this chart in the meantime.

For the economical feeding of animals, every man who keeps stock should learn something of the underlying principles of his practice.

Having now learned the nature of those constituent parts of feeding stuffs, which are termed albuminoids, fat, carbohydrates and ash, I shall present a chart which shows the composition of bodies of animals which are commonly fed and fattened upon the farms.

COMPOSITION OF BODIES.

	Water.	Albuminoids.	Fat.	Ash.
Ox (half fattened) per cent..	51.5	16.6	19.1	4.66
" (fat) per cent.....	45.5	14.5	30,1	3.92
Sheep, (lean) " "	57.3	14.8	18.7	3.16
" (fat) " "	43.4	12.2	35.6	2.81
Swine, (lean) " "	55.1	13.7	23.3	2.67
" (fat) " "	41.3	10.9	42.2	1.65

In selling a half-fattened ox, a farmer sells more of the expensive part of the fertility of his soil, and gets a lower price for the whole carcass than if he makes the animal fully fat.

You can sell the water—the water which forms part of its flesh—for five

cents a pound in a fat ox and three and a half cents in a half-fattened ox, or get fifty dollars against thirty-five dollars for the same weight of an animal. Fat swine carry off the land, less than lean swine. The farmer who markets lean stock sells more of the wealth of his fields, and gets less for it.

I am trying to give you an object lesson so that you will remember the principle, if you do not remember at all the figures which I mention.

In feeding oxen on ensilage or other substances, and in feeding all other animals, it is necessary that they should receive a certain proportion of albuminoids, a certain proportion of fat and a certain proportion of carbo-hydrates which go to furnish heat.

A long series of experimental work in many stations has brought the fact to light that certain animals require certain quantities of these things. Take this for illustration :—In the fattening of oxen the standard says they should receive two and a half pounds of digestible albuminoids or nitrogenous matter per day fifteen pounds of carbo-hydrates, gum-starch, sugar and fibre, and half a pound of fat (1). We fed three lots of steers last winter.—I did not plan to conform to this chart, I did not have any particular intention of conforming to this chart, in my practice. I was trying to discover whether it was cheapest to feed animals on hay, roots and meal. or on corn ensilage and meal. The experiment lasted for five months and when I came to make up the exact quantity of these constituents, which the steers consumed, I found that those which were fed on corn ensilage and six pounds of meal per day had consumed the quantities mentioned in the standards for feeding rations, or so near them, that the difference is not worth mentioning.

Six steers were divided into three lots of nearly equal age and weight, and evidently of similar breeding. The main object of the test was to discover the value of corn ensilage as compared with common hay. One lot of steers were fed on a ration composed of hay, roots and meal; another lot of steers were fed on a ration of corn ensilage, with the same kind and quantity of meal; and the third lot of steers were fed on a ration consisting of corn ensilage, hay and roots, and an equal quantity of meal of the same quality as the other two rations contained.

(1) This standard ration is for an animal weighing one thousand pounds in weight. Ed. A.-B.

The compositions of the rations were as follows :—

	Lots of Steers.		
	Nos. 1 and 2.	Nos. 2 and 3.	Nos. 5 and 6.
	LBS.	LBS.	LBS.
Hay	20	.....	10
Turnips	40	.....	20
Corn ensilage	.....	50	20
Straw	5	5	5
Chopped barley	2	2	2
do pease	2	2	2
Ground oil-cake	1	1	1
Cotton-seed meal	1	1	1
Total	71	61	61

For a period of five weeks, from 17th March to 20th April, one pound each of oil-cake and cotton-seed meal were added to the ration.

For the whole period of 20 weeks, from 29th December to 18th May, each steer of the lots Nos. 1 and 2 consumed an average of 55.5 lbs. per day; each steer of the lots Nos. 3 and 4, an average of 60 lbs., and each steer of the lots Nos. 5 and 6, an average of 52.8 lbs. per day.

For the purpose of making a comparison between the actual cost of feeding steers on the three different rations, a market value was estimated for the component fodders in each. The hay was valued at $8 per ton; roots (turnips or mangels) at $4 per ton; straw at $4 per ton; pease and barley at $20 per ton; and cotton-seed meal and oil-cake at $30 per ton. The corn ensillage cost $1.40 per ton, as per statement in Bulletin No. 12 issued by Pros. Saunders in June, 1891. It will be observed that the corn ensilage was placed at cost, and the other fodders at an estimated market price; but it will not be considered by farmers, in many districts in Canada, that they can produce hay, at a cost below $8 per ton; or roots below $4 per ton.

The following table shows (1) the increase in weight of the steers in 20 weeks, (2) the quantity of feed consumed per day, and (3) the cost per head per day for feed—

TABLE.

		Ration.	Increase in Weight.	Average feed consumed per day.	Average cost of feed per day.
			Lb.	Lb.	Lb.
First lot	No. 1	Hay, roots and meal	188	55.5	19.23
	No. 2	do do	179		
Second lot	No. 3	Corn ensilage and meal	221	60.0	11.90
	No. 4	do do	212		
Third lot	No. 5	Hay, roots, corn ensil'g. & meal	128	52.8	15 58
	No. 6	do do do	182		

All the steers were allowed as much feed as they could eat up clean; and the quantity was varied from time, to time as they would eat more or less.

It may be mentioned in explanation of the small increase in weight of steer No. 5, that he did not thrive well, part of the time. That could not be accounted for satisfactorily. He seemed to be healthy, but, as everyone who has fed cattle knows, an animal "will go off his feed" occasionally, and will not thrive.

It will be observed that the steers fed on the corn ensilage and meal ration gained an average of 33 lb. each more than those on the ration of hay, roots and meal, during the 20 weeks.

During the last month of the testing period, steers No.3 and 4, on corn ensilage and meal, gained in weight much faster than the others; and when the experiment was finished, they were in more attractive condition for handling and selling.

The steers on hay roots and meal cost 19.23 cents per head, per day, or nearly 19¼ cents; the cost of the steers fed on the corn ensilage and meal was 11.90, or 19½ cents, against less than 12 cents per day; and the steers on the ensilage gained thirty three pounds each more in the same time. Now you see the economy of feeding ensilage, apart from the standards and also confirmatory of the standards.

I am going to exhibit this chart for the purpose of showing the proportion of these different constituents in every pound of certain ordinary feeding substances. I put wheat as a feeding substance because in Canada we may be compelled, in my humble opinion, to feed a large quantity of wheat to our stock. We have large districts where wheat gets frozen occasionally and we are now feeding frozen wheat to swine—very badly frozen wheat—and getting over 15

pounds of increase in live wheight for every bushel. There is a possibility of making money from feeding ensilage and frozen wheat. Combined with corn ensilage it makes capital feed for steers.

QUANTITIES OF Digestible Protein, Carbo-hydrates and fat, in each pound of certain Feeds, from tests with ruminants (Oxen and Cows).

	Total Dry Organic Matter.	Digestible Protein.	Digestible Carbo-hydrates.	Digestible Fat.
	Lb.	Lb.	Lb.	Lb.
Wheat.....1 lb.	.89	.095	.588	.014
Barley..... do	.89	.094	.600	.026
Oats..... do	.87	.080	.440	.044
Pease..... do	.87	.201	.534	.029
Oil-cake..... do	.92	.283	.368	.050
Cotton-seed meal..... do	.92	.336	.264	.070
Wheat bran..... do	.87	.117	.453	.027
Mixed straw, (wheat, barley, oat)..... do	.85	.035	.330	.004
Mixed hay..... do	.86	.051	.430	.012
Corn ensilage..... do	.25	.016	.230	.006
Corn stover..... do	.48	.033	.480	.008
Turnips..... do	.085	.010	.075	.001
Mangels..... do	.120	.011	.100	.001
Carrots..... do	.141	.013	.115	.002
Sugar beets..... do	.185	.010	.167	.001

Your President said that the Hon. Commissioner of Agriculture, the Hon. Mr. Beaubien, had provided for a stenographic report of this meeting. I have this chart here so that you will have it in the report for studious examination afterwards. In that respect also, I think the Association is most happily launched in its course of service for the farmers, in as much as the Hon. the Minister of Agriculture, has extended his patronage to it, and he is one of the first and largest feeders of ensilage in the Province, and one of the strongest advocates in support of the practice.

The next question which comes up in connection with this subject is the economical feeding of ensilage.

Since a farmer must obtain these things which I have indicated so often, —the albuminoids, fat, and carbo-hydrates,—to feed his animals, and since he can obtain them in all the different farm products mentioned in the table, it becomes a matter of great importance to the farmer, to know where he can find them cheapest. He can find these things—albuminoids, fat and carbo-hydrates,—from strawberries down to corn stalks; but he must study where he can find them cheapest, because you can see that the success of a man's feeding depends largely

on the cost of his raw material. Any man in business knows how easy it is to sell at a profit goods that are bought right; and how hard it is to make a profit in any market on goods that are bought wrong. A farmer buys, you may say, from his fields the raw material he gives his animals. There is no plant that can be grown on farms in Canada to-day that will furnish these constituents,—albuminoids, fat and carbo-hydrates,—for the feeding of animals as cheap as the corn plant.

In hay, oats, pease, barley and wheat, you can obtain the same constituents, but they cost so much higher that the man who feeds these things, gets a less profit than the man who feeds them from corn stalks. I will illustrate that statement: the major part of the animal's food is carbo-hydrates, which keep it warm in our cold climate; these are found most palatable and digestible in sugar, gum and starch. The corn stalk has the faculty of appropriating these from the air, when exposed to sunlight and grown in a field where the plants have room.

While near Montreal, last autumn, I saw fields of corn, where the men had wantonly thrown away two and a half bushels of seed to the acre, perhaps they were benevolently inclined towards Mr. Ewing, or other seedsmen.

Where the corn stalk has not room enough, the green coloring matter is less active, and does not take in the carbon for the gum starch and sugar. The corn stock serves the farmer in proportion as he gives it a chance.

This chart is for the purpose of showing you the comparative value of corn stalks cut on the 25th of August and the 19th of September. It is taken from the work of Mr. Frank T. Shutt, chemist at the Central Experimental Farm. When cut on the 25th of August, every ton of the crop had of digestible matter 249 pounds, when cut on the 19th of September every ton of the crop contained 297 pounds of digestible matter.

INDIAN CORN—Digestible Matter per ton of Green Fodder.

	—	Cut.	Lb.	Value.
Average of 7 Varieties.	Total digestibe matter	August 25	249	
		September 19	297	
	Albuminoids	August 26	25	
		September 19	27	
	Fat	August 26	3.1	
		September 19	5.0	
	Fibre	August 26	77	
		September 19	89	
	Carbo-hydrates	August 26	143	
		September 19	175	

In every ton of green fodder there were in the first stage 249 pounds of digestible matter, and in every ton at the other stage there were 297 pounds. These are the constituents: Albuminoids, fat, fibre and carbo-hydrates. Of these the albuminoids are the most valuable constituents, corresponding to the fibrin of beef or the albumen of eggs. At the first period, there were 25 pounds of albuminoids as against 27 in the later. Of fat there were 3 pounds, as against 5 pounds; of fibre the proportion was 77 to 89; of the carbo-hydrates there were 143 againts 175. The teaching of the whole thing is, that every ton is worth more at the later stage, and you have more tons to the acre. This lower chart will illustrate these points still more clearly. It is taken from the average of five varieties of Indian corn at these stages.

INDIAN CORN—YIELDS PER ACRE:—

	Lb.	
Tasselled, July 30.	18,045 Green weight.	
	16,426 Water.	
	1,619 Dry matter.	
Silked, Aug 9	25,745 Green weight.	
	22,666 Water.	
	3,079 Dry matter.	
In milk, Aug. 21	32,650 Green weight.	
	27,957 Water.	
	4,693 Dry matter.	
Glazed, Sept. 27	32,295 Green weight.	
	25,093 Water.	
	7,202 Dry matter.	
Ripe, Sept. 23	28,460 Green weight.	
	20,542 Water.	
	7,918 Dry matter.	

Most of the gentlemen of the convention will understand that there are several distinct stages in corn growth. For the sake of convenience we speak of the later stages in the following terms: First we have the "tasselling." Then you have the "silking," when the silk threads come through the husk; then there is the stage when the corn is "in milk;" after that is the stage when the kernel is "glazed" on the outside; and lastly you have the "ripe" stage, when the plant is matured. At the "tasselled" stage, there were 18,045 pounds of green corn to the acre. In these 9 tons and 45 pounds there were 8 tons and 426 pounds of

water; so that we had only 1,619 pounds of dry matter. The dry matter is all that is valuable. It is not equally digestible in all its stages, but still it must be there to be available. At the "silking" state, there was great increase in the dry matter, and so all through, as shown by the diagram in the chart. If you put it down in dollars and cents, the difference would be this: that if it be said to be worth $16.19 per acre at the first or "tasselling" stage, the same crop is worth $72.02 per acre at the latter or "glazed" stage, and there is no increase in the cost of production per acre between that stage and this. The man does not put an extra ten cents to the acre. The extra digestible constituents are largely taken from the atmosphere. So you will see the great importance of growing corn for ensilage purposes to the "glazed" stage. We have been urging everywhere, for the last two years, that farmers should grow corn so that it may reach this stage. (1)

The corn at the "glazing" stage has the largest quantity of food value in itself, and it is then in the most digestible condition.

In our work last year on the Experimental Farm in 1891, we compared four varieties of corn, the Thoroughbred White Flint, the Red Cob, the Longfellow, and Pearce's Prolific.

At the "tasselling" stage we realized per acre of dry matter,—not all digestible,—but dry matter, 6,468 lbs. We realized at the "silking" period from the same varieties, 7,770 lb.

At the early milk stage, we realized 9,138 lbs.; at the late milk stage 9,467 lbs.; and at the glazing stage 11,298 lbs.

I want to read these figures to you to make an impression on your mind with regard to the advantage of cutting at the late stage. There was nearly double as much dry matter per acre at the "glazing" stage as at the "tasseling" stage, and you cannot get corn to the "glazing" stage by sowing it broadcast.

I wish to give a further illustration, by taking Indian corn on an average of five trials. The stage of growth from 24th July to 5th August, at different Experimental Stations, reached the condition from the "tasselled" stage to the "bloom" stage, First we may take the quantity of dry matter per acre at these two stages. The diagram that I have prepared to illustrate these points is as follows:

(1) I am pleased to state here that the *Journal of Agriculture* has been urging this for the last ten years.—Ed. A. B.

		Inches.	
July 24 to Aug. 5. Tasselled to bloom.	Dry matter.....	10	———
	Albuminoids.....	10	.....
	Fat.....	10	– – – – –
	Carbo-hydrates...	10	+ + + + +
Sept. 3 to Sept. 23. Glazed to ripe.	Dry matter.....	30.5	———————
	Albuminoids.....	21.4	.....
	Fat.....	33	– – – – – – – – – – – – – – –
	Carbo-hydrates....	36.5	+ + + + + + + + + + + + + + + + + +

I need hardly emphasize still further the fact that no additional expense is involved in producing a crop to the later or "glazed" stage; the work is all done and the outlay has all been made before the crop reaches the "tasselling" period.

The silo will not grow a crop of corn. If you put it at the "glazing" stage, in the silo it will give you a large quantity of feed, but at the "tasselling" stage, it will give you an expensive way of watering cows.

I fear I have encroached on the time of the other speakers, but I wanted to show you that ensilage is the cheapest feed for cattle, and also to show you how this Association might help the prosperity of Canada by instructing farmers how to make ensilage in the best way. I will give you a few more words on the feeding value of it. I have given you one instance from the feeding experiments I quoted. We have been carrying on a series of extensive experiments this winter which are not yet completed. I made an examination of the books the other day, and I found this to be the teaching of the experiment this year—that in feeding steers on a corn ensilage return as against a hay and roots return, for one quarter less cost, we get one quarter more gain in weight. In both cases an equal quantity of meal was put with the fodder ration.

Q. By a member:

What price do you put on the hay in making your estimate?

Professor Robertson:—Eight dollars per ton. I am putting ensilage at two dollars per ton, but most men in the vicinity of the City here can make it for one dollar and a quarter per ton. In our feeding tests during the winter of 90-91, I reckoned the ensilage at what it cost,-viz $1.40 per ton. When the corn was put in the silos in 1891, it had been wilted on the average for two days. The shrinkage on the weight, caused the ensilage to cost most per ton. Hence it has been valued in our feeding tests during the winter of 91-92, at cost—viz $2.00 per ton. One other object of the feeding of ensilage has been overlooked, and it is this:—by feeding cows with ensilage it is possible to have winter dairying in our

cold climate ; and that means an income from our cows the whole year round ; it means the possibility of feeding milking cows with not more than 6 lbs. of meal per day. In feeding eighteen cows in groups of three, I do not find any gain from feeding over 8 lbs. of meal per head per day ; but I find farmers around Montreal, feeding twelve, fifteen, and sixteen pounds per head per day, an extra cost of 8 cents per day, with no more milk returns. As soon as we feed over eight pounds of meal per day, we make the milk richer in color but no richer in constituents ; thus you see with ensilage you can get more value in product with less cost per day.

The magnitude of this possible economy does not come within the comprehension of the ordinary farmer or business men. Last year, from this Port of Montreal there were handled about 4,000 car loads of cheese which represented millions of dollars. The value of the cheese exported last year was over nine and one half millions of dollars ; the value of the butter exported was about six hundred and two thousand dollars, and there was not a tub of that butter made after November, so far as I know. This year, we started two creameries by altering cheese factories into creameries ; and we made shipments for the first time of that class of butter to Europe, most of it from cows fed on fodder corn. The latest report I had was that the butter was fetching 124 to 125 shillings per cwt.

In western Ontario we may have next winter twenty five creameries running all winter, wholly due to the corn crop and the use of ensilage. We can have in ten years time, as large a value of butter exported as of cheese, by growing corn and feeding ensilage ; and if Montreal could handle ten millions of dollars worth of cheese, it would be beneficial to the whoselesale trade, and every other line of business. Then in live stock, last year, Canada exported one hundred and eight thousand head of cattle of a value of $8,623,202. It is possible to feed more than twice as many animals on the same farm, by growing corn for ensilage instead of growing hay. The tremendous possibility of this is apparent, if you take the figures in regard to the keeping of animals that are being fattened, and the keeping of those which are giving milk, and calculate the possible reduction in the cost of the wintering of cattle in Canada every year, I mean from November to the end of April, by the feeding of ensilage. The actual saving would amount this year, if ensilage without hay were fed to ($19,000,000) nineteen million dollars in the Dominion of Canada.

Now in the export of agricultural products, we might send abroad forty-two millions of dollars worth annually ; but if we shall save the nineteen millions of dollars that can be saved by feeding ensilage, we will find the farmers better off, and they shall have a large proportion of the profits, which now remain with the merchants.

One more point, by winter dairying it is possible to extend our trade in swine, and in this climate, with the best conditions for the growing and curing of fine bacon, we could send to England as much bacon as cheese. I see a large possibility of a bacon trade in the North-West, which has the best climate for growing animals and curing meats. If the people of Quebec do not take it up, the people of Manitoba will, and will market the grain in the form of concentrated products and get the best profit for themselves.

In winter dairying, it is possible to raise little pigs during the winter, and these raised on skim milk and butter milk, can be marketed to advantage at 6 and 8 months old. No matter how you look at it, the growing of corn and the feeding of ensilage will enlarge a farmer's output and multiply his profits. Five acres of corn made into ensilage will keep fifteen cows in splendid condition so far as fodder is needed all winter.

The small farmer, the man who has been neglected, the man who says: "the big farmer can keep stock and make money, but I cannot," can so enlarge his output through feeding corn ensilage, as to have on a small farm a larger profit than the man who grows hay and feeds it.

The growth of corn and the making of ensilage, is capable of the best service to the farmers; and every farmer's prosperity is a measure of prosperity to every good citizen of the country. Canada can make gains from the growing of corn and the making of ensilage; and your Association in my opinion is deserving of the most hearty support.

Q. By Mr. Fisher: I would like to ask Prof. Robertson to give us a little further explanation with regard to the statement he made, that in feeding above eight pounds of grain a day to the ordinary animal, it was not only waste, but actually doing harm to the animal. I would like some further information on this subject.

Prof. Robertson: I think this is a most important point that has been brought up. The statement I made is a rule which I think I can very well substantiate. Of course there are individual exceptions to all rules. You will find individual cows that will use more with advantage, but I have never seen a herd that could use more on the average. Every cow seems to have an individual limit of capacity for digestion. Whatever feed you give more than that, requires an effort to throw it off, by the system. There is a waste there, and the food is thrown off undigested; the food is lost and in passing through undigested, the expenditure of energy required to perform these functions is increased. In most steers and cows, whenever you go beyond the limit, you merely throw food away.

Q. By Mr. Trenholme: I would like to ask Prof. Robertson if that

applies to cows giving milk and those that are required for meat,—meat and milk at the same time,—does this eight pound ration apply to that case? (1)

VOICE: What amount of milk would you expect to get from a ration of that kind?

PROF. ROBERTSON: It depends on the cow. You will find this, as a rule: a cow giving thirty-five pounds a day at the third month, will usually get down to about 18 lbs. per day, say at the seventh month, and I cannot make her give much more by giving her more meal. I find that gradual reduction in the cows of a herd, although an individual cow may maintain her yield undiminished. By gradually letting the meal go down to 2 or 3 lbs. per day, after the seventh month after calving, I do not make the milk go down any faster. Therefore I reduce the meal that way.

Q. BY MR. GARTH: For large heavy cows would you not have to feed much heavier than with a smaller breed of cattle to get the same amount of milk? I should think the heavy cattle would require more food for their own living.

PROF. ROBERTSON: Taking grade short-horns weighing on an average of twelve hundred pounds, I found in every case there was no gain in feeding above eight pounds of meal per day as a maximum. In Holstein and thoroughbred Short horns, I found the limit about eight pounds, 11½ pounds of meal per day did not give me any more milk, of a better quality than 3½ lbs; and these animals weighed on an average thirteen hundred and fifty pounds. Taking Holstein on an average of twelve hundred and fifty pounds, I gave them sixteen and three quarters of a pound of meal per day, and did not get as good results as when I gave eight pounds, so I have put eight pounds as a maximun.

Q. BY MR. FISHER: How about the Jerseys that weigh 800 or 900 lbs.?

PROF. ROBERTSON: They have a wider range of capacity in consuming food than any animals I know of. We feed Jerseys down to 5 lbs. and 5½ lbs., of meal with I think the best results.

Q. BY MR. FISHER: What weight of animals?

PROF. ROBERTSON: They averaged 860 and 825 lbs.

Q. BY MR. GARTH: Then the larger cattle need more food?

(1) This important question has apparently been overlooked. It is certain that what a cow digests, when fully fed, goes to fat and muscle, if not milk. The whole question therefore, is how much the fatting cow can return in beef, over and above her milk with profit and what ration is best and cheapest. The weigh beam, carefully used and results noted, will alone give the correct answer, as to profit and loss.—ED. A. B.

PROF. ROBERTSON: Yes, I gave the range from six to eight pounds of meal per day according to the weight of the animals.

Q. BY MR. BARNARD: Have you found that an animal requires a proportionate amount of food on account of its size? If an animal weighs 800 lbs. it would require more food in proportion than one weighing twelve hundred pounds; did you find that so?

PROF. ROBERTSON: We have not tested that thoroughly yet.

Q. BY MR. TRENHOLME: What is the quantity of ensilage you feed, to come to this result?

PROF. ROBERTSON: There comes in a matter that is important and difficult to explain in a few words. A big cow has a larger capacity in her stomach and requires a lot to fill her up. I do not make the rations the same for a large cow as a small one, most men do, but they make a mistake. I believe a small cow will eat about sixty to sixty-five pounds a day of bulk, therefore I put with that five to six pounds of meal. A large cow will eat one hundred pounds per day, and if I gave her food as rich, she would eat 10 lbs. of meal. Giving large cows a mixture of forty pounds ensilage, thirty pounds of roots and ten pounbs of meal, equal part of bran, meal, barley, cotton-seed meal, animals would eat 134 2-3 lb. per day of that rich mixture.

I made the mixture poorer by adding sixty pounds of ensilage and no meal, and of that poorer mixtnre which was cheaper, they eat 122 lbs per day, 12 lbs less of the poorer grosser mixture and they gave me as much and as good milk. To a cow with a large body, give a lot of feed, but make it poor in quality, and to a small cow, just the reverse. (1)

Q. BY MR. GARTH: Was not the ensilage you used very rich in grain?

PROF. ROBERTSON: Our ensilage was not nearly as good as the average ensilage of the farmers should be. It was only in the late milk stage. We were growing different kinds of corn for a test, and we had so much of that stuff to save, that we had to fill our silos to save it. Now we will grow corn only to the glazing stage.

Q. BY MR. BENNY: Will you tell us what proportion of hay you fed with the ensilage and meal?

PROF. ROBERTSON: We fed about forty pounds of ensilage, twenty pounds of roots and ten pounds of hay.

Q.—Just hay, meal and ensilage?

(1) The principles applying to the feeding of animals of different weights will be found further on.—ED. A. B.

PROF. ROBERTSON: I never feed hay if I can help it, without roots. I never do it at all if I can help it, but, if I do, I must have roots or some succulent food with the hay. I have the best results from ensilage and meal alone, without hay at all, but with about five pounds of straw (1).

Q. Without roots either? A. Yes.

Q. What is the meal composed of?

PROF. ROBERTSON: Mainly pease, barley and oil-cake, equal proportions of each. I like bran if it can be got cheap. It would pay the farmers to grow more barley and more pease and avoid buying so much so called provender for their cows. You can put pease and barley with ensilage and make a splendid ration. In growing pease and barley you have no cash outlay for the feed.

Q. BY MR. BARNARD: Do you think you might recommend buying cheap refuse feed such as cotton seed meal, with advantage to farmers who could grow barley and pease? If I understand the authors right, there is as much as $27.00 worth of manure in the shape of indigested food. If I read them rightly, they put the manurial value of bran at, as much as eleven to fourteen dollars per ton of food consumed, and merely in the manure. If it be so, it is a thing farmers should take notice of, because they get cheap manure and get a profit on the food purchased.

PROF. ROBERTSON: In purchasing supplementary feed for cattle, some men can make money, if they have the best machinery in the way of a cow.... The ordinary farmer will make most money by feeding what he grows and keeping no more stock than he can feed; but the man in a better position can make money by purchasing feeds rich in fertilizing matter such as cotton seed meal, bran and oil-cake. The main value which these foods are said to possess is of the manurial sort and is largely based on the nitrogen which they contain. Farmers cannot afford to buy nitrogen at seventeen cents a pound; you can afford to buy commercial fertilizers, namely: phosphates and potash. Four fifths of the atmosphere is nitrogen; if you grow pease and plow it in, and grow clover and plow it under, you will get your nitrogen free and it would make the farmers rich in that way. The farmers of England and Germany are learning to grow pease after the early harvest.

Q. BY MR. BARNARD: That means plowing in a crop and losing the return for one year?

(1) On hay farms, hay may be fed with great profit, with or without roots or ensilage by preparing it in advance, wetting it so so that it reabsorbs the proportion of water it contained as grass. Chaffing and softening it with hot water, at least 12 hours in advance, is an excellent practice, especially where milk is aimed at. The hay ration where thus prepared will replace a considerable proportion of the meal ration.--ED. A. B.

PROF. ROBERTSON: No! after the early harvest, you can have pease come six inches above the ground, that will give you one third to one quarter of the nitrogenous value in the crop of a dressing of manure (1).

Q. HON. MR. BEAUBIEN: We have just heard Mr. Robertson tell us that he has been experimenting on some sixty eight different kinds of corn. Will the Professor be kind enough to tell us which is the best kind that will mature in this country and that can reach this ripe stage on the twenty-third of September, in Ottawa or Montreal?

PROF. ROBERTSON: At Ottawa the thoroughbred White Flint, a very leafy sort, came to the milk state of growth; it is a large yielder. The next is the Longfellow and then Pearces Prolific.

Q. HON. MR. BEAUBIEN.—Where do you get the Thoroughbred White Flint?

PROF. ROBERTSON: New-York, the full name is the Rural Thoroughbred White Flint.

Q. TRENHOLME: Pearces Prolific is the earliest?

PROF. ROBERTSON: Yes, and a good yielder, the Longfellow is quite as good.

A VOICE: Is not the name of the corn "Pearces Prolific" a fancy name for the Mammoth Southern ensilage corn?

PROF. ROBERTSON:

Mammoth Southern sweet corn or Mammoth Southern is a different corn. It is a white dent corn and Pearce's Prolific is a yellow flint corn, a good deal like Western Canada Yellow. Longfellow is also a flint corn with a longer ear. My experience lately leads me to this conclusion, in only the most favored places for corn growing in Canada, will this Southern dent corn grow in the average years to the best stage of maturity, therefore I want a more early ripening corn than that.

VOICE: I have known Montreal dealers to complain of the quality of the milk from ensilage fed cows.

PROF. ROBERTSON:

If the ensilage is made from immature corn, its sourness is lactic acid; if it comes to the matured state and is allowed to be one day in the field, it will have a malty smell but no offensive odor.

VOICE: You approve of leaving it one day to wilt?

PROF. ROBERTSON: Yes, unless it were very dry in the field. Some seasons from the atmosphere it will dry on the root, other times it will wilt in a day.

(1) Growing an abondance of clover would cost much less and should when ploughed up leave in the soil a larger supply of nitrogen that an after crop of peas. A table, further on, will show the value of various articles of cattle food, both as feed and as futilizers.—ED. A. B.

Q. MR. BARNARD: That would leave about seventy-five per cent of water in the plant?

PROF. ROBERTSON: Even less than that. We found our corn lose twenty-eight per cent in weight by wilting two days.

Q. BY MR. FISHER: There has been a suggestion made that the extra sugar in sweet corn would lead more to fermentation than the ordinary corn.

PROF. ROBERTSON: I do not think so, I have kept the sweet varieties of corn and they did not sour any more than the next layer which was of the common corn. We put our corn in layers this year and put a layer of long stalks between them, to find out the best varieties for preservation.

VOICE: We found milk fed from ensilage sour this winter.

PROF. ROBERTSON: If you had poor ensilage, it was poor food the same with poor hay or anything else.

Q. Should the ensilage have a sour smell?

PROF. ROBERTSON: It will have a smell slightly fermented, it will always have a slightly acid taste.

Q. BY MR. PERRAULT: What do you consider the equivalent in ensilage by weight as compared to hay?

PROF. ROBERTSON: It is not safe to generalize very often; two years experience, shows that two and a half tons on an average will give you more milk and as much beef as one ton of hay. I found in 1891 every two tons of ensilage gave as much as one ton of hay.

Q. BY MR. BARNARD: Does that mean glazed ensilage or tasseled ensilage?

PROF. ROBERTSON: Ensilage from corn at about the milk stage.

Q. BY MR. PERRAULT: Under the most favorable conditions?

PROF. ROBERTSON: I should think in this case the ensilage would go two tons to two and a half tons, according to the kind of season you have for getting a large number of ears on the stalks, two and a half tons of ensilage to one ton of hay.

Q. BY MR. BARNARD: If it is too dry you would have to pump water into the silo, you would not carry the water from the fields, you would simply pump it in which would not do any harm.

PROF. ROBERTSON: Yes.

Q. BY HON. MR. BEAUBIEN: I found that the ensilage had to heat, and when it did not, the contents of the silo were sour and that gave a bad taste to the milk. Now since the last two years, when we took in the corn too dry, we had to put in water, we had to sprinkle the corn in order to give it the proper degree of heat. Now, if I was wrong, I want to be rectified; but that is my experience. I find in order to have good ensilage, I must have the corn to

heat, and if I take it in when it is dry, sometimes it will be four days without proper fermentation, we had to pour water over it to make it heat, so now I cut it and run it straight through the machine and put it in the silo, when it will heat in eighteen hours. I do not see why we have been advised to let it wilt on the ground. I pile it four feet in the silo and leave it there until it has one hundred and thirty degrees of heat, and when it is to that temperature, I am sure it will not be sour. But the Professor says: let it wilt on the ground. I want that taken up this afternoon, because it is a most important question, and I hope that when the Professor comes from his lunch, he will have that question discussed. A good many of our farmers say that ensilage gives a taste to the milk; that is because the ensilage was sour. We could not go near the barn the first year I tried ensilage, we were getting poisoned, and this year it smelt just like fermented sugar and the milk never had any bad taste. My son has been selling his milk all the year round, and he never had a complaint about the taste of the milk. Now gentlemen this is a most important question, because I know that there are a good many milkmen here. I say that this is a most important question and I hope that the Professor after lunch will have it discussed, there is a right way and a wrong way to go about anything, and a great many have been discouraged, because when they first fed the ensilage to their cattle the milk was not suitable, was not drinkable; that happened to myself and I suppose it happened to every one of us.

In the afternoon the meeting resumed business, when the Rev. Mr. Charest read a paper on: "Preparing the land; Sowing, and varieties of corn suitable for ensilage."

PREPARING THE LAND FOR CORN.

Ensilage being now admitted as one of the most succulent and economic of foods, it is the duty of all who have used it to communicate to others their knowledge and experience. Corn is undoubtedly the crop best suited for making ensilage. The greatest amount of food per acre can be grown from it and it seems easier to make good ensilage of it; but it requires a rich mellow land. Thus, the first thing to know is how to prepare the soil.

To insure a good crop, prepare the land in the autumn or early in the spring. It should be heavily manured. It is better to manure immediatlely before ploughing, and, if possible, to have the plough to follow the manure spreader as a general rule, in order to avoid losses by leaving manure exposed too long to the rays of the sun and to the air. When stable manure is scarce, it is advisable to use commercial fertilizers with it, such as land plaster, superphosphates, bone dust, nitrate of soda, etc., but at time of sowing only, except for superphosphates, which it is better to apply in the autumn. The land being ploughed in the autumn

or early in the spring, let it lie until just before planting, when grub and harrow thoroughly, thus killing a number of weeds, which have just started.

Plant at the time you would for a crop of corn grain, after all frosts are over. It must be sown so thin as to give abundant opportunity for cultivation, for there is probably no crop where Franklin's favorite motto, which he used to express when addressing farmers, finds better application—"Stir the Soil." Besides, it facilitates sunlight and air getting at it; and corn grown thick is of little value. For this reason, never sow broadcast, but in drills from 2 1-2 to 3 ft. apart for the small varieties, and from 3 to 4 ft. for the largest, and only allow 2 to 4 stalks to grow for every foot of drill (1). It is only thus that the proper maturity can be attained. By the above method of planting, the crops can be well and often cultivated.

For planting, one can open a shallow furrow with a plough and throw the seed in it by hand or with a garden seed drill, covering with hoe, or in large fields by harrowing cross wise, or a corn planter can be used (cost abont $25.00) which will plant the corn, and put on artificial manures and cover. At our school, we use the Aspinwall potato planter and find it still better than the special corn planter, because it is steadier in the ground, the driver riding on it and thus making straighter rows. An ordinary grain drill can also be used by stopping up all but two or three of the spouts. Harrow after planting, when first up, and when again 3 or 4 inches high. It is better to use the smoothing harrow, made specially for this kind of work. Then cultivate between the rows once a week as ong as you can without damaging the corn. Dry soils should receive flat cultivation, and damp soils should be ridged. The object in the first place is to save as much of the moisture as possible, and in the second, to get rid of what excess there may be.

In Central Canada, almost any kind of corn can be grown, but care should be taken to sow varieties that will mature before the first autumn frosts. Canadian and sweet corns are to be preferred, because they mature better and consequently contain less water and more nourishing substances, but some object to sweet corn as being more difficult to grow and not so certain of abundant crops. Our farm being near the city, we grow sweet corn, sell the best ears and ensile the rest with stalks, along with some of the large varieties. Grain from ears sold is replaced at the time ensilage is fed by mixing a little ground grain with it. Among the well known large varieties of corn, as far as my experience goes, I can recommend the red Cob. It is very leafy and I have grown it for a few years, always with good results.

(1). Two stalks per foot are fully as much, and even more then we would recommend. (Ed. A. B.)

A discussion here arose respecting the applicatien of plain superphosphate.

THE PRESIDENT: Plain superphosphate should be applied in the fall, so that a certain amount of dissolution would occur and thus be capable of being assimilated by the crops in the spring.

Q. BY MR. BARNARD: I quite agree with my friend; if it is a proper spring and wet enough, the superphosphates, by which I mean the ground phosphates prepared with sulphuric acid, may prove useful. In dry seasons, the application of superphosphates in the spring, no matter how well prepared, will not do justice to the manufacturers. Unless we apply superphosphates at the time they can be dissolved and absorbed by the soil, they remain dormant for that year and appear useless. Complete fertilizers, viz: those which contain nitrates, as well as potash and phosphoric acid, are best applied in the spring, on account of the nitrates which would be washed away. But in plain superphosphates there is no nitrogen, so there can be no danger in putting it in the fall, and it enables more of the phosphates to dissolve and become plant food.

THE PRESIDENT: As I understand the matter, you use superphosphates as an adjunct to barn yard manure not as a complete manure. The benefit claimed for artificial manures being that they force the plant in the earlier stages of growth and until they get hold of the barn yard manure.

MR. TRENHOLME: What is the advantage of putting it in the spring when a large portion of it is not going to come to the object that is wanted?

MR. BARNARD: Where manure is scarce, I would advise adding superphosphates to it. The spreading of 300 or 400 lbs of superphosphates before the plowing, in early spring, might prove most useful, It requires a little work, but three or four hundred pounds would not take much time, nor cost much money.

THE PRESIDENT: Would it not be better in this half dunging to use a substance that could be more quickly made useful?

MR. BARNARD: Yes, but there are two points to consider. As a rule, farm manure contains enough nitrogen and potash, but is wanting in phosphoric acid. This is the only element contained in plain superphosphates besides lime. However, when you are putting on this fertilizer which all plants require, you must put it in a soluble form, or the immediate effects required are not obtained. Respecting the per cent of phosphonic acid in superphosphates of the highest degree, it is not often that the manufacturer can guarantee to a few per cent. Where we apply a large quantity of superphosphates and a small quantity of manure we should apply the superphosphates in the fall over the plowing.

REVD. MR. CHAREST: That is my opinion too.

MR. BRODIE: I agree with Mr. Charest regarding the Aspinwall potatoe

planter; it is the best I have tried. I have planted corn with it, it is straighter in the drill and I can use it to plant my potatoes as well, and only use one instrument for the two purposes.

CORN ON CLOVER SOD, AND PHOSPHORIC ACID.—THIN SEEDING.—VARIETIES TO SOW. BY MR. FISHER:

I have no hesitation in saying that with good clover sod and with 200 or 300 lbs. of superphosphates, you can grow a good crop of corn without any other manure, I can still grow a better crop, if I put a little farm manure. Corn responds to all the manure and all the richness you can give it, I do not think there is any question about that. As far as cheapness in growing is concerned, I have no hesitation in saying the more you can get off each individual acre the better, and therefore I think it is well to give your land a good dressing and grow the largest amount of corn on the smallest acreage. I think there is no question that thin sowing is an absolute necessity and the man who sows this grain, in the old fashioned way of two bushels to the acre is not only throwing away seed but losing in every way possible. The corn crop for ensilage should be grown very much as a corn crop for grain, and you will get a better quality of ensilage and more of it. It is the first time that I heard of the Aspinwall potatoe planter. I saw the advertisement, but did not know it was procurable in this part of the world. For a number of years, I used a corn planter, planting one row at a time with one horse; it was very satisfactory in every way; but there may be better instruments, such as the "Aspinwall" planter. Corn ought to be set in drills not less than three feet apart for the large variety, three and a half feet is better, but I do not think any corn grown for ensilage should be planted less than three feet apart. The varieties of corn we discussed this morning, the common western corn does very well, the Thoroughbred White Flint does remarkably well; I got a bushel of sugar corn from you (Mr. President), which yielded the best crop I ever had. I got the next year a bushel of what you said was the same, but it did not turn out so well. The first trial of sugar corn was the best crop I ever raised, and if we could get a good crop of sugar corn, I think it is the best corn to grow. Last year, I tried some Canadian corn from the District of Sorel and it was thoroughly satisfactory and came to a very advanced stage of maturity and gave me a large profit. It grew to about ten feet high.

A VOICE: What is the name of that corn?

A. I do not know what the name of it is, it is a corn grown in the neighborhood of Sorel, it has been grown by one gentleman for twenty years, I believe;

he got the seed from the West. I got it from Dr Bruneau last year. He is one of the directors of the Dairymen's Association. It is a large yellow corn, 12 rows of kernel on the ear, about ten feet high, and one or two ears on each stock, a very large stock. I cut my corn very early last year and what I put in the silo was not ripened ; but some hills I left ripen. I may say in an ordinary season at Sorel it ripens every year, whereas in the townships it would not ripen every year on account of the soil, and I doubt if it would ripen every year here, the neighborhood of Sorel is adapted to the growing of corn.

THE PRESIDENT: Is it not Dent corn ?

MR. FISHER: A Yellow Western Corn, they say the original seed came from the west.

MR. TYLEE: Mr. Fisher mentioned about planting corn in clover sod. Is it necessary to plow that down in the fall or only when you plant your corn in the spring ?

MR. FISHER: If a heavy tenacious soil, in the fall; if a light soil, as early in the spring as you can.

HON. MR. BEAUBIEN: I wish Mr. Fisher had continued his experiments, because there is nobody that knows better than he that seasons change, and men's minds change, and therefore because he had not a good crop of patatoes one year, he would not sow them again, he might have a good crop the next year. My own personal belief is that sugar corn is the best, but people have different opinions about that. I would like if some of the men who have sown sugar corn and other varieties would say something about it.

MR. TRENHOLME: I have been growing corn, a fodder corn, for fifteen years before the ensilage started. I do not agree with Mr. Fisher in so far as plowing the corn long before the planting; I claim the time for plowing the corn is immediately before the planting, not more than a day or two before, and let the grass or weeds on the ground be turned over. By that process the grass that is thrown under heats at once and the result is the corn gets a start before the weeds, and you can raise a crop of corn off the sod as far as the weeds are concerned, better than in any way I have worked.

MR. BARNARD: That is the experience of many, to manure as early in the fall as possible, in order to give the grass a good start and let it go on growing in the spring until about seeding time, and then plow and seed at once and keep down the weeds, because your corn grows quicker than the weeds and gets ahead of them and morever, feeds on the deeaying roots of the grass.

THE PRESIDENT: That is common sense. Corn is a tropical plant and wants heat to produce quick growth, and sowing as recommended by Mr Trenholme

is same as in a hotbed. But sometimes you have a succession of dry weather and the weeds come up but the corn wont.

MR. BARNARD: Let us remember that the roots of the decaying grass just turned over contain fully eighty per cent of moisture, and must therefore be the best of food for the growing corn.

THE PRESIDENT: I have seen very foul land, with a growth of weeds 2 feet high on it, turned down as described by Mr. Trenholme in dry weather; a shower of rain, came and the corn went ahead quick.

MR. D. MCPHERSON: I think we ought to have a clear idea of this matter. There is not only the sowing of corn but also the preparation of the soil, and if we defer all work to the spring we will not be able to get our work done. I have tried that both ways: plowing in the fall and in the spring, and I find no difference and I have as good a crop plowing in the fall as in the spring.

I sow a very large amount of corn, and I find a great advantage in plowing in the fall; it is this, the work is done and the corn can be planted earlier and in better shape, another advantage is that manure can be put on in the winter and spread early in the spring and the corn has a full benefit of the manure; it is an advantage to have the ground plowed in the fall; it enables you to perform the work and have the corn planted in a seasonable time. The advantage of plowing in the fall is quite considerable.

THE PRESIDENT: I wish some of you would say something you consider necessary about the depth of cultivation on ordinary land:—

REV. MR. CHAREST: It would be better not to cultivate too deep, for what reason I don't know.

MR. BARNARD: You want corn soil rich. If you have got rich bottom soil which has been deep plowed in previous years, I do not see that it can hurt the ground. What corn wants is a hot bed and it requires an abundance of food.

A VOICE: How deep would you plow your land.

MR. BARNARD: As deep as Rev. Mr. Charest said: If you have a deep reserve in the soil, plough deep—if you have not, keep the subsoil where it is and keep the good soil on top.

THE PRESIDENT: Mr. Cochrane, how deep do you plow your land? A. As deep as I can.

THE PRESIDENT: I am glad to hear that, because I have seen statements lately advising shallow ploughing for corn, as well as shallow culture for the growing crop.

MR. BARNARD: Shallow culture for corn, which everybody agrees to, and deep plowing are two very distinct things.

MR. R. ROBERTSON: We plowed our land quite deep in the fall; by chance

in the spring we were experimenting a little and I plowed a piece the second time. I plowed a piece as deep as usual, and the piece that had the smallest depth of cultivation had positively the best crop.

MR. BARNARD: Of course it would be so, because the roots of the corn extend all over the soil in a very short time, and if you drive in the cultivator deeply it cuts those roots up. I found that shallow cultivation in the spring was better than deep plowing in the fall. Another thing I would like to give to the audience is the benefit of putting the manure on top of the land before plowing in the fall. The great thing is to get in plenty of manure into the soil. Corn is a good grower and will respond to the food that can be given it. Plow deeply in the fall and cultivate shallow after the seed is in, and you will have a good crop. Possibly, where the ploughing is done on fat clover lee in the spring, deep ploughing is not so advantageous.

THE PRESIDENT: This is a most important topic and I would like to have it threshed out well. There are many people here who can tell us something about it.

Q. What do you mean by deep plowing?

MR. R. ROBERTSON: Five to seven inches in the fall, and two to three inches in the spring produced our best crops last year.

THE PRESIDENT: What kind of soil?

MR. R. ROBERTSON: Yellow loam with a lot of manure.

MR. BARNARD: If my memory is good, the largest crops of corn grown in the States, 106 Bushels of shelled corn, were produced on clover and plowed up in the spring at seed time, but enriched in the fall. This was a corn crop alone, but it strikes me that similarly good results would be obtained with ensilage corn. There are very many varieties of land. We must discuss these questions in connection with the climate and the quality of the land. It has been shown this morning that when we grow ensilage we should act as if growing a corn crop, therefore, it seems to me that the American System of cultivating corn on clover sod is the best; clover enriches the soil, as it obtains in its growth a quantity of nitrogen from the air. This gives the corn a chance, and as the weather becomes warm there is a quantity of dampness left in that sod. If the land has been thoroughly harrowed and made fine, the corn will start and go right ahead. After a fortnight of cultivation, that crop will be right up and will cover the land, and then we need not be afraid any more of dry weather injuring it.

MR. FISHER: It seems to me that this discussion is not so essential as some other things in connection with ensilage. When we admit the ensilage corn

should be grown the same as other corn, you all know how to do it. Each man here probably has grown corn.

THE PRESIDENT: You might say the same of every crop that is grown, and still the discussion of different methods by many men might be advantageous.

MR. MACPHERSON: In a six acre field I had three acres manured with good manure, plowed in the spring, the manure put on top of the plowing; and the other three acres I put 400 lbs of complete fertilizer of very good quality. Where the manure was put, I cut twenty five tons to the acre, and where the superphosphates were put, there was not over eight to nine tons, and of a very poor quality. What I think we want is more stable manure on our farms of a better quality and more of it.

THE PRESIDENT: How many tons of stable manure did you put to the acre?

MR. MACPHERSON: About eighteen tons per acre.

THE PRESIDENT: How many pounds of complete fertilizers?

MR. MACPHERSON: About four hundred pounds.

THE PRESIDENT: This is only a homeopathic dose.

MR. MACPHERSON: I am only showing the difference between stable fertilizers and commercial fertilizers (1).

Q. Was this corn grown on sod?

A. On sod down for twelve years.

MR. BARNARD: Was the superphosphate applied in the spring?

MR. MACPHERSON: Yes, in the spring.

MR. BARNARD: How did you cultivate?

MR. MACPHERSON: I use the disc harrow which cuts it up nicely and makes a good seed bed.

MR. GEO. BUCHANAN: The most important point in our cultivation is getting the full return of the manure—I hear gentlemen talking of plowing in the fall, and plowing it in seven inches, I would like to know if we can get it back in the spring by plowing less than that—if the manure remains there which costs us a dollar a ton, if we lose half of it in the ground we never see it again; it is a loss; the question is whether it is better to plow deep in the fall and shallow in the spring. My experience is plow late in the fall and have it mixed in the spring and bring it up to the surface. I have not had much experience in corn, but I have had some in potatoes and other crops.

MR. MACPHERSON: I plow seven inches in the fall and top dress in the

(1) A ton of manure on the field is worth at least $1, making the cost of stable manure $18 per acre, whilst the best commercial fertilizer did not cost over $36 a t n. or about $7 for 400 lbs. Therefore the comparison was not a fair one. The more so that the application in the spring gave little time for the fertilizer to dissolve.—ED. A. B.

winter and spread the manure in the spring and then cultivate on top of this deep fall plowing and keep the manure on the surface and that is where we want the most of it.

MR. BRODIE: Can any gentleman here say what will prevent smut in the corn?

PROF. ROBERTSON: If you sow smut you will have some.

THE PRESIDENT: Is it so that you will not have smut, unless you sow smutty grain? (1)

PROF. ROBERTSON: I think so. I may say this that if a crop of corn is very badly smutted, a farmer should not plant corn on that field for two years. If you sow corn in that field, a portion of the smut may remain in the soil, and come up the next crop.

THE PRESIDENT: Professor, is there anything you would like to say with regard to any of the questions asked referring to cultivation of the soil for corn?

PROF. ROBERTSON: I think every man is right, although they all differ from each other. If I made a rule for cultivating for grain, I would make a different rule for each farm. The first four weeks means a great deal, the next four weeks means a great deal; the last four weeks, the corn will take care of itself. I would put manure where the corn would get it at the beginning, after that the corn will do for itself and get the substances it requires from the atmosphere. THE corn plant is one that can get its food from tough combinations, there is no plant grown on farms that has more robust digestive apparatus. Plants like wheat, barley and oats require rotted manure or fertilizers. Barn yard manure or the refuse will serve the corn palate very well. The cultivation of the corn should always be deep at first—corn plants are tender and the farmer is rather afraid of them, he feels about the young corn stalk as a bachelor does about his uncle's babies,—he is afraid that they will go to pieces with handling.

Flat culture gives us the same yield as when moulded up, and leaves the ground in a better state for the next crop. It is difficult to find a paper so comprehensive and yet so concise on corn cultivation as Rev. Mr. Charest's. It thoroughly covers the ground.

A VOICE: What is the best kind of corn to plant?

REV. MR. CHAREST: Red Cob.

HON. MR. BEAUBIEN: I did not see Father Charest's crop—he saw mine—mine was Mammoth southern white—you have sowed Canadian corn, which was the best of the two.

MR. CHAREST: I saw yours, only a couple of acres away.

(1) The smut germs may be in the field from a previous crop.—ED. A. B.

HON. MR. BEAUBIEN: That is a very important question, and I put it to the meeting that we should know which is the best corn to sow. We know how to sow and take care of it, and we want the corn that grows best and ripens. I bought corn under Mr. Macpherson's directions and I found it answered the purpose splendidly—we cut the crop on the first frosts, that was on the twenty-first or twenty-second of September, as soon as the top leaves were beginning to be frost bitten, it would grow to the first of January if you gave it a chance, but we are not allowed by natural law to give it that chance.

The first point I have to decide is, which is the best seed, the best kind of corn, and then there is another point I would put before the meeting and on which I disagree with Prof. Robertson. I say that we must ensilage the corn when it is fresh and wet, because we want the corn to heat in the silo. If it does not, the corn will sour and make bad milk. If we ensilage the corn too dry, we have to wait two or three days which is a big loss, you have a gang of men at work who have to stop for two or three days, and if you do not allow the corn to heat, you will not have sweet ensilage; let us have an understanding and regulate the laws of nature on this matter. My experience is this, I have ensilaged the corn when it was dripping wet, in fact it was raining all day, and in twelve hours it had heated enough for us to put another coat on; we put about three and a half to four feet each time. We had three silos and then we went to the second, and then to the third, and sometimes when the corn was dry, when we got back to the first silo we could not work, we had to stop or have sour ensilage corn, corn that had not heated in the silo. The great draw-back with beginners is that they get sour ensilage which spoils the milk, spoils the trade and spoils the silo business which we want to introduce. That is the principal point, gentlemen, and I think that is the one we should regulate first. Must the ensilage heat and to what degree? and must we store the corn moist or dry? My opinion is that it should be stored wet, and when it is not wet, it must be sprinkled with water so as it will get the proper temperature to give us sweet ensilage.

A VOICE: What is the proper temperature?

HON. MR. BEAUBIEN: One hundred and twenty-five to one hundred and thirty, or as high as one hundred and fifty degrees. When I say heat I mean fermentation.

A VOICE: I understand the Hon. Mr. Baaubien to say that the corn had been frost bitten and of course it needed wetting?

HON. MR. BEAUBIEN: That was in the infancy of the art, we have improved since then.

THE PRESIDENT: Prof. Robertson named Thoroughbred white flint as doing

best at Ottawa. Mr. Charest says Red Cob, both are good sorts. I think there are a dozen kinds of corn that would pay any body to grow. One season is best suited for one sort, and another season for another kind, and so, unless before hand you know what kind of a season you are going to have, it is pretty hard to tell what variety of corn to sow. 1891 was a good year for corn, many varieties matured last year that did not the previous year (1).

MR. GARTH: Can we grow as much sugar corn per acre as the other and will it not make a better feed for milk and beef?

PROF. ROBERTSON: In growing corn I grow the kind that will give the largest weight per acre and reach the glazing stage; and analysis does not show that there is more substance in sweet corn than in other kinds. The corn that will come to the glazing stage is in the best condition for feeding. I would suggest we have another paper.

HON. MR. BEAUBIEN: I have not got an answer yet.

PROF. ROBERTSON: In the matter of wilting corn I quite agree with the position Mr. Beaubien takes that corn put in the silo "too dry" will not make good ensilage, will not heat; but "too dry" to my mind, is less than sixty five pounds to every hundred pounds of corn. If I put my corn in dryer than that, it will not heat quickly but will be of an inferior quality. If I put my corn in with from 65 to 70 pounds of water to one hundred pounds of corn, it heats quickly, makes better ensilage and there is a better aroma from fermentation—a delightful aroma which I cannot dispense with; it does not add to its weight or color—but as in coffee, it adds to its value. Near Montreal, if you get the corn more nearly ripe, it does not require so much wilting. A great many things are more green in Ottawa than they are in Montreal.

M. Garth reads the following paper on

CUTTING THE CORN AND FILLING THE SILO.

Having been asked at one of our meetings in town to write a short paper for this convention, on the filling of the silo, I consented to tell what I have done during my five years' experience with ensilage. If you will now follow me to the field where the corn is standing in proper condition for cutting, that is, with the ears well formed, in fact I may say as near maturity as possible without being dead ripe, we will start cutting. I have always used my reaping machine to cut the corn, taking only one row at a time, the rows being thirty inches apart. I cut up one side of the field and down the other and have a

(1) As the quality of ensilage depends so much on the proper glazing of the corn, it is safer to sow none which cannot reach the glazing stage in ordinary seasons.—ED. A. B.

sufficient number of men on each side to gather up the corn stalks and put them in handy armfuls, crosswise to and out of the track of the reaper. I generally let the corn stalks lie for twenty-four hours to dry, thinking it unnecessary to cart more water into the silo than is needed to generate sufficient heat. There is an exception to this in the case of those who grow corn and sell the ears to the canning factory. The stalks getting very dry in this case, the addition of water to the cut corn in the silo would be advantageous. We will now start loading. The best vehicle for this purpose is a waggon with as smooth a platform as possible, on which a rope twice the length of the platform is laid, one end being fastened to the back and then drawn forward and coiled on the pole of the waggon. When finished loading, bring the rope back over the load and fasten behind; this will help to steady the corn. On arriving at the cutter, fasten, and if you have a hook on the upper rope, hook it to something conveniently near the cutter; you then start the horses, when the load of corn stalks will be immediately discharged. If you have the cutter on a level with the bottom of the silo, an elevator connected with the machine will be necessary.

A large assortment of cutters are now made. I prefer those that have a good long cutting knife, they being easier to sharpen and remaining longer sharp. In buying one of these cutters, see that the knives are well fastened to the arms of the wheel, as I have seen them with too few bolts, causing the knives to bend and thereby not cutting clean. Another fault with some machines is that green and soft corn stalks get jammed in the feeding wheels, necessitating the stoppage of the machinery and great loss of time. For those who have the cutter on top of the silo, and who wish to elevate the whole corn stalks, a very simple elevator can be made with an old horse power, the chains being lengthened, light wooden slats bolted on instead of the treads and the large driving wheel being connected with the power driving the cutter. This elevator runs slowly and takes very little power. I have had one, made by myself, running four years without needing any repairs. We are now elevating and cutting the corn into three-quarter lengths. This I find the best length; as when cut shorter it is apt to hurt the mouths of the cattle, unless very soft. As the corn falls into the silo, I would strongly advise keeping a man inside to spread and tramp the edges and especially the corners. Too much care cannot be taken with this work, the centre you need not mind, as it always seems to pack with its own weight and I suppose the extra heat in the centre helps it; I may say here, that the finest ensilage that I have seen this year in the silos inspected by me, in the County of Hochelaga for the awarding of prizes, was tramped down by a horse.

When there is about two feet of corn in the silo it should be left for a day to

generate heat to about 125° Far. Without this the ensilage is not so good and you will not get nearly so much corn in the silo. A good plan is to have the silo divided into two parts, filling into one-half each day. It is not absolutely necessary to fill every second day; you can safely leave the corn a day or two longer if you are pressed for time. When the silo is filled, leave it twenty-four hours; then cover with boards, planks, pickets or anything else that is handy. As regards weighting the ensilage, there has been a great deal of controversy. Some contend that it does not need weighting. I myself have tried both ways and prefer a moderate amount of weight, especially around edges and corners, as I find that there is less loss. Of course, if you intend to start using the ensilage immediately, there is no need of any covering. On opening the silo I prefer taking my supply of ensilage from the top, taking a thin layer every day. A few days' feeding will show you what thickness to take. About filling silo with whole corn I have had no experience. Clover and buckwheat I have put in; the clover spoilt, (1) but the buckwheat was very good.

I would in closing like to tell you of a very useful silo I saw this winter. It belongs to Mr. McGibbon of Mount Royal Park. It was filled with what we might call waste material, that is, cuttings last autumn of natural grass, etc., around the Park. It made excellent ensilage, which I saw eaten greedily by cows and ponies. This grass is cut so late in the autumn that it was seldom possible to cure it (2). This experiment shows clearly the use of the silo.

PROF. ROBERTSON: I would like to know how the clover spoiled, what it consisted in?

MR. GARTH: I put about two feet of buckwheat on the bottom of the silo, one and a half feet of clover and twenty feet of corn, and when I got to the clover, the cattle would not touch it, it was black and dirty stuff, the clover they would not take.

PROF. ROBERTSON: How long had the clover been in before the corn?

MR. GARTH: Just a day, just long enough to get the heat.

MR. BARNARD: Was it second crop clover?

MR. GARTH: Yes.

MR. BARNARD: In what state was the buckwheat?

MR. GARTH: It would have been frozen, if left on the field, and it was put in quite green, about half the grain was fully formed.

MR. BARNARD: Was the clover cut into chaff when put in?

(1) Clover will spoil if not fully tramped down. It would be best if cut fine like corn. It would then press down in safety.—ED. A. B.

(2) This grass is naturely tough and wiry and was much softened and improved by the fermentation of the silo.—ED. A. B.

MR. GARTH: No, it was short clover.

MR. BARNARD: The buckwheat was long?

MR. GARTH: Yes, a heavy crop.

MR. BARNARD: Did you tramp it down at all?

MR. GARTH: Yes, I always tramp it.

MR. FISHER: I would like to say with regard to the last paper, that when I began drawing corn from the field, I tried the experiment of a waggon as he does; but after a couple of years, I found it more convenient to take two waggons with one team, I would draw it to the cutter and leave it there, taking off the waggon by means of a rope, and the team would then return to the field and get the other waggon load so that the man at the feeding machine was kept constantly at work, I find a waggon known as the "Farm Truck," which I got last year in Chatham, Ontario, is the best and most handy waggon I ever drew corn on, it is a truck like the Grand Trunk have here, but lighter; I find it a very useful waggon for all other purposes, but especially for carrying corn from the field; the wheels have a wide tire, I think it is a very good waggon. I have drawn two tons weighed on the scales all day long for a week at a time.

THE PRESIDENT: Did you use one rope or two when you drew it off?

MR. GARTH: A double rope looped should be used.

THE PRESIDENT: If you use two ropes within a foot of the sides of your waggon, you would draw your corn off as straight as it lay on the floor of the waggon—but if you had one rope in the middle it would be next to impossible to draw off straight.

MR. FISHER: I found I could not, it is very difficult to draw it out of that heap of corn, put it on the machine and keep the machine properly fed.

A VOICE: I found it easier to take it off with a double rope.

THE PRESIDENT: Mr. Dawes you think a Scotch cart most economical?

MR. A. J. DAWES: Yes, we have five carts and two men cutting, with a boy on a Scotch cart, they go down to the machine and the men catch it and put it in and we cut fifty tons a day and draw it in five carts with our machine.

MR. BARNARD: How much will a Scotch cart draw?

MR. DAWES: I do not know, I am sure.

MR. BARNARD: Not a ton?

MR DAWES: No.

HON. MR. BEAUBIEN: I have always used a Scotch cart and there is nothing handier than that. We put perhaps a little less than a ton. It is dumped almost standing, it falls just as straight as when it was on the cart itself.

MR. GARTH: We have not as many men as Mr. Dawes or the Honorable Mr. Beaubien, and if the corn is far from the silo we want a cart to take as

much as possible, what suits one man would not suit another probably, every man likes his own wife best.

MR. CURRY: I would like to say it is a matter of very small importance, if you grow the corn, it is easy to bring it in—what I want to impress on you is to deal with what will apply to the poor farmer. It is more than eight years ago since I went to Stanstead to see how to adapt it to the poor man's wants and since that time I have been doing what I could to get a cheap Silo and a cheap cutter, because these are the things a poor man wants. We purchased for forty dollars an old horse power and a cutter and spent three dollars getting it in working order, we made a carrier which cost some ten or twelve dollars and put a chain, such as a dog chain, only larger, and a large wheel to drive the carrier, the whole money cost of filling the silo, including horse power, cutter and carrier, was sixty-seven dollars and this machine was rigged up and cut as fast as a steam engine, we cut a ton in less than half an hour.

The Secretary Treasurer of the Association, Mr. C. D. Tylee, reads a paper on the

CONSTRUCTION OF THE SILO.

I feel it would have been more in your interests if the committee had selected some one with more experience than myself to prepare a paper on this subject, as I think that upon the proper construction of the silo rests to a great extent either the success or failure of your ensilage. To those who have silos of their own, this paper will be of but little interest, but I must ask their forbearance while we try to give a few points and perhaps a little help and encouragement to those who are not so fortunate and are still doubtful, by showing them that expensive structures are not necessary and that where a portion of the barn can be used, a separate building is not needed. There is one thing I would like you to impress upon your friends who are still hesitating on account of cost—that a silo is the same as a house, as far as cost is concerned. Suppose some rich man moves into your section and builds a house that will cost thousands of dollars, it does not follow that it will be warmer or more conveniently arranged or healthier than an ordinary farm house which has not cost one-tenth of the money. So it is with the silo, my friends.

Perhaps there are some here to-day who have heard of silo and ensilage and do not clearly understand what a silo is and have come here hoping to get a little information. So for their benefit, I would say that a silo is simply an air-tight building, box, tank, compartment, trench or pit, into which fodders in a succulent state are put for preservation and curing. When this system of preserving green fodders on a large scale was first introduced, it was supposed that expensive masonry receptacles were necessary, and this to a great extent retarded its general introduction. It has been demonstrated beyond dispute that the

cheap wooden silo will keep the ensilage just as well and in many cases better than the most expensive stone one that can be built, so that now this cheap way of preserving green fodders is so rapidly coming into general use, before we are many years older the silo will be found on every well managed farm. I think the only definite rule as to location that need be given is to place it so that the contents can be fed to the animals with as little labor as possible. If its door can be at the end of the feeding alley, so much the better. By all means place it in the barn or stable if possible, for when placed there, the expense of outside siding and roof will be saved, which will reduce the cost about one-half.

The size must depend upon the number of animals to be fed. It is always better to build the silo a little on the large side, as it is possible that on opening it a small portion may be found worthless, although there is no reason why this should happen if ordinary care is exercised in filling. It is now pretty well agreed that two tons of ensilage has a feeding value equal to one ton of good hay, so if we assume that a cow will eat 2½ tons of hay during the winter, we ought to store up for her benefit 5 tons of ensilage. Fifty cubic feet is about the space occupied by a ton of ensilage, therefore in calculating the size of our silo, we should allow at least 250 cubic feet for each animal. A silo to contain 100 tons might be 15 by 15 by 23ft. Extra space is necessary, as it is impossible to fill a silo so as to have it perfectly full when it has finished settling. The shape of the silo does not matter. It can be either square or oblong; the square one will take less lumber, but is not so good as the oblong. For some time it was thought that the silo should not be more than 22 feet deep, but now silos 40 feet deep turn out as good ensilage as those 20 feet or less. When the silo is a building by itself, a stone foundation is necessary, and it is strongly recommended, as it greatly helps to preserve the sills. Any kind of sound lumber will do; it is not necessary to have it either planed or grooved and tongued, though many claim it is best to have this done, and as the difference in price is not much, to use matched lumber will not add greatly to the cost.

The sills can be made of dimension timber, 8 by 8, notched and firmly bolted together at the corners, or some such lumber as you will use for the studs; 2 by 10 to 2 by 12 will answer for this work. Use three or four layers; they should be cross lapped at the corners and all well spiked together. Now make an ordinary balloon frame. The studs should be 2 by 10 or 2 by 12 and not more than two feet apart from centre to centre. If the silo is very large or very high they can be placed closer. In my silo, which is a small one, I have them 22 inches apart. These can be mortised into the sills and plates, but the easiest way is to notch them so that the ends can pass down in the inside of the sills and then to nail them. You must remember that there is great lateral pressure

and that the least give in any portion of the silo may cause a crack to open and let in the air which will spoil a portion of the ensilage, so it is always best to err (if error it is) on the right side and make your work extra strong. The plates need not be quite so heavy as the sills, but see that they are well bolted or spiked together at the corners to prevent them opening.

I would strongly recommend the studs to be so placed that those at the corners will be close together, so that the boards of the first lining can alternately cross each other at the corners and be nailed to two studs; this will prevent the corners from opening. I built mine that way, four years ago, and it has never moved. (See engraving in the appendix.—Ed A. B.)

The siding boards should be good sound lumber one inch thick and all the same width if possible. Both linings should be put on horizontally. When the first lining is all on, tack a piece of tar paper. I put two thicknesses at the corners and lapped the edges four inches. In commencing the second lining it is best to start with a narrow board so as to break the joints in the first lining. See that the corners are fitted true and the walls are perpendicular; if they are not, the ensilage will not settle evenly. A 10 or 12 inch board with the edges bevelled should be set in the corners and the space behind filled either with saw dust or sand well packed down. As you will fill the silo over the top, you will only want a door to empty it by and the easiest way to make it is to saw out the double lining between two studs almost from top to bottom and make the pieces so that they can be put back in their own places. Nail a batten on each of these studs to make a check to nail these pieces on while the silo is being filled and tack a piece of tar paper on from top to bottom on the inside so as to cover the door. It will not hurt the ensilage. These boards are easily taken out as the silo is emptied and can be put to one side for use again another year. If an outside door is thought necessary, it can be made in sections to open on hinges and placed at the other edge of the studs, but it is not necessary.

Many have deemed it best to paint the inside of the silo to preserve the wood. Crude petroleum is about as cheap as anything that can be used for this purpose and it does not affect the ensilage as coal tar and other mixtures are apt to do. Where the silo is large it is best to put in a division; this should be almost as strong as the sides. You may be told you can make the division of double boards with tar paper between, which will be strong enough if you fill the two sides on alternate days and that after the ensilage has once settled, the lateral pressure will cease, so that you can safely empty one side without harming the other. I put my division in that way and when I had one side about three-quarters empty I noticed the division bulging and had to shove it up, but I did not notice it in time to prevent some of the ensilage on the other side

being spoilt. I tried it again another year with the same result, so I took it out. Hence my reason for advising the division to be made good and strong. A good clay floor will answer all purposes, but if you are troubled with rats about your buildings, use cement (1).

Now if you build your silo as a separate building, you can make the inside part just as I have endeavored to describe and finish the outside as you would an ordinary building. By using the truss pattern roof you will do away with the need of tie pieces which you would find in your way when filling and covering. Place a large door or window in one of the gables to fill by. Now as to cost that will depend greatly on what you have to pay for the lumber and if you are handy with tools you need not hire a carpenter. The larger the silo, the less it will cost per ton capacity. But in any case, if the silo is made in a barn or stable, it ought not to cost over one dollar per ton. I have seen it stated that they have been built for fifty cents per ton, and I think you will agree with me that even one dollar per ton is very little when compared with the cost of a hay barn of equal capacity.

MR. MACPHERSON: I would like to throw out a suggestion in connection with this excellent paper. I am sure it has given great satisfaction. There is one objection to the wooden silo, that is it is short lived and liable to rot, and to prevent this rotting is quite an important factor. What causes the rot in the wooden silo is damp air both inside and between the lining, just the same as any other building where damp air is confined—it will cause rot in the wood and decay very quickly—How to remedy this evil is to make appertures or holes in the bottom of the silo through and through so the partitions will dry in the spring and also the inside of the silo. A very good plan is to take out the bottom part on the outside to allow a current of air through the partition, then a small door opening into the side, or a few other holes so that the air can get in and dry it inside. Without this precaution a wooden silo will rot in a few years. I think it is a very important suggestion, all who intend to build silos and those who have them built should do this to allow this damp air to pass away and the silo will last a good deal longer.

MR. TYLEE: Are you speaking of separate silos or of a silo in a barn?

MR. MACPHERSON: Both. If you do not put back your door, there is nothing at the top, it is open into the main barn and there is a current of air completely round your side. A silo in a barn is like in a box, it has no connection with the walls of the barn.

(1) Cement will decompose with the acid of ensilage. Try a coat of coal tar, shortly before laying in the ensilage and cover up with dry earth. The rats avoid such places ED. A. B.

What I mean is where confined air is kept between two linings, it will decay the wood in a few years. Where the bottom of the silo stands below the floor six or eight feet, the confined air will cause decay and destroy the usefulness of the silo.

MR. BARNARD: I saw a report from the state of Wisconsin where they have pushed ensilage very much and where they know most about it probably. They reported on the lasting qualities of the silo and the report is unfavorable to wooden silos on account of want of air from the bottom. We cannot expect air to go from the top and create a current which may dry the lower timbers.

MR. BENNY: If the linings are coated with petroleum, that would prevent any dampness getting into the ensilage. I coated mine with petroleum and it did not swell in the least.

MR. BRODIE: What about rats?

MR. BARNARD: Rats do not like tar at all; if you wash the bottom of the silo with coal tar and mix this with the earth surrounding the silo, some few days before you put in your ensilage, the rats will not go through the coal tar and earth, and if you do it from the outside as well as from the inside for several feet, it is a sure cure for rats as far as the experience of the United States goes.

A VOICE: Supposing I want to build a silo in my barn, would the steam from the barn injure the ensilage?

MR. BARNARD: I think the only safe way is to cover up your silo on the top when you are opening it up. We put six or seven inches of black muck dry is the best. As we remove the boards covering the ensilage, we place boards and earth over the square of the silo. Thus the opened silo forms a closed box, and in this case there is no steam reaching the rafters of the barn, etc. Rotting is to be feared when there is heat, I never heard of rotting without heat. Rotting comes from heat and an accumulation of moisture. If the silo remains opened, the moisture from the ensilage covers the boards of the barn and in that cold state during winter there is no danger, but the moment the hot weather comes, that combined moisture without a current of air to dry it of, brings on the rot. If you wish to prevent that, keep the moisture in the silo during the winter; then there is no danger, because there is no heat. The moment your silo is empty, dry it by an opening in the bottom as soon as you can make it.

MR. FISHER: I have a silo made of hemlock boards without any preparation of any kind; I have tried them over and over again the last two months and I cannot find any symptoms of rot. As a matter of fact, your silos are wet only twice a year: when you put the ensilage in and when you take it out—you will find very little lumber about your barn or buildings which is not wet once a year. I have another silo which is painted on the inside with crude petro-

leum but it has only been four times filled and emptied and there is no sign of rot. When I finished emptying my silo it was like anything else in the barn, the air goes through and all around it all the time.

MR. BARNARD: Have you a door which leads down to the bottom of the silo.

MR. FISHER: No I have a shute from which there are a lot of little doors.

MR. BARNARD: Have you a door at the bottom?

MR. FISHER: The bottom door is about two and a half feet to three feet from the bottom. In the winter time, when I fill my silo when I thresh, I put scaffolding and cover it with straw, the silo is a little warmer than the air in the other part of the barn. I think that is a good plan and makes it more comfortable to go in the silo to throw the ensilage out and work in it, also I think it prevents cold air coming in contact with the ensilage which is slightly warm all winter. I do not think you need take very much trouble beyond what you have to take in any ordinary building with regard to rotting. I have no hesitation in saying a wooden silo is as good as a stone or cement one.

MR. MACPHERSON: I might say that I had one in my section which was used for two years, and there was quite an apparent sign of decay in the wood which was easily traceable to the confined damp air.

A VOICE: But that was not coated with petroleum?

MR. MACPHERSON: No.

A VOICE: I think the idea of ventilating between the inside and outside boards a good one, if that is done I think there is no danger of rot, but if not I think there would be very great danger.

THE PRESIDENT: Of course that plan looks reasonable, but when you get facts like what Mr. Fisher gives us, we consider them.

MR. FISHER: My silo is not built in the way described; it is built inside the barn and is simply a bin inside the barn—there is an abundant current of air between the walls of the barn and the walls of my silo and of course inside there is not two thicknesses of wall with a dead air space between, if there was I could understand you should ventilate that dead air space. A silo built inside the barn does not require that. I use common hemlock boards costing five dollars a thousand.

MR. BARNARD: Hemlock has the reputation of not rotting like spruce.

MR. FISHER: Not so quickly.

THE PRESIDENT: Has it been decided whether it is necessary or not to cover the ensilage when the silo is filled up?

A VOICE: I would not like to say it has been settled.

MR. BARNARD: It has not been settled here.

THE PRESIDENT: Had not we better finish this discussion by having a few remarks on that point and the rotting of the wood from professor Robertson.

PROF. ROBERTSON: Some three years ago, I had a silo built with four different sides, one side inside was lined with two ply lumber with tar paper, both plies of lumber tongued and grooved, the second side was lined with two ply lumber with tar paper not tongued and groved, the third side had one ply of lumber tongued and grooved and the other side had one ply lumber neither tongued nor grooved. That was at the Guelph College. I went there two weeks ago to get information for this meeting. I found one side of the silo with one ply lumber tongued and grooved had kept the ensilage equally well and it only costs about half the money. So in building a silo I would only use one ply of lumber tongued and grooved and no tar paper. In that same silo I painted sections with tar and crude petroleum and left parts without it. In three years time I found no difference, and I tried it with my pen knife. In the meantime I am quite satisfied to recommend this officially, one ply of lumber tongued and grooved, the preservation of the silo is in favor of one ply of lumber tongued and grooved.

MR. FISHER: I can corroborate what Prof. Robertson says with regard to the boards being put on horizontably. I find mouldy ensilage sticking to every crack in the silo, where the boards are put on up and down and I would therefore recommend the boards horizontal and the joists perpendicular.

THE PRESIDENT: What would you put on the top of your ensilage?

MR. FISHER: I covered it merely with straw without tramping.

MR. ROBERTSON: I had a neighbor who went to the other extreme, he tramped it very thoroughly for a day or two, then he put on a ply of tar paper and a ply of boards as carefully as possible and about a ton or more of stone and he has not lost anything.

THE PRESIDEET: It seems to me that when the straw is worth about three or four dollars a ton, and corn half that, that it would be cheaper to loose a foot of corn than use straw.

MR. BARNARD: I think this is a very important question. If the principle of preservation is to keep the ensilage away from the air, we cannot allow the air on top any more than on the sides or at the bottom. Ensilage is nothing new, it is many centuries old. In France and Germany, they have ensilaged the pulp of beets—you know beets when pulped will not keep long in the air, and they have kept them for five years, but they tramped it down and covered it with earth six inches deep; a few inches will do, provided it does not get wet from the outside.

MR. MACPHERSON: I might say that I have tried several ways to preserve

the corn on top. I find it is necessary to tramp the corn on the top of the silo after filling it, two or three times daily for several days. The best way is to throw back a little of the surface corn, lay a covering of tar paper, then throw back about two inches of corn on top of the tar paper, I find that the most economical way, otherwise the corners get mouldy and considerable is lost, but with tar paper and very little trouble it preserves the silo.

MR. BARNARD is called upon to speak on

"CLOVER & OTHER CROPS SUITABLE FOR ENSILAGE."

The subject which has been given to me is "Clover and other crops for Ensilage." I am sorry I had so little time to prepare for it. I shall be short, I hope, and merely touch on the most important points.

First of all what is ensilage?

Ensilage is preserved, fermented food. Crops for ensilage must be of course of that nature which will give the best of food, in the best combination. We have not perhaps heard so far, except through Prof. Robertson, as a side issue, what proportions of the varieties of food are needed to obtain the desired object, either in flesh or fat or milk.

Prof. Robertson has told you that with large animals he has found them to require a larger proportion of heat forming food, and recommended to fill up these animals partially, to a great extent in fact, with carbonaceous or heat producing food, and that is perfectly right. Only, if the subject had been brought to that point, he would have told you that in order to obtain milk or labor, flesh or fat, animals required besides this carbonaceous food, which, as he very properly puts it, is only used for the heating of the machine; they require the nitrogeneous food which is essentially flesh forming food. But it is not only a flesh forming food: it can be transformed, when needed, into heat or into fat forming food, in a proportion which does not vary, provided it be digestible. So, nitrogenous food may replace any or all of the elements which the animal requires, according to the nature of the food which is given them. I would like to hear Prof. Robertson more on this subject. This is a most important factor when we consider the other kinds of food besides corn for ensilage, for corn even at its best is not a complete food, and I believe Prof. Robertson and those who have made a study of it will support me here. In fact, all those who are thoroughly posted on that subject, from experiments of long duration, know that corn is not a complete food, therefore if we can obtain from clover or other rough crops a food which contains the proper elements for the production of milk, or fat, or meat, then such crops become equally important with corn for ensilage. At all events, they can supply an abundance of complete food to put

into our silos. You all know, gentlemen, that corn requires heavy manuring. You are mostly from Montreal and you have plenty of manure from this city. But a good many here come from a distance and they know that unless they produce the manure themselves at a profit, they cannot get it from elsewhere, therefore it is very important for them to know which is the ensilage food that will cost them the least in manure and that is important for those portions of the country where the soil or climate is not entirely fitted for a heavy crop of grain or corn.

As to clover ensilage, it has been stated that some has rotted; but the explanation given shows it was not a complete experiment, a small quantity only having been ensiled, and that between some green buckwheat and a mass of corn ensilage.

The first instance of clover ensilage we hear of goes back many centuries, in Germany where a kind of food was put in green in pits and was called brown hay. This was nothing else than green clover, put in an earthen pit, well pressed down and covered with earth. This brown hay was generally made outside; it was covered up with earth only, and no wooden covering, because in Germany as in France building lumber is expensive. If the year was dry, the brown hay was delicious, completely favorable; if wet it would rot and nobody could say exactly why. The reason was probably that rain water went through the earth, got mixed with the fermented hay and rotted it. When this brown hay was prepared properly, animals could be fattened on it and cows would produce a large abundance of milk or beef, with very little, if any, other kind of food. It is also a fact that in England clover has been and is still considered the best kind of hay. In this country we do not all admit that. Why? Because in Europe, especially in England, the clover is stacked in a particular manner, it is stacked at the green state, not like ensilage, but too green to put inside of the barn, where it might heat and burn. It is stacked with very great care, at a certain degree of moisture, and what is needed to obtain the best of clover is that the stack will actually appear in the morning shortly after being finished, as if there was a fire in it, covered with smoke, so that the talent of the English farmer is to bring his clover in that state where it cannot ferment excessively. It becomes a brown hay, very much like the brown hay pitted in Germany, which used to be covered up with earth.

Let us then take in this point, that clover is a complete food, whilst corn even at its best, is not. Therefore well prepared clover ensilage is of that nature which animals can get fat and produce milk on it alone. It follows that if we can combine clover ensilage with corn ensilage, we will improve the corn ensilage greatly and we shall have less of the grain food, or substitutes for grain food to purchase. Besides corn ensilage, we can in fact ensile any crop which will press

down into the silo and leave no air spaces, for air is the great enemy of ensilage. We were shown here a jar of ensilage which I am told was filled five years ago. It is very nice and green, and still it could not be put there with the same advantage as if the silo had been a large one. It proves that ensilage put in an air tight vessel, pressed down as well as could be, and then covered up tight, can be preserved for five years or more.

If we take up any kind of roughage from the farm which is food for animals, even the coarsest of green fodder, as long as it is not poisonous, if we put it in the silo, it ferments, the fibrous matter is thereby softened and is transformed in a chimical way, and we obtain an ensilage very much of this kind here. This roughage off a farm may be mountain grass, water meadow hay, wire grass growing on ditches, etc., etc.

(At this point, Mr. Barnard shows a sample of ensilage made of tough mountain grass which animals would have refused to eat in the shape of hay. It was put into the silo, by Mr. McGibbon, the Montreal Mountain Park director and alluded to in Mr. Garth's paper.)

If this had been put in the barn as hay, the cattle would have spurned it, whilst as ensilage I am told ponies and cattle on the farm are eating it without waste, and do well on it.

Unfortunately, gentlemen, I have not brought with me some posters like those Professor Robertson has shown you, exemplifying points which it would be important to discuss on this very question of economy in the food which is needed for our animals. They will be useful, as I could have shown in a clearer manner by them the proportion of food required to produce milk or beef, and how the different varieties of clover and the various rough crops on the farm could be turned into good food by ensilage.

I hope to have these posters in the morning, when if the Chairman will allow me a few moments I can then complete my paper of this afternoon.

As to clover in the silo, let us not forget that we cannot expect clover, especially when it has passed the flowering stage, to remain green and come out green from the silo. As long as it is sweet, and the cattle will eat it, and give us good milk and butter from it, that is all we can expect. The color is of less consequence, it will be brown, but it need not have a mouldy smell.

It seems to be admitted that, unless we have a large silo and unless we pack it in very thoroughly, the long clover ensilage will not be as nice and as complete a food as if the clover had been cut in advance with a straw cutter. However, if it is packed closely and heavily in a large silo and put in with not less than one hundred and thirty degrees of heat, we can with such care do without the straw cutter.

Now, gentlemen, very often we accuse clover of being mouldy and we allow it to get mouldy on the field; we wait too long and it is beaten down by the rain, when it becomes rotten and is not fit for animals. However, even at this stage it will improve in the silo.

Now, gentlemen, I will not extend my remarks any further as to putting the roughage of the farm into ensilage—there is one precaution to take with that roughage, it must be solid, whatever it is. If the plant be hollow, to a considerable extent, it cannot be packed so in the silo that it may not spoil to some degree. Oat straw when dry, or nearly ripe, would be like a pipe stem, empty inside. Any plant which is not solid will have a reserve of air inside and you cannot drive it out by packing, therefore, it will make poor ensilage.

Whenever you wish to use a rough plant at any time for ensilage, the rule is first of all to see that it is not poisonous, and second to see that it is solid, with no air remaining inside the plant. If you cut such rough fodders in a greener state, there is no danger, unless for coarse water plants which may be destroyed in the root when cut too green. No plant should be hollow enough to have considerable air in it, after tramping in the silo.

Clover ensilage will be a complete food while the best of corn will always be incomplete. I mean by incomplete food, one which you have to give in a very large superabundance, in order to get a satisfactory result. It is very much like a man having to carry money some hundred miles and carry it himself; if he takes it in bank notes, he has not much to carry; if it is in gold, it will be heavy, if in silver it will be still heavier, and if in copper it will overload him. This is not even an exact comparison, because the whole difference in this case is in the weight. I mean to say this, that in order to obtain a sufficient amount of nitrogeneous food in corn, you have to feed your animals more than twice as much in weight as if you fed them in clover. One hundred pounds of clover will go as far as two hundred pounds of corn or more of the best corn ensilage, as far as the indispensable nitrogeneous food is concerned, and supposing you want to feed nothing else but corn ensilage. This subject will be better explained to-morrow, when I shall have the charts to show you the exact proportions required for milk, beef, fat or strength, of the various food elements, viz: heat producers, flesh formers, and fat.

There is another subject, if the Chairman will allow me, I would say a few words on. We heard to-day of the advantages of ensilage; but, gentlemen, you can prepare any kind of dry food on your farm, and you can bring it back to a state equal to ensilage, without putting it in the silo, and I think this a very important matter, which is not in the programme.

Any kind of dry food in your barn can be brought back to the equal value

of ensilage by fermentation. What we want is to ferment that food so that it will have the right proportion of water and will heat and soften; in such case, the amount of food which is in the plant gets into a digestible and appetizing form, provided you prepare it.

The principle brought out by Prof. Robertson of drying the corn to a given extent in the field, before bringing it to the silo is all right. It is so much water left on the field which is not required. Any kind of food you can put in the silo must be brought back to the digestible form, because all that is not digestible in the food we give our animals is waste; it goes right through the animal into the dung heap, it is really no food, being undigestible, and is hurtful instead of being beneficial. It has to go through the system by the labor of the animals and that is costly to us and entirely useless as food, whilst if we cut up such rough indigestible food, if we mix it, wet it and heat it in some way, either through hot water or fermentation (hot water is better than cold fermentation, because such fermentation may go too far and cause disease). If the stables be cold, disease may be carried into the animal and do it harm, whereas if our stables are warm and you mix the food with a given quantity of water to bring it back to the proportion of grass, which contains about eighty per cent of water, and let the heat permeate the whole mass, which takes about 30 hours, you will find that all the food there, although not digestible in its dry form, will become digestible.

MR. FISHER: I have heard that for a number of years, Mr. Dawes has used clover ensilage and been very successful with it. I would ask him to give us his experience, because it is a subject that we are all interested in.

MR. DAWES: The second growth of clover, when I could not preserve it in hay, I put it in the silo and found it satisfactory. It is worth more than corn ensilage, if, for example, you put corn at the figure two, clover would be worth three; it is worth more than this in its heating value, it is a complete food; a cow will retain her flesh and give her full flow of milk on clover, when she will not do it on corn ensilage. I had none this year on account of the dry fall, I had only a bite for the cattle after the crop was in. In my twelve years experience of ensilage, I had five years of clover and had only partial failure one year, that is because I rushed it out of the cart into the silo and rolled it into place carelessly. Unless each cart load of clover is lifted from the field carefully and properly spread in the silo, it will roll into balls and these round balls cannot be packed together without leaving air spaces; there will be spots of mould; but if each forkful is shaken out with a common hand fork, the ensilage will do perfectly well as in a dry form.

MR. FISHER: Have you never put in the first crop of clover?

MR. DAWES: I never tried the first crop.

MR. FISHER: You never cut it up?

MR. DAWES: No.

MR. FISHER: Do you put it mixed with corn or in a separate silo?

MR. DAWES: Either by itself or on top of the corn.

MR. BARNARD: There is another article for ensilage which I did not mention; this is sweet corn, and if the Chairmain will allow me, I will just say one word.

We have a return here from our Provincial experimental station at St. Hyacinthe. The paper was handed me by our very good friend, Mr. J. Drummond.

The point I wish to make here is this. Ensilage corn has been experimented upon and analyzed by a great many chemists, and I hold in my hand an official return which is given in Europe as a standard. It shows the quantity of digestible food to be found in an average quality of ensilage. In every 1000 lbs of ensilage, the quantity of heat producing material will be 11%, the flesh formers would be 9-10ths of 1%, and of fat producing, material 4-10ths.

The following is a showing of what Mr. Drummond got from the stocks of the sweet corn the ears of which gave him fifty dollars an acre. The proportion of heat formers is 8.03 instead of 11, but heat formers are to be found in straw in large abundance and as valuable, if not given in excess. What is costly is the flesh formers and in the case of ensilage it is 9-10ths of 1% while in sweet corn it is nearly 1½%, so that the sweet corn gives us 50% more of the flesh formers which are a great deal more costly, about five times as costly to buy as the heat formers. Of fat formers there is nearly fifty per cent difference 4-10ths of 1% in corn ensilage, while in ensilage made from sweet corn we have six tenths of 1%. By selling sweet corn on the market and using the stalks for ensilage, you can make money both ways, if you are near enough to such market. However, I give this statement for what it is worth, as it does not say whether the food constituents are all digestible. Digestibility is in all cases the measure of utility in food.

MR. FISHER: I would like to say one word in corroboration of what Mr. Barnard said in regard to other plants than corn for ensilage. It was my good fortune to attend a Dairy Convention at St. Thomas de Montmagny. I know the good Scotch farmers of this part think they cannot learn much from the French Canadians below Quebec. Amongst other things brought up at that Dairy Convention, there was a number of samples of ensilage, a great many not of corn, but made from oats and tares, from clover, from wild hay and marsh hay found on the river banks and some of the very best ensilage I ever saw in

my life was amongst the ensilage I saw down there. The one that got the first place came from below Quebec from the County of Montmorency which was made from a mixture of oats and tares and put in the silo without being cut and it came out in first class condition, and I believe a more perfect food than any corn ensilage I ever saw, and if they can do it down there, there is no reason why those who do not wish to grow corn should not do it here.

They say they can grow as much of this highly nutritious food as they can of corn, certainly they showed a wonderful success in adapting it to ensilage.

I would like to say another word in regard to what Mr. Barnard said last, that is with regard to sweet corn for ensilage. It is evident from the analysis of Mr. Choquette that sweet corn ensilage, even after the bulk of the ears are taken off, is more valuable than the ensilage from ordinary corn. If you can get the double profit of $50 an acre, say $25 an acre, well that would pay for the ordinary growth of the crop and you get then, as Mr. Drummond says he got, 10 to 12 tons of ensilage such as in that jar, and seven tons of as good hay as you could buy on the market here. Just think, $50 an acre net returns and 7 tons of hay besides on your acre of land, there is nothing in farming that will pay like that; if you can do that, go ahead and do it. The people who are extravagant are those who do not follow such good example.

MR. PRESIDENT: I am very glad when I hear any one speak in favour of sweet corn.

HON. MR. BEAUBIEN, Commissioner of Agriculture and Colonization:

MR. PRESIDENT AND GENTLEMEN,—I know I have a duty to perform here to-day, but it is not the one of delivering a lecture or giving advice, or even bringing my experience here, because I know that I have got friends here who can do that, and have done it, far better than I can, but there is one duty I must perform and that is this, to come here and tell you that my heart and soul are with this enterprise in spreading information regarding ensilage throughout the country. That is my duty. It was my duty when I was an ordinary simple citizen, five years ago, but it is my duty now, because I am bound that the good practice should be spread as far as possible through this country.

Gentlemen, there is one thing I desire, one thing I propose to myself and that I shall propose to my friends, and that is to put a silo in every one of our Parishes in the Province of Quebec.

When once it has got hold of a locality, it is bound to spread, because it is beneficial. This is a gift of Providence. Mind, gentlemen, we are afflicted with a winter of six long months, and with the system of ensilage we have got it within the power of our intelligence and activity to prolong the pasture through

the winter and to feed our cattle in winter the same as we can do it in the summer, and as cheap.

Well, gentlemen, the old proverb says: "Help yourself and God will help you." We are bound to help ourselves with this system and those who have been benefitted by it, those who know how beneficial it is, it is their duty through charity and kindness to their neighbors to do all in their power to spread it through the country.

There is not the least doubt, gentlemen, that the great fault of our agriculture and a fact which every good farmer will remark throughout the country is the poor lean cattle we let loose in the pasture in the spring. If we let the cattle feed on the pasture, they will have a good beginning and when the calving time came, the cows would keep in good health and increase in weight. To-day what do we see in a great many localities? The cattle are not wintered as they should be, because the farmer has not got the means. But see, gentlemen, with this system of ensilage how economical farming becomes.

Suppose you want to drive it to its utmost application, you could say to a farmer, my good man have a piece of ground of sufficient extent to give you the corn to winter over your cattle, that is all I ask from you; then have a pasturage sufficient to keep them in good feed for the whole summer, what more do you want? Perhaps a field of oats just to furnish you the straw; perhaps a small patch of potatoes for the family. If a farmer has a good pasture and a good piece of ensilage ground, he goes through the year happy and his purse will never be empty.

Gentlemen, the fault with us is that we cannot winter our cattle, the winters are too long and the feed is too short as we provide it, whilst this system of ensilage not only gives us the food for the winter, but it induces us to find the food when the pasture is lacking it. It happens to me, and everybody that grows ensilage corn, when the pasture runs short and a field of ensilage corn is there,—that he goes and robs it—does he not go and cut some of it and give it to the cows which are failing in milk? The consequence is he has not only his field of corn for the summer, but very soon he has tares and other green food which he grows on his farm for the winter, so he sees his cattle well fed winter and summer.

This is the ensilage system and if it was not invented for us it should have been.

It was found in France forty years ago, and they do not need it one twentieth as much as we do in Canada, but you see it has come here to stay, and I call it a gift of Providence, and all of you, gentlemen, who are here, citizens of Montreal, you are really doing a work of charity, the greatest help that you

can bestow on your fellow farmers who are not as lucky as you are, being situated next to a market where you can sell your produce, but in far back localities the trouble is to have produce to take to market which will not cost much to take it there.

If you keep the cows in milk and keep making butter, winter and summer, as you can with the ensilage system, you can have your butter, you can have your cows to calf in the proper time, you can make your butter in the winter when it is selling at thirty-five and forty cents a pound.

If this system of ensilage were completely carried into effect, we could feed cattle in winter as well as in summer and make butter as well. You can see the difference, you get for your summer butter perhaps 15c. per lb., some distance from town, and instead of that you could send it down and get thirty-five cents a pound as winter butter.

Now, there is one thing I am proud of, and I must congratulate the President and his Directors and it is that this society is on its feet again.

You remember three years ago, we first got together at my place and I asked Mr. J. Drummond, and we made him our President. Next year, we had a meeting and we went through my silo, the first silo I built, and the year following, with the same President, we went to Mr. Garth's who was very kind indeed to us. The farmers who went there were addressed in French and English, and the number of silos have doubled since then. Last year, for what reason I do not know, nothing was done, but this year I am glad the society is started again.

It is one of the most important Societies, gentlemen, and I can promise you, Mr. President, that so far as I am concerned I will always look upon it as one the most important societies for agriculture in our district, on account of the great good and the great benefit it can do to the whole country.

For one reason or another, the City of Montreal is looked upon as the head quarters for the Province, the headquarters of the wealth and spirit of enterprise, the headquarters of farming on account of the success of the farmers here, and the headquarters because there is no doubt it is the part of the country which is the wealthiest, and you are bound to give an example to the whole country. What is done in Montreal has a great deal more influence in the country than what is done in other localities.

I am glad to see my Scotch farmers around me here to-day, but Frenchmen got ahead of them, all the same, with regard to ensilage.—They had it in France thirty years ago.

These papers will be printed and spread through the country, and if you go as an alien from this Province, on your return you will find one, two or three silos in each parish of the Country, and they will tell you they owe them to the report

of your meeting, and it will be a great reward to you. You know, Scotchmen, better than anybody else: you are bound to do something for yourselves, and the best thing you can do is to do the least work and get the most money, and if you want to simplify the work on the farm, you must have a silo; in fact it is the main thing to do in the Province of Quebec. Do you think you can compete with the North-west, when they have five or six millions of people? Do you think we can compete with them in raising grain, oats, barley or wheat? No, Gentlemen, we must give up altogether that part of farming: we will have to go into stock raising and butter and cheese making; we will have to follow the example of our Eastern Township people, and I am glad to have occasion to say before all these wealthy farmers, they give a name to our products, give a name to our cheese, and they got the first prize, and to-day they are paving the way for us, are creating a market for us, and it is by being middle men for the West that we will complete our success. We must leave the cultivation of cereals to the north-west.

There is one experience I can give my brother farmers. You have been talking of phosphates. I thought this winter we could manufacture supherphosphates in a very cheap manner. I met my friend Mr. Miller, who is the Agent of the Buckingham Phosphate Company—I bought from him apatite, that is 65% of phosphate rock, natural rock, that is phosphate without being treated with sulfuric acid. I bought it cheap (1), delivered in bags of two hundred pounds, it was ground in a very fine powder, we spread that on the floors of our barns under the cattle, even under the pigs and everywhere we could spread it, this was swept in with the manure, you understand all the acids of the urine during the winter came in contact with this appatite. When next summer we spread the manure before the plowing, that will be easily dissolved, it will be reduced, and we can call it then a kind of superphosphate. This is my first winters' experience, but I expect a great benefit from that. There is no doubt if we give time to the apatite to be dissolved, either in manure or land, we can derive as much benefit as if it were treated with sulphuric acid, and superphosphate is nothing else but the phosphate proper dissolved by the action of acid in the soil; but by putting this fine powder in contact with the urine of the manure I think we will have the superphosphate spread on the land at the same time as the manure (2).

(1) Ground apatite sells from $6.50 to $10 a ton, according to its contents in phosphate, viz. from 55 to 75 o/o of phosphate. We are now making experiments with it in connection with the JOURNAL OF AGRICULTURE, for future report.—ED. A. B.

(2) This problem of dissolving ground apatite without sulphuric acid is being studied by several chemists, in various parts of the world. So far, the concensus of opinion is against the practice, as a paying one.—ED. A. B.

If I can be of any service to you, gentlemen, by letting you visit my silos, it will be with the greatest pleasure that I will receive you there—my son is always there. I have three silos 24 feet deep, we fill them one after the other and I find that sometimes we are stopped in a very disagreable way. A whole gang of men are stopped, because the ensilage has not heated fast enough. We fill about four or five feet in one silo in the morning, in the afternoon we do the second one and the next morning the third one; and in the afternoon of the third day, we come back to the first, and if we do not find it has heated, we have to stop and very often we have to water the ensilage so as to lose as little time as possible. This is the reason I put the question to Prof. Robertson, asking him if he did not think that it was necessary that the ensilage should heat. It must ferment to 125° degrees of heat, for my ensilage was always sour until I adopted this system, and we may let it ferment to over one hundred and forty degrees. When I began using ensilage at first we could not drink the milk, it had such a strong taste; that was because the corn was not ripe, but last year was my fifth year's experience, the corn was three and a half feet apart; it was the southern mammoth white, it was ten or twelve feet on the average, the cobs were so large that we broke our machine several times in running them through the cutter, and we had to slacken the spring, so that the rollers of the cutter would be far enough apart to allow them to go through. All that was cut in discs or sections and when looking in the silo you would see these sections and you could tell at once how good that ensilage must be, because it is really a kind of grain, and that is the best time to cut the ensilage. You must have it when the cob is formed and when it is suitable to be eaten roasted in the ashes. When the cob is in that state it is the proper time with the mammoth southern. You can sow it on the fifteenth of May, I do not think it pays to sow it before, because the land is too cold before the fifteenth of May, near Montreal. If you want your corn not to rot in the ground, but come up fast, you must sow it when the weather is warm.

Well, now as to my practice in preparing the land, just in one word, gentlemen, we each have our experience and I think mine the best, because I follow it. We put the manure in the fall and plow in the fall, as deep as we can. In the spring we partly grub with a harrow, and if there are any stones we take them up and then we roll. Now you see we are going to sow on the flat, we have got a little machine which is drawn by two horses. Although it does not weigh much, the man wants to see the hills and go straight. That machine will sow the grain and the phosphate at the same time, make the furrow, deposit the seed four inches deep, and cover it over—we sow it three and a half feet apart, four feet would be better. Four or five days afterwards we pass the smoothing

harrow over it, that is just when you see those little green weeds getting kind of green on top, then you pass your smoothing harrow, go lengthways and cross-ways, without minding the corn at all; the teeth do not go down as far as the corn, the corn is four inches down and the smoothing harrows go in one and a half inch. You can get them made in Montreal, (1) it is a harrow with slanting teeth, instead of perpendicular or upright. It is drawn horizontally and it will destroy all these little weeds and will not touch the corn.

Four or five days afterwards, according to the state of the atmosphere, you do the same thing over again. The width of the harrow is nine feet and you go across twice and the second time do the same thing. When the corn is up about six inches, sometimes one or two stalks may be pulled up, but it does not do any damage. Now, you see gentlemen, the corn will cover its ground and I never put a hoe to my corn field, and there was not a single weed. All the old farmers know that as well as I do, lots of you have large fields of potatoes perfectly clean and never put a hoe through them. It is my practice before the roots of the corn are long, and in order that it should not lodge, to pass the cultivator between the rows of corn, if you put phosphate in, it will never lodge and it is far easier to cut because it is straight up. We cart on a scotch cart and seven stalks is all a man can take at one handling. He fills the scotch cart and when he gets to the machine, he dumps it on the ground, and when the horse starts, the corn remains on the ground just as it was on the cart.

I am very pleased to see my friend, Mr. Tylee, taking such an interest in this matter, he is such a persevering man and I advise you to keep him as long as you can as your Secretary. I advise you to settle where the meeting next winter will be; there is no reason why you should not go travelling and have your meetings in the Eastern Townships and other places.

THE PRESIDENT: We think it best to have our meetings in Montreal.

MR. BEAUBIEN: The Dairymen's Association move from place to place, and I find they do a great deal of good, and you might adopt that Society's practice, but the principal thing is that the Society should not be a winter without a meeting, because it is a lesson for the rest of the country, and we should have that lesson at least once a year.

Gentlemen, I do not think I should keep you any longer. Anything I can do for your Society, I will do with the greatest pleasure, I will do it because I think it the most important, with the dairymen's Association; so far as the farmers are concerned, these are the most important Societies, and I will do all

(1) By Rvd. Brother Charest. Deaf and Dumb Institute, Mile End,—ED. A. B.

I can for you except being eloquent, and that I cannot be, but all my best wishes are yours.

THE PRESIDENT: What is wanted to make this Society a success, are members. If we had a couple of hundred members, all men interested in the economic feeding of cattle, we would be a power in the land. I think the annual meeting should always be held in Montreal, and if we had a numerous membership, we could always have good meetings there. Mr. Beaubien tells us, Hochelaga is the leading agricultural county, but supposing it is, we want members to join this Association from all parts of Central Canada, and that all will come to Montreal once a year at least. If we do not have a strong membership, we will not have a strong Society, so I ask you to join our Society and make it strong and make it permanent.

About the good that may result from the ensilage system, the opinion to-day seems to be favorable. There have been two opinions. Perhaps we cannot grow cereals, as Mr. Beaubien has said, to compete with the North West, but, still if we have a proper and cheap way of feeding cattle and getting manure, I do not know but what we can compete. This puts me in mind of a story I once heard. An old man was driving a cow along the road and he met an English clergyman who asked him where he was going; he said he was going to the market. "What might you get for that cow" asked the clergyman. "Oh, I might get £8, or £8.10, if it is a good market". The clergyman said: "If you had that cow where I come from—I come from London—you might get fifteen pounds for it." Nae dout, nae dout, said the old man (and pointing to Lochlomond along the margin of which the road lay) "and may be, if you had that loch in a certain place we all have heard of, you might retail the water out at six pence a glass." Well the cereals are in *Manitoba*, and it takes a great deal of money to take them here, just as the old man's cow which was on the Banks of Lochlomond, and it would about take the difference in market value between there and London to pay the transport. If we grow full crops here, the cost of taking the produce from Manitoba will about make it as profitable growing cereals as in Manitoba.

The meeting then adjourned until the evening Session, which took place in the same hall, at eight o'clock p.m., the 17th.

WHERE SHOULD THE ASSOCIATION MEET?

THE PRESIDENT: Before we adjourned, this afternoon, there was a suggestion made as to the advisability of changing the place of our meeting each year. For my part, I think we should have one strong Association, but still there is no use being dogmatic about it. If the sense of the members is that it is in the

interest of the association that we should move it from place to place, we should do so, but before doing so, I would like to hear what Mr. Fisher thinks about it, he is an Eastern townships man. Of course, Montreal thinks we should have the association here, but if we cannot have it here successfully, we want it where it will be most successful and best attended.

MR. FISHER; Mr. President and Gentlemen:—I know very well you are anxious to hear Prof. Robertson this evening, as he will be able to tell you things which it is essential you should know. I will say a few words with regard to the association. I said a good deal this afternoon about ensilage, I will not say anything now. The discussion before we separated was a most important one, and I did not wish to say anything then, as the meeting was breaking up.

I was extremely pleased as an Eastern Township man, as one who farms a good ways from Montreal, I was greatly pleased to receive an invitation from a farmers' meeting in this city. For a long time back, I have wondered and thought a good deal about the connection which is absolutely necessary between this our metropolis and ourselves, the farmers in outlying parts of the Province and country. I say country, because you in Montreal are just as much interested in Eastern Ontario as in Eastern Townships and other parts of the Province of Quebec.

I was pleased to get an invitation to come to this meeting, because I have felt for a long time that the people of Montreal did not come in sufficiently close contact with the farmers around them; therefore, I felt this was an opportunity, which should not be neglected, to get the farmers and business men to talk over what is to their commercial advantage. You live upon what you eat, and we, the farmers, have to supply it. In the second place, you live on the money you make and you make that to a large extent by supplying us with what we want, and if you and we come to understand one another and know more about each other, the way we supply you with food and you supply us with boots and shoes and clothing, it will be a mutual advantange to each of us.

The Eastern Townships and the rest of the Province of Quebec, as is well known, is not supplied with capital—you have the capital and are constantly putting it in enterprises, and when men want capital for an enterprise which is going to be of advantage to the whole country, they naturally look to the great monetary centre, and Montreal is the centre. Under the new system of agriculture which has been talked of here, and in other places, for a number of years, more capital is needed to aid us in our agricultural enterprises, and if the people of this great city, the capitalists, the Bankers, the wholesale merchants and others who have capital, find out what we want, and what is needed to

aid us in our agricultural enterprises, I am satisfied we will be able to appeal to them to help us with their capital, and you are dependent upon us as we are on you. I have come in contact with lots of people in Montreal, in private houses and other places, who grumble at the supply of food, at the butter, etc. We can give it to them first class, if they give the money, but we cannot give it unless we get the price for it. Some people have grumbled at the milk supply of Montreal, I suppose there are some here present who have not heard of that grumbling—I can tell you that if you want good milk you must give your money in return, and if you give your money, there are thousands of farmers who will only be too glad to supply you with the best of milk, but you must come in contact with us to enable us to know what you want, and we have to come in contact with you, so that we will know how to supply you with these things.—If you will meet us half way and join hands with us, we can arrange so that you will be able to get what we make on the easiest terms, most directly and of the very best quality. I therefore think this meeting is the inauguration of a better era of understanding between producer and consumer. I would be sorry to see the meetings taking place elsewhere than in Montreal. This is the commencement, I trust, of a better understanding between us, not simply an ensilage meeting, but of the Stock Breeding & Stock Feeding Association, and as such, you want members from all parts of the Province together, and I do not know any more convenient place than Montreal. It is the railway centre and nearly all the chief farmers of the country have some friends and esteemed connections in Montreal, and they can more easily arrange to come here, than to any other place. If they went to any other place, a large portion of them would have to pass through Montreal, but if the Montreal people want us to come here you have to hold out your hand and make us welcome. It is a great commercial city, and such a meeting as this may be swallowed up in it, and if the farmers are not made comfortable, when they come to discuss this business, you need not expect them to come, if they find they are outside of the people and the people take no interest. I am alluding to the farmers outside of the Island of Montreal.—The farmers around the city are just as much at home as the merchants and bankers, but the farmers outside are not, we want to see that we are welcome and that there is an interest taken in what we are undertaking.

The suggestion was made this afternoon that this Association should meet here this year and somewhere else another year. I think it better, if the meetings occur here in Montreal; but there is an adjunct to these meetings which could be easily carried out. Mr. Sheppard told you how the fruit growers in Ontario managed their business, and I do not know any better way for this Association to do, for this Association to extend itself, than by doing what they do.

You are aware that all over the Province we have different Dairy and Farmers' Institute meetings, and I hope there will be more; the Province of Quebec is somewhat behind Ontario as regards these institutions. These institutions are of great value to the farmers, and I trust in Quebec the Government will see that we have the same thing as they have in Ontario. If that is the case, there is nothing to hinder every facility being given for the board of management or representative delegates to be sent from this Association to each and every one of these Associations, to aid them and bring home to them what this Association as the central one has found to be the best.

I do not believe myself that at this time there is any room for further multiplication of Associations in the Province to any great extent. I understand this association is one which, though this is the first meeting in Montreal, has been in existence for some time and has already done some good work, and if it takes some such course, it will keep in contact with the different associations in the Province. I do not think that there is necessity of my saying any more on this subject, as Professor Robertson is going to give you a treat.

I find it is absolutely necessary, not only for the farmers in the Province, but the people of Montreal, the Mercantile people, should take more interest in this matter. It is true unfortunately, that the farmers of Quebec and Eastern Ontario have not been making money and prospering as they ought to. What does that mean to the people of the great city of Montreal? It means we are producing your food and we cannot do it as well if unsuccessful, as if successful. When a farmer is crippled for want of means, he is sure to do his work worse, and the result is poorer food for you. Your whole commerce is depending on the consumers. If your wholesale houses and manufacturing establishments are going to prosper, it is by selling to farmers of the country what they want; and if they are poor and crippled, you will have less trade. Just as soon as the country merchant ceases bringing in money, the wholesale houses are crippled and the bankers have to carry the wholesale merchants and they have to carry the people in the country. Until you help to bring up the farmers market, to improve it—and to do this, you have only got to encourage the circulation of that knowledge which will enable the farmers to do better in their business and be more successful and buy more continuously and largely your productions.

I thank you Mr. President for allowing me to say these few words.

THE PRESIDENT: I do not think I can add anything to what Mr. Fisher has said regarding the location of the association, but the thoughts arising in my mind from what he said regarding commercial men, makes me think it strange that the people in Montreal, the merchants, who are dependent so entirely and un-

reservedly on the production of the soil, should not wish to know something about these matters. Our Financial men, when giving advice to merchants, very seldom get further than to tell us that times are bad, and that we should curtail credits, and import less, and so on, but that has not everything to do with our commercial success, it is merely negative advice. If we are going to do any great good for our country, we must endeavour to reduce the cost of production of what we are raising, and not only that, but increase the production. The efforts of this Association are simply devoted to find out ways and means to produce these results. We can have all the fiscal policy we like about the trade of the country, but when all is said and done, the whole thing rests on what is taken out of the ground. There is no doubt about it, and it seems strange to me that there are not more merchants here who would try to learn something about that. Prof. Robertson has studied this question, he knows the possibilities of this country—we have a grand Province—a grand country, but we must take it out of the soil. We will have an address from Prof. Robertson which will show some of the possibilities of the agriculture of this Dominion.

As regards Associations in outlying districts, their meetings will always be attended by as many members as possible from this Association, and everything possible will be done for our mutual advantage.

MR. TYLEE: I understand that the Province of Quebec Dairy Association will hold their annual meeting next year at St. Therese—they are composed of French and English and that is one very strong reason that we should hold our meeting in Montreal, as near them as possible. We can amalgamate and then ask the Merchants of Montreal to come forward and meet, not only a few farmers as we have now, but perhaps a thousand. We will try and get a big hall and have our meeting a few days before, so that they can stop here on their way to St. Therese, or afterwards, they can stop in Montreal on their way home.

THE PRESIDENT: That is a very feasable proposition. What we want is a strong Central Institution in Montreal—the deliberations of which will have some influence in directing men's minds in the way of profitable agriculture.

I would now call upon Prof. Robertson to address the meeting on the

"RELATIONS OF AGRICULTURE TO PROGRESS IN THE DEVELOPMENT OF CANADIAN LIFE."

PROF. ROBERTSON: Mr. President and Gentlemen:—I am very glad that the Ensilage and Economic Cattle Feeding Association of Central Canada has found a place for its convention in the City of Montreal. Montreal's position as the commercial metropolis of Canada, gives it a special advantage as the centre from

which to dissiminate information, that will help the agriculturalists who live in its immediate vicinity, and also in the most distant parts of our wide Dominion.

The newspapers of this city are to be complimented upon the attention which they have devoted of late years to agricultural topic. Through the wide circulation which the leading journals here have obtained, and the excellent reputation they have won, whatever appears in their columns is read with a large degree of confidence by many farmers; and newspapers elsewhere in the Dominion copy readily for their issues.

I trust that this Association will have a happy development in occupying the largest possible sphere of usefulness among the many associations which exist mainly for the improvement of agricultnral products.

If I might express a modest wish on behalf of this foundling among agricultural associations, I would say that I hope it will live to attain among them as ample proportions as its respected paternal author has among men.

I expect from it also, the utmost service within a wide sphere, and hope that its sphere will continually enlarge until farmers everywhere, who keep cattle, fall into the habit of growing enough corn for ensilage for the economic feeding of their stock. The discussion which has just been closed, has informed me of one other fact in regard to which I needed some correction. In expressing a preference for Montreal as a meeting place for this Association's Convention, the saying was used "since the mountain cannot go to Mahomet, Mahomet must come to the mountain," and hence the inference was left that the farmers of the surrounding country must come to the mountain of Montreal.

I have been accustomed to speak of the elevation of land behind your beautiful city as "a hill," and such it always seemed to me; but I will not again offend against the tender susceptibilities of Montreal people by speaking of it otherwise than as "a mountain."

Many of the leading men to whom Montreal owes much of its commercial prosperity, forget to remember the source from which that prosperity is drawn.

The vast ware-houses which line your business streets, the extensive wharves which present such scenes of bustling activity during the shipping season, owe their existence to the handling of large quantities of farm products. If these can be multiplied in quantity and increased in value, every handler, every business man will have a better chance to enlarge his business and increase his profits. The wholesale trade of Montreal ultimately depends on the great mass of consuming farmers for the purchase of their goods and wares. The dry goods merchant, the hardware merchant, the agricultural implement dealer, the seed merchant, and nearly every other branch of commercial enterprise in Montreal, respond speedily to good times among the farmers.

If the remittances from the stores in the country districts come in slowly, the bankers and professional men will also find financial stringency and difficulty in carrying on their business with success. Montreal is perhaps the latest among all the cities in manifesting in some concrete and public manner its interest in the well-fare of the farmers, who after all furnish the bone and sinew for its commercial enterprise, and Montreal has this substantial quality of business in its midst,—its progress has been gradual, solid and real. Cities in our country, which grow up upon the establishment of enterprises and transactions which have little of the real wealth of the country in them, or behind them, are subject to great booms and depressions.—Western cities are noted for their adhesion to the sentiment, which they have paraphrased from Tennyson's "In memoriam"; and they say "it is better to be boomed and bust, than never to be boomed at all."

As the citizens of Montreal recognize their dependence upon the farmers of the country, and lend what assistance they can to improve their condition, so far will they remove from themselves all probability of commercial depression. Toronto has set Montreal a good example in the development of Associations with their locus there, for the improvement of agriculture; and I dare say that the ardent tenderness which Montreal entertains for her sister city, will enable her to copy her good example in this regard.

In the study of the relation which agriculture sustains to the condition of society which we call "highly civilized life," we must bear in mind that the farmers furnish most of those things which outwardly distinguish the civilized citizen from the rude barbarian. In the minds of very many men, the difference between the highly civilized citizen and another individual, consists largely in the quality and kind of the clothes that are worn and the fruit which is eaten. The raw material for the clothing of the people comes from the farms. From the woollen goods for coats, to the silken neckties, the raw material is the product of living creatures fed upon plant products; and the production of such things is the aim of all modern and intelligent agriculture. In the march of progress, the agriculturists have not been lagging behind, but have been leading the race and community to higher attainments. The food of the people also comes from farms, and good living in this sense, provided by skilful farming, means good living in many other senses also.

When farmers furnish an abundance of nutritious food at a low cost of production, it is well within the reach of more people; and when a community is well fed, even to its poorest members, it is strong for all the activities and claims of our wearing modern life. The importance of agriculture to the commercial enterprises of our country is easily noticed by observing how sensitive they all

are to the condition of the farmers. When hard times prevail in rural districts, depression follows in every centre of manufacturing and commercial endeavour.

The success of farmers, which means for them good times, comes mainly from good crops; good crops depend mainly upon good cultivation, the use of good seed, the exercise of good management and the prevalence of good weather.

In nine seasons out of ten in Canada, the weather is quite favorable for the production of good crops; the other factors are well within the control of the intelligent farmer. The want of knowledge about his own business and the want of interest in the methods whereby he can improve his productions, are perhaps among the main difficulties that afflict agriculture at the present time.

Associations such as this, conventions such as the present, are means whereby these ailments of the farmer and farming can be cured.

The magnitude of the interest of agriculture might be set before you in statistics that would bewilder you and not serve you much afterwards. Instead of adopting that plan to present to your mind a view of its greatness, I would prefer to take you on an imaginary trip across the continent, to indicate very briefly the vast agricultural ressources of this country, and to point out that upon agriculture the largest part of our population depends for a living.

At present, there are some twenty-five million acres of land under cultivation, of which sixteen and a half millions of acres are under crop annually. It would be easy for a farmer by an intelligent improvement of his methods to increase the yield and value of products by at least three dollars per acre. That would mean in figures, an increase of the available wealth of the country to the extent of fifty millions of dollars per year. If the poor farmer of the country —that is the man who farms in a poor way—would improve his practices until they were equal to that of the good farmers of the Dominion, the value of the crops and products could be increased annually by at least fifty millions of dollars, without the outlay of a single dollar additional. An acquaintance with the vast extent and almost limitless resources of our country, will give spirit to every wholesome national enterprise, and will also put such patriotic pride into the heart of every citizen that he will do better for himself and thus do better for his country.

(PROF. ROBERTSON here, by the use of a map took his audience on an imaginary trip over the continent, commencing at Ottawa, passing through the northern portion of the Province of Quebec, through New Brunswick and into Nova Scotia, through its fertile fields over to Cape Breton and back to Prince Edward Island, which he characterized as the gem among the Provinces of the Dominion, with less waste land in its area than any other. Reference was also made to the large fertile areas of Manitoba and the North West Territories and

to the fields on the river banks in British Columbia which yield enormous crops per acre.)

Perhaps no five million of people on the face of the globe, in a national capacity, are possessed of natural ressources and sources of wealth in an equal degree with the people of Canada. The quality of what wealth is, is seldom very well understood by even men who frame the opinions of our agricultural classes. The annual statements of Bank Managers seem to others like myself to be compilations of figures and statements that frequently obscure the true meaning of wealth, its production and distribution.

It would not be wise to weary you or to trouble you witk the abtruse definitions which have been given of wealth by many writers on political economy. The ordinary laboring man, as well as the millionaire, knows the true meaning and nature of wealth as something substantial which he wants to gain possession of; and hence I put it that anything that ministers to the wants of man and the ownership and possession of which can be transferred from one person to another is wealth. Its main sources are the soil, the air, the sun, the water, the rocks and intelligent labor. From the first four and the last, we obtain all agricultural products. They then represent in themselves, something which people want to possess and which have been obtained by intelligent labor. The market never makes or creates any wealth. The frequent handling of a box of cheese or a tub of butter does not add anything to its nourishing qualities. Although a bushel of wheat may change hands every week, such exchange will not add an iota to its life sustaining qualities. What the country needs is improved methods in the production of wealth, rather than increased facilities for the handling and exchange of wealth. One factor in the production of wealth, which is most under our control, is that of intelligent labor. The intelligent labor on the farms of England has brought to that country vast wealth which could never have been secured by the shiftless methods of farming which prevail in this country, and on this side of the ocean. For the best horses we go to England or France. For the best cattle, sheep and swine, for the best live stock, for all farming purposes we go to England. The cause for this does not reside in her superior soil or better climate, but in the superior intelligence of her farmers, whose operations in these matters have been directed by the skill of the educated classes, who have made plans for the work of her farmers. The men trained in the sciences, with intellects brightened by the best education afforded by colleges and universities, have owned the larger share of her farming lands. The rules in the old leases, which guided the operations of the farmers, provided for improvement in every kind of product which was obtained from her fields. Far be it from me to recommend that the system which pre-

vailed in England should be transferred to this country. Farmers in Canada live under happier auspices, where every man has the opportunity and need for directing the toil of his own hands by the thinking of his own head. In our country more than elsewhere, the quality of the working farmer's thought determines the outcome of his own labor. Hence the commercial and professional men of this country, who have unusual opportunities for having their minds sharpened to perceive the best methods of carrying on work, should give farmers every encouragement and aid towards clear thinking about their own business. The nature of the farmer's work compels him to be a rather isolated individual; he has not frequent occasion to meet his fellows and rub against them in transactions, whereby his mind would be quickened in its action and strengthened in its judgment. There should be nothing of antagonism in the interests of the city and the interest of the country; the prosperity of the one is dependant on the prosperity of the other. Hence as the professional and other city men help the farmer to appreciate and acquire knowledge about his business, they advance their own interests.

It has been mentioned to-night that there is a great deal of capital in Montreal seeking investment in all sorts of enterprises. The capital which is most wanted in our country is that of confidence in our own business, a hope in the future of our country, and enthusiasm in carrying on our work. If this Association and the city of Montreal can infuse some of that capital into the homes of the farmers, it will render them the largest public service. Somebody's clear thinking must precede and underly every rational method that makes for the improvement of products, the increase of profits and the mitigation of toil. Many nostrums for the bringing about of national prosperity have been advertised, sometimes by men from unselfish motives, and sometimes by men in prominent positions, from motives which had best be left undefined. The one rule for national prosperity which applies alike effectively to the country and city, is the application of industry with skill, the practice of frugality. Fair dealing between man and man, and the blessing of Providence in giving good harvests. Such is national lasting prosperity, and these conditions can be brought about largely through the instrumentality of such Associations as this and its work.

The present status of agriculture is rather a reproach to the honor of the nation and threatens its stability. The Governments of the country have recognized the need of helping the agricultural interest, because of its bearing towards commercial prosperity; hence the establishment of Experimental Farms and the work of travelling instructors in dairying and other branches of farming. Their object is to shed the kindly light of knowledge into the homes of the humblest farmers in the whole land, as well as into the life of their more

favored brothers. Their range of usefulness is being yearly enlarged, and the educational part of their work is becoming more effective.

Reference may be made to one or two branches of the work, which seem to exercise the most direct influence in the improvement of agriculture.

Distribution is made of few and promising varieties of grain to the extent of a sample three pound bag to every applicant. From the three pound bag, many farmers obtain a yield of one bushel, or two bushels. By this means they can get into a new and good variety of seed grain very speedily, over twelve thousand of such sample bags were sent free by mail during the course of last year. The farmers who grow these small plots of grain, become more observant in their methods of farming, and the educational value to themselves in this regard is quite as important as the possession of a quantity of some new variety of seed. Experiments are carried on in regard to the cultivation of grain under different methods. As one instance of the possibility of improving the yield of grain per acre by the improved methods of agriculture, it may be mentioned that in a series of six ranges of plots on the Experimental Farm at Ottawa, experiments have been carried on to discover the relative results per acre, obtained by sowing the same variety of grain in the same soil during the same season at different dates. Two plots of wheat, barley and oats are sown as early in the season as the land can be worked; a week later the same varieties are sown upon adjoining plots, and so on until the thirty-six plots are sown by the end of the sixth week. The early sowing seems to result in a much larger yield, which is very striking in the case of wheat and barley. Taking the returns from last year we find the following:

	Sown April 21. — Yield Per Acre.		Sown April 28. — Yield Per Acre.		Sown May 5. — Yield Per Acre.		Sown May 12. — Yield Per Acre.		Sown May 19. — Yield Per Acre.		Sown May 26. — Yield Per Acre.	
SPRING WHEAT.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
Campbell's White Chaff.....	47	50	32	50	27	30	29	30	28	30	19	10
White Connell.....	35	50	26	40	30	00	23	20	23	40	27	10
OATS.												
Prize Cluster.....	59	24	84	04	54	24	33	08	53	03	40	00
Banner.....	76	01	79	24	86	26	87	22	78	18	55	30
BARLEY.												
Prixe Prolific.....	65	10	55	35	50	20	51	37	40	40	37	14
Baxter's Six-rowed.....	55	35	67	04	56	32	42	39	34	08	35	30

The experimental work in the feeding of cattle has also a very important bearing upon the improvement of agriculture and the national prosperity of the country. As was mentioned at the morning session of this convention, it has been successfully demonstrated that steers can be fattened on a ration of corn ensilage and meal, at seven cents per day less for feed, with an average gain of more weight during the same feeding period than upon a ration of hay, roots and meal. Experiments are also in progress at our Experimental Dairy Stations to direct the attention of the farmers to the possibility of developing the winter dairy business, whereby they will be enabled to export to England quantities of butter which will bring as large an income to the country in the winter, as we now realize from our shipments of cheese during the summer. The handling of cheese through Montreal, in the course of last year, aggregated something like 4,000 car loads. The shipments of butter during the winter, in the course of ten years, should be of an equal value. This could be brought about by the extension of feeding ensilage and the growth of larger areas of corn. The developments of civilisation have changed the conditions of the farmers very much; they have made competitors out of men who are geographically far removed from each other, and in this competition the farmers who produce the most concentrated products will usually succeed best.

Now-a-days, the butter maker in New Zealand is a direct competitor with the butter producer in Ontario. They both send their products to England, to the English market. The freight charges on a tub of butter weighing sixty pounds need not be very much higher than the freight charges on an equal weight of grain. A tub of butter may readily bring $12.00 or $15.00 while a bushel of grain might bring $1.00.

Under the auspices of the Dominion Government, two cheese factories in Ontario have been altered into creameries for winter butter-making. The first shipment of winter-made creamery butter was sent to the English market a few weeks ago. Advices have since been received that it has met with the most favorable reception, and is rated as being almost as fine as the very finest Danish butter.

When our farmers have a number of fresh-calved cows for winter dairying, the butter will be altogether as fine as that which is sent to England from Denmark or any other Country. The only difficulty in the lot which was sent was due to the absence of a rich flavor, from the cows whose milk was furnished to the factory being calved for a long time. I fully expect that at least twenty-five such creameries will be in operation in Ontario during the winter of 92-93.

If even a million of dollars from the exportation of butter could be obtained annually within three years, that would prove a boon to the country in many

respects. This industry does not replace any other and does not lessen the farmer's receipts from any other source. On the other hand, it enables him to develop other branches of his business with more advantage and profit. In some measure, the farmers, as well as men in other callings, have lost control of the market, but in as much as they have gained control of the cost of production by improved methods and increased knowledge, their profits may still be as large as ever. Profit always comes in between the cost of production and the price that may be realized. If the former can be reduced, the profit is more certain to stay with the farmer than if the latter happens to be increased by any combination of circumstances. The profits from an advance in price, usually stay in the pockets or tills of the crafty commercial men; the profits that are obtained from the reduction in the cost of production are more generally left in the possession of the farmers.

In the development of agriculture, farmers should be discouraged from marketing primitive products, which take from the soil large stores of its fertility. They should be encouraged and advised to sell animals and their products which enable them to realize larger incomes without the exhaustion of their soil. Farmers have an impression that there are much larger profits in manufacturing than in agriculture. I think the farmer is right in this impression; but instead of advising him to complain because this state of things exists, I would advise him to become a manufacturer himself and thus obtain his share of these larger profits. The primitive products such as hay, corn stalks, pease, barley and oats, can be manufactured into refined and concentrated products such as beef, butter, cheese, pork, mutton and horses. Of all agricultural products, leaving out horses and hay, Canada exported to Great Britain and the United States last year to the value of $35,955,986. While this export trade is of great value to the farmer, he should never overlook the value to him of the home market, and he should cater to meet its requirements. Of these products which I have mentioned, Canada exported to the United States, during last year, to the value of $10,017,390. During the last ten years, the increase in the city and town population of Canada amounted to 384,146. That number of persons living in towns and not producing food, consume of farm products annually, at the wholesale farmers prices, to the value of at least twenty-one millions of dollars. An enlarged home market can be created and sustained by furnishing products of the very best quality.

CHEESE.—The total value imported into Great Britain, in the year ending December 1891, was $23,434,829. Canada sent of that $9,692,438, and the United States sent $8,660,817. In 1881, we sent to great Britain cheese to the value of $5,510,443, and now it is nearly $10,000,000 a year. Ten years ago—

1881—the United States sent cheese to the value of $16,380,248, and last year —1891—$8,660,817. We are gaining on our competitors by sending to England the kind of goods for which they have a preference; and, if we will do the same with other articles, we will win an equal preference and advantage. In this commodity also, it is possible to increase the profits by reducing the cost of production. The Hon. Thomas Ballantyne said very lately, in my hearing, that he had one cow that gave last year over 12,000 pounds of milk, and another one which yielded 11,000. (1) By enlarging the capacity of our cows, lessening the cost of their feed by the use of corn ensilage, and improving the quality of our cheese, the profits may be greatly augmented. The English Cheddar cheese retails in England in some cases, for 8 cents a pound above Canadian Cheddar cheese, and the latter occasionnally sells for 8 cts. a pound more, under the name of English Cheddar. I want the Canadian cheese marked on the cheese as well as on the box. We are making an effort, by branding cheese "Finest Canadian", to gain for our farmers the higher price, which presently finds a stopping place in the pocket of the crafty English shop-keeper. The shipment of cheese from the Dominion Experimental Dairy Stations, is having the effect of still further advertising the fine quality of our cheese. The trade with England might be doubled, as doubtless it will be in a few years, when the Maritime Provinces have their dairying developed. In Prince Edward Island, which is admirably adapted for Dairying, the farmers thought that it would not pay, and that fodder corn would not grow. Last year, from the meetings which I addressed in the Maritime Provinces, I sent out 524 samples of corn, to plant nearly a quarter of an acre each; and you never before heard of such glowing reports as I have been receiving since. In England, we have had to meet with competition from inferior goods from foreign and from our own markets. It is quite possible to develop the cheese trade to England to an almost indefinite extent. The more general feeding of ensilage would enable the farmers to produce at a lower price; the quality would be so excellent that no lower price need be taken, and therefore larger profits would be left for the producers, the handlers and the transportation companies.

BUTTER.—In the matter of butter, Great Britain imported during the year ending December 1891, butter to the value of $56,410,414. Of that quantity Denmark sent $23,680,421; France, $14,785,239 and Canada $912,307. Why did we send so little? Because we have not learned the art of making butter in the cheapest way, of the best quality, and at the most favorable season of the year. Denmark makes the largest share of her butter from September to March

(1) In Quebec, we have a herd of ten Jersey-Canadian cows, averaging 850 pounds in weight and which gave an average of 10,500 pounds of milk in 12 months.—Ed. A. B.

The average price realized by the Danes was 24 cents, and by Canada 18 and one half cents per pound. We have sent lately a shipment of 186 packages from the Experimental Dairy Stations at Woodstock and Mount Elgin, which I think will sell as high as the finest Danish butter. We have been running a Creamery at Woodstock on the cream gathering plan. The farmers set the milk on their own premises, raise the cream and furnish that. We have also one at Mount Elgin, where we take in all the milk and use a centrifugal cream separator. By the use of a centrifugal cream separator, we can get from 15 to 30 per cent more butter from the same quantity of milk, when the cows have been calved more than six months. It means that there is the possibility of a very much greater profit, when all the cream is taken out by the centrifugal machine. The English price for fresh-made, fine butter is always high during the winter A responsible firm of exporters of dairy products has offered to provide one half the amount required to alter 25 cheese factories into creameries for the manufacture of butter during the winter. By the use of a centrifugal cream separator at a creamery, from 15 to 30 per cent more butter can be obtained from the same milk than when it is handled in the ordinary way at the farms. A higher price can always be obtained for quality that is uniform. The winter creameries will enable us to ship $1,000,000 of fresh made creamery butter to England annually during the winter, within three years; and these 186 tubs from the Experimental Stations are the first which have ever been sent.

CATTLE.—The imports of cattle from Canada last year, ending Dec., 1891, into Great Britain were 108,289 and the value was $8,623, 202. The oxen, bulls and cows averaged $81.40 each at the landing ports. Freight, including landing charges, cost about $28 per head. If the farmers of Canada cannot make a profit in fattening steers and selling them at $53.40 on the average, each, they have only one alternative. They cannot lift that market, it is a market of 507,407 cattle, imported at a value of $41,673,659. If they have not made a profit of selling at $53 they can do so now by reducing the cost.

Then we have an advantage in selling cattle to the English market, in that our cattle can go alive to all the inland towns of Great Britain, and that is worth from $2.50 to $5 a head to us, above all competitors who are barred from doing that. We can send at an increased profit, by improving the quality of the animals. We do not want these great long, thick, tall animals that some men want to breed all the while. In the English market you will get about 20 per cent more per pound for the low-set, compact animals. The possible profit might be greater if we would export dressed beef instead of live cattle, in many cases. I have been mildly abused and opposed for recommending the establishment of large slaughter houses in Canada. But you do not send to England live

animals without having them reach Liverpool bruised and jaded fevered in condition and lighter in weight; while dressed beef in a cold storage compartment does not deteriorate. At present the retail butchers in England are opposed to any change that will prevent them from realising the larger profit which they make from sales of meat from fresh killed animals. We will be able to overcome that hostility, and after a time, put our beef and mutton on the English market in the most economical way. We should seek to develop the trade in fattened beef and not in lean steers.

Of dressed beef, Great Britain imported in 1891 to the value of $21,386,610 of which Canada contributed only seven hundred and forty dollars worth ($740.)

SHEEP AND LAMBS.—The total number of sheep and lambs imported into Great Britain, in 1891, was 344,504. Canada sent, in the year ending June 30th 1891, to the number of 40,732. Some experiments in the shipment of lambs to the English market were made and reported upon by Professor Shaw, whose excellent reputation is known throughout all Ontario. He states, as his conclusion that a profitable trade in the shipment of lambs of good quality can be developed with England.

MUTTON.—The total value of mutton imported into Great Britain in 1891 was $15,972,404. Canada sent $8,066 worth. in the year ended June 30th 1891.

SWINE PRODUCTS.—The total value of Bacon, Hams and Porc imported into Great Britain in 1891 was $48,868,234. The total value sent from Canada in the year ended June, 1891, was 7,530,079 pounds, with a value of $62o,037.00. Denmark, with a population of about 65,000 greater than Ontario, sent over 52,000,000 lbs., for which she realised an average of 12cts. a pound. We realised about eight and a quarter cents; and the bacon from the United States, was entered at an average of about 7 cents per pound. The Danes have learned to cater for their customers, and have not believed in trying to sell lard to a man who wants to eat lean pork. So it will pay us to get leaner and less lardy hogs. The quality that is wanted is lean pork from dairy-fed swine. To meet the requirements of the English markets, larger numbers of our swine should be sold by our farmers alive. They could then be slaughtered at packing houses, where the carcasses could be treated and cured in a uniform satisfactory manner. As a rule, it pays the farmer and feeder better to sell his swine on foot, than to market them as dressed hogs. Canada competed in the English market with the United States, which sent to England the largest proportion of the Bacon she imports. That realised 7 cents per pound, and our bacon will sell for a cent to a cent and a quarter higher, because our pigs are fed on the by-products of the dairy and mixed cereals, while theirs are fed chiefly on corn. We can increase the profit by reducing the cost, through economical fattening

and selling the animals before they are too large and old. In the course of feeding experiments at the Experimental Farm, Ottawa, six pens of pigs were fed for over five months. The experiments at the Farm at Ottawa show that four and one half pounds of grain will give 1 pound of increase in live weight of swine, and that it is not profitable to fatten swine for any market, after the weight of the animal exceeds 200 pounds alive. In some feeding tests, during the first months of feeding, when the pigs weighed from 77 to 103 pounds each, only 3.31 pounds of grain were required for each pound of increase in weight. During the next month 3.07 pounds of grain were consumed for every pound of increase in live weight. During the third month, 31 per cent more grain was consumed for each pound of gain; 86 per cent, 110 per cent and 125 per cent more grain was consumed for each pound of gain during the next three months respectively. At the end of the test the pigs weighed an average of 231 pounds each. For the last month's feeding 6.93 pounds of grain were consumed for every pound of increase in live weight.

CANADIAN GRAIN PRODUCTS.—It is contrary to my own preference to advise the farmer to sell any primitive grain product off his farm; but some men will have a surplus, and as we will have a surplus as a nation, let us see if there is a possible market in England at a profit. Great Britain is the centre where competition meets us from the whole world.

WHEAT.—The wheat crops of the 22 main wheat producing countries in the world in 1891, were estimated to be 2,029,302,000 bushels. The following are the particulars:

YIELD OF WHEAT IN DIFFERENT COUNTRIS IN THE WORLD IN 1891.

England	70,125,000	bushels
France	226,875,000	"
Germany	85,250,000	
Italy	100,375,000	"
Netherlands	41,250,000	"
Switzerland	8,250,000	"
Belgium	15,125,000	"
Denmark	1,787,500	"
Sweden and Norway	4,675,000	"
Spain	74,250,000	"
Portugal	7,975,000	"
Austria	39,875,000	"
Russia	182,875,000	"
Hungary	116,875,000	"

Roumania	45,375,000	bushels
Bulgaria and Eastern Roumania	34,375,000	"
United States	525,250,000	"
Canada	60,500,000	"
Algiers, Tunis and Egypt	66,000,000	"
East India	269,990,000	"
Australia	31,625,000	"
Turkey	20,125,000	"
Total	2,029,302,000	bushels

Some of the information I have gotten from reports of the publications of the Board of Trade, Vienna. Of the countries which require an additional quantity for home use, England takes 148,000,000 bushels and France 82,000,000 bushels. These are the only two countries that buy a quantity of wheat, with which we have any direct trade relationship. The United States' yield last year was estimated in Vienna at 525,000,000 bushels, and they will have available for export about 165,000,000 bushels. Another estimate has been issued by Henry Clews & Co., of New York, the well known crop authorities. Their figures are:

	Estimated production.	Required for Home consumption.	Available for export.
Wheat	600,000,000 bush.	360,000,000 bush.	240,000,000 bush.
Corn	2,065,516,000 "	1,700,000,000 "	365,000,000 "
Oats	758,559,000 "	600,000,000 "	158,559,000 "
Rye	36,000,000 "	22,000,000 "	14,000,000 "
Barley	77,400,000 "	67,000,000 "	10,400,000 "

Last year, Great Britain imported wheat to the value of $143,314,592. She imported wheat-meal and flour to the value of $49,566,450; and perhaps she will go on importing still more as her population becomes more dense. Of wheat and flour, Canada exported to Great Britain, during the year ending June 30th, 1891, to the value of $1,821,046. It has been reported that during the four years from 1871 to 1875, the increase in the area of land in the United States occupied for cultivation, was 32 per cent. From 1875 to 1880, the increase was 34 per cent. From 1880 to 1885, it was 19 per cent. During the last 5 years, 1885 to 1890, the increase had been only 7 per cent, or an increase of one and three fourths per cent per annum. That means they have reached almost the *top most* limit of their expansion, and they are expanding slowly in the area

which they cultivate. We are only beginning to extend our area of cultivation; and the *inexhaustible* (1) agricultural riches of the North West have only been touched. I think we will be able to export out millions of bushels of grain, and millions of dollars worth of animal products from that part of our country. That will bring re-payment of the big investments we have been making in its behalf.

BARLEY.—In the matter of barley, Great Britain imported in 1891, 34,931,396 bushels, having a value of $28,916,920. Canada has been sending to England very little barley.

During the past season, a little over 300,000 bushels of two-rowed barley were shipped, and the price paid to the farmers here has been from 8 to 15 cents higher than for six-rowed barley. It has not met with the same favour in England as perhaps some of us expected, for this reason, that the English market in everything is a discriminating market. Farmers need to have the different qualities, graded properly, cleaned properly and kept separate, so that everything will stand on its own merits and quality. The Russian Government has been moving vigorously to establish a system of grain inspection at its ports, for Russian wheat has been dumped into England indiscriminately, and consequently brought the lowest prices. The prices in England for barley have been ruling at 36 and 40 shillings per quarter. That means a price of 92 and one half cents for our weight of 48 lbs. to the bushel. The freight and charges from Toronto to Great Britain vary from 25 to 27 and one half cents per bushel. If we had a quantity of barley as good as the samples which were sent, it could have been sold in England at 36 shillings a quarter. The expense of getting it there would not be over 27 cents a bushel; that makes it possible for the Canadian farmer to realize 65 cents per bushel of 48 pounds. If you want to gain the English market, you must suit it, and it will give you fair play.

OATS.—Oats have been imported into Great Brltain in 1891, to the value of $26,648,572. The Liverpool price has been from 50 to 55 cents, and the Toronto price about 34, leaving a bare margin for profitable export.

PEAS.—Peas were imported into Great Britain in 1891 to the value of $4.197,144. During the year ending June 30th, 1891, Canada sent to England peas to the value of $1,485,348. They have been selling in Liverpool at about 90 cents, and in Toronto at about 60 cents. Other varieties, like the Prussian Blue and Marrowfat will sell at a higher price per bushel.

(1) The word *inexhaustible* is relative only for exhaustion of apparently inexhaustible soil has followed wheat culture from East to West, and after twenty or thirty years at most of wheat culture, the soil will show great exhaustion, in our North West, as well as in all other parts of our Dominion. ED. A. B.

APPLES.—I have here the particulars of prices obtained for Canadian "Baldwins" in the Liverpool market, during the present season. Based on sound Number One stock, the average price was 16s. 4d. a barrel, or about $4. The average transportation charges are from 90 cents to $1.10 per barrel. I have a chart here, showing the relative position for 4 years of the Canadian apples showing how the Canadian *Baldwins* compare with New York, Maine and Boston *Baldwins*. The chart shows that the Canadian *Baldwins* have been getting the highest prices going. That means that we have obtained the preference of the English purchaser, which I think a very important matter. Mr. John Dyke, Canadian Government agent at Liverpool, writes as follows:

"The Canadian barrels are somewhat larger than those from the United States, but the quality of the Canadian fruit stands superior to any other apple imported into England. The particular varieties received from Canada are, *Baldwins, Greenings, Northern Spy, Kings' Russets.*"

"*Baldwins* are the apples in greatest demand, and the lowest average price for No. 1 sound stock this season, has been 14s. 6d., whilst the highest average has been 20s. per barrel. Later in the season, *Russets* arrive here, and, being a keeping apple, it has the entire control of the market. *Kings* realise very good prices, but the quantities received are small. It is difficult to make a comparison between one season and another, as the crop varies very considerably. It is rarely that two big crops come in successive years, so that to compare the prices of this with last year is scarcely fair; but, as will be seen from the prices quoted, high rates are being obtained, notwithstanding the quantity received, and there is no doubt that the results have been very remunerative to shippers. The imports this season have been in excess of anything before recorded, but the quality has been excellent, and there is practically no limit to the demand for Canadian fruit of this quality and condition."

"The English apple, generally speaking, is not of a keeping quality, and is mostly disposed of by the time the Canadian winter stock arrives here, say the middle of October. After that date, the English fruit is not a factor in the competion at all. The freight from any part of Ontario to Liverpool will not average more than $1 per barrel."

Better methods and better systems of farming, would enable the farmers to produce larger quantities and better qualities of all these commodities which I have enumerated. The material wealth of the most important and numerous class of our citizens would be augmented, and better gains and benefits than that would come to our country from a betterment of the financial condition of its rural population.

The fact of better farming would be observed in an improvement of the

country homes, in their furniture and equipment, in the clothing of the farmers and their families, in their carriages and harness and in the possession of all those manufactured articles which give employment to the denizens of our cities.

The possession of these things would be the cause and consequence for an improvement in the intellectual life and activities of the farmers and their families. For many of its strongest and best intellects, the nation in its most comprehensive sense has to draw from the country homes. The man who attains eminence in professional life, and in commerce and manufacturing, is frequently recruited from the ranks of the farmers' boys. The vigor of intellectual life usually accompanies a sense of contentment and satisfaction among farmers who are doing well. In this regard again, improvement in agriculture would re-act most beneficially on the intellectual life of the whole Dominion. To the farmers' judgment as the final court of appeal, are submitted all public questions; and upon its verdict, depends the policy of the people in their national capacity.

The moral life of the people, in some measure, depends upon their personal comfort and well-being. Increased prosperity in commercial circles, would tend to give our people a kindlier and more brother-like feeling towards their fellow-citizens

As has been already indicated, we are essentially an agricultural people, and our commercial entreprises depend in a large measure on the success which attends the farmers' efforts.

The production of greater wealth on the farms of the country would give every honest business man a better chance to obtain a share of it for the support of his family and the accumulation of a competence under favourable conditions. I am hopeful that with the assistance of all the classes in the community, and under the direct leadership of the leading commercial men of cities, very speedily the farmers of Canada will come to be recognized as the people who have the most comfortable homes, the most contented lives, and the most advantageous opportunities for acquiring all that the heart of man can honestly desire, of any people who follow farming on the surface of our mother earth.

THE PRESIDENT: I think if this Association had done nothing else but been instrumental in having brought Prof. Robertson here to give such an address as we have heard now, it would not have lived in vain.

There is no doubt at all, it is as plain as two and two make four, that the whole commercial fabric of the country depends on what is taken out of the soil, and if we had any doubt about this before, and I do not know that we had,

we cannot have any now. After hearing Prof. Robertson's address, I hope every one here to-night will come here to-morrow morning at ten o'clock, when Mr. MacPherson will address us on the feeding of cattle with ensilage, or at all events with ensilage as the main ingredient, and we hope we will even have a better meeting than we have had to-day, that we will learn something of advantage to us, and that is what we are here for. We want all the support possible from the Farming Community and we ask you to join our Association, so that in another year, we will be able to present you with a better programme than we have this year.

MR. A. G. MCBEAN: After the addresses given to-day, I feel somewhat abashed coming before you. The subjects have been so ably treated by the gentlemen who have spoken to-day that there is very little left for me to say.

My principal business for the last twenty years, has been the handling of the products of the country, and it is only within the last four or five years that I have undertaken to do a little in farming. I may say that I am a son of a farmer and therefore I was not wholly ignorant of the occupation of farming, but when I started farming, a few years ago, and made a fresh start, I received a good deal of information from my friend Mr. MacPherson and I am largely indebted to Mr. MacPherson for the course I have taken in farming.

I started with the raising of ensilage about four years ago, this is the fourth year I have used it. The first two years were very wet years in this country, and I had not a great deal of experience in ensilage and my ensilage was acid and did not do so well as it might have done, but for the last two years I have had ensilage of the very best kind. I saw some of the ensilage taken out of one of my silos on Monday last, and I think, that any person who saw it would admit that nothing could be better. I noticed, when the men were throwing the ensilage out of the silo, that the corn came out almost as it went in, a beautiful green color and the cattle relished it very much, in fact my cattle have done so well this year that my neighbors around there will hardly credit me, when I tell them all the products they give.

I had forty cows last year, and I may state this, that I think I have derived as much from my cows during the winter months as I did during the summer months. I have been sending my milk to Montreal, and although I have fed my cows on ensilage, I do not think I had more than one or two complaints this year about the quality of the milk.—It has been acceptable to the people who received it, and the person who handles it here is one of the leading milk dealers in the city.

I am convinced ensilage is the only way that farmers in Canada can relieve themselves of the position they find themselves in to-day. I am speaking more

particularly of my own native county, Glengary. I think our farmers are becoming alive to the importance and necessity of taking some steps in changing the mode of agriculture.

I have been a merchant myself in this city for the last twenty years, and I feel that, unless some steps are taken by the merchants of this country, by our Bankers, wholesale men and others interested, and more interest taken by them in the agricultural products of this country, our country will not amount to much. I look upon the agricultural resources of the country as the backbone and sinew of the country, and in my humble way, I have endeavored to impress on all those I come in contact with, commercial men and others, that fact.

There are very few merchants who cannot realize the importance of giving more attention to the agricultural productions of this country. I hope we are entering on a new era, and not only the farmers and country merchants, but also the dry goods men, hardware men, Bankers and others will take a deeper interest in the agriculture of this country than they have done in the past.

I sincerely trust that this Association will be instrumental in bringing before our merchants this phase of the condition of our country with such force and emphasis that the Merchants, Bankers and others will become leading and active members of this Association.

I do not know that I can say anything more, only I wish this Association every success, and I hope it will be the forerunner and precurser of better times for Canada.

THE PRESIDENT: Mr. McBean has spoken as to the advisability of having other than farmers in this Association. I know the position he occupies in the mercantile community and that he can do a good deal in getting us members, and I know he will do it. There is no other way to strengthen the Association than to get people enlisted under its banner. We have had a good meeting to-day, much better than our most sanguine expectations, and to-morrow we expect to have a better one. We are indebted to Mr. Graham of the *Star* for the use of this building. The *Star* has put this room at our disposal and given it to us without money or cost. We are a poor institution, and being very "canny" we did not wish to hire a hall without knowing how we were going to pay for it; but the *Star* came to our aid, not only giving us a free Hall, but they also gave us our advertising free, and I think we should thank Mr. Hugh Graham for what he has done for us, and the enterprise he has displayed in having our meetings reported so fully.

PROF. ROBERTSON: In all my experience of farmers' meetings, and I have had an exceptionally large experience, having supervised 291, during the past year with my assistants, I do not know of one single instance where a hall has

been furnished free by a newspaper to the farmers. And to have added to the use of the hall, the free advertising and most excellent comments on the importance of the Association, is deserving of the greatest appreciation. I think the least we can do is to subscribe one dollar for the Association, and one dollar for the " Star ".

MR. BARNARD: I shall take great pleasure in moving a vote of thanks to the proprietors of the " Star ". They have put themselves out considerably, and I am sure every one here will join in a hearty vote of thanks to the proprietors of the " Star " and all the gentlemen connected with it for assisting us at this, our first annual meeting.

MR. BENNY: I have much pleasure in seconding the motion.—Carried unanimously.

The meeting then adjourned until Friday morning, the eighteenth of March, at ten o'clock a.m.

Montreal, 18th March, 1892.

THE PRESIDENT: Yesterday we heard how to grow corn and to make a silo, how to get the corn put into the silo and we are now going to hear from Mr. Dawes about the best way to feed the Ensilage.

MR. DAWES, reads his paper on

"FEEDING ENSILAGE."

The feeding of ensilage, as of any other feed, includes the handling of it from the time it is taken from the silo or place of storage until it is put in the manger before the animals to be fed. The most approved method is to remove it from the whole surface of the silo in layers not less than three inches thick (1) per day, to prevent loss from mold, decay, or frost. This I have found the most satisfactory method. I have tried slicing down large and small sections of the ensilage, leaving the rest of the surface with its weights and covering undisturbed, but the objection to slicing down in sections in this way is that at the place of cutting the exposed surface of the ensilage it molds and mildews, which is very objectionable. This is obviated by removing the ensilage from the whole of the top surface each day, or every three days at the longest. The whole of the covering ought to be removed at the first opening of the silo, all decayed and moldy portions which are always found on the top if the walls and bottom of th esilo are not properly constructed, being removed. In some years, there is practically nc waste if the silo is properly covered, the only waste being

(1) Even the removal of one inch thick of ensilage per day will be enough to prevent all loss from mould etc. ED. A. B.

what small quantity adheres to the covering. The ensilage is best removed from the silo to the feed or mixing room in small boxes or cars, suspended on iron rods extending from over the silo to the feed room. The feed room is best situated between the silo and the feeding floor or passage. The iron rod track is arranged somewhat similar to that used with the improved hay forks.

Ensilage in its present state of development is not a complete food in itself that is, a possible complete ration of ensilage could not be fed, or rather an animal could not be found capable of digesting a sufficient quantity of corn ensilage, at least, to sustain life and make a profitable production of milk or flesh. Ensilage must be combined with other foods more concentrated, or richer in nitrogenous protein or albuminoid constituents, as wheat bran, oil cake meats ground feed, grain, etc. In the feed room or mixing room the ensilage is spread in layers, with the cut hay, chaff or bright cut straw and the ground feed spread evenly over the surface. The ensilage and cut or shaff hay are spread in alternate layers, the meal or ground feed being added to each layer in proper proportion to make the desired ration, that is, the number of bushels or basketfuls of ensilage and chopped feed and pounds of ground feed to be mixed for a day's feed. The feed for each day should be mixed not later than the afternoon of the preceding day, in order that the whole may become uniformly moist and blended, which process may be assisted by turning over the heap at least once with forks or shovels. The mixed feed is shovelled from the pile into baskets or a small car or truck, and carried to manger or feed boxes, where it is distributed to the animals according to their requirements, which the skillful feeder alone knows best how to do.

After deciding on the ration or quantity per day, the next thing to be considered is the number of times to feed or into how many portions the day's feed shall be divided. Many feed only twice daily, with small additional feeds of long or uncut hay or good bright straw once a day, either at noon or in the evening. My own practice has been to feed three times daily, dividing the day's ration accordingly, and giving a small additional feed of long hay at night. A large portion of the hay may be fed long or uncut where it is inconvenient to cut all the hay or straw, but at least sufficient hay or straw should be cut to mix equal quantities by bulk of cut hay and ensilage with the ground feed or oil cakes, in order that the whole may be better masticated. I have found that ensilage alone or with a small quantity of hay, say 5 or 10 lbs. per day, will make a good maintenance ration, but will leave nothing for profit. The pregnant cow in milk, if fed on merely sufficient good corn ensilage and hay to grow the calf and maintain the cow in good health, does not get sufficient to make a profitable production of milk. If continued in milk the cow will fall off in flesh and

finally in milk and as pregnancy advances will require to be dried off completely about ninety days at least before calving, or she will lose greatly in flesh, which is not a profitable state of things at all. But by the addition of wheat bran and oil meal, or ground feed, she may be maintained in profitable milk production to within thirty to forty days of coming in, without detriment to calf or dam.

The following are some American dairy rations of ensilage and other feed, with their cost:

60 lbs.	corn ensilage,	@ $ 2.50 per ton	.....	7½ cents.
5 "	cut hay	@ 10.00 "	.....	2½ "
2 "	linseed meal	@ 30.00 "	.....	2½ "
4 "	wheat bran	@ 15.00 "	.....	3 "
				15½ "

60 lbs.	clover ensilage.....	9 cents.
4 "	corn meal.....	4 "
		13

40 lbs.	corn ensilage.....	5 cents.
40 "	clover ensilage.....	6 "
4 "	bran.....	3 "
		14 "

40 lbs.	corn ensilage.....	5 cents.
40 "	clover ensilage.....	6 "
40 "	millet.....	6 "
		17 "

MR. BARNARD: Did you take in the rent of the land?

MR. DAWES: I included everything, I have a paper here I have prepared for the Agricultural Journal of the province of Quebec, giving the cost in items of the whole crop.

MR. DAWES reads extract from said paper as follows:

COST OF ENSILAGE CROP, 1882.

Ploughing, autumn	$6 00	
Grubbing	1 50	
Harrowing and cross-do	1 50	
Sowing rye	0 25	
		9 25
SPRING WORK:		
Ploughing	$6 00	
Hrrrowing	0 75	
Drilling up	2 25	
Rolling	0 75	
Sowing	0 50	
Hoeing in uncovered seed	2 00	
		12 25
CULTIVATION:		
Horse-hoeing twice	$1 50	
Hand-hoeing, man 19 days; woman 15 day	26 50	
		28 00
HARVESTING, August 28th to September 6th:		
Women cutting corn, 8 days	$4 00	
Hauling	9 00	
Horses	4 50	
		17 50
PACKING:		
Men, 9 days	$9 00	
Horse on chaff-cutter	2 50	
Filies tramping	4 50	
Man feeding chaff-cutter	4 00	
Self	4 50	
		24 50
60 loads of dung at 25cts	15 00	
		15 00
		$106 50

A total of $106.50, or $53.25 per acre.

MR. FISHER: What do you think is the comparative cost of clover ensilage and corn ensilage?

MR. DAWES: I think Stewart gives it very fairly, he gives clover at $3.00 and corn at $2.00 to $2.50.

MR. BARNARD: That would make the clover ensilage cheaper, because a ton of clover ensilage is certainly worth two tons, or very near two tons, of the best corn ensilage (1).

MR. DAWES: It is worth more, it costs a little more, but it is worth more in the ration than corn.

MR. FISHER: In your practice do you find you can make a ton of clover ensilage as cheap as a ton of corn ensilage?

MR. DAWES: Yes, because I do not cut it up in the straw cutter and it makes good ensilage. It may be looked at in this way: Clover can be brought nearly to its natural condition of green clover after it has dried in the field, by mixing it with corn ensilage or pulp juice, whereas the corn plant cannot. The corn plant when once it is ripe enough to preserve it during the winter cannot be brought back to the same succulent condition as it was in the field; but the clover plant can, except in the fall, in the frosty nights and heavy dews, and these are the only years I ensilage second growth clover. In wet falls or if it is later than usual, I ensilage the clover, but if I can dry it I dry it, and mix it in again.

MR. BARNARD: Take a year where the season will be bad for clover hay, even the first crop; don't you think it would be of great advantage if the silo was ready to take it in instead of letting it waste in the field?

MR. DAWES: Certainly, but those years very seldom occur in our climate. Three years ago, I had great difficulty with a field of clover in curing it. I cut it down, expecting a change in the weather, I cut a little every day and I may say from the time the mowing machine went on to the field until the time the last load went into the barn it was six weeks. I will never attempt such a thing again. I did not put it in the silo that year, I had such a magnificent corn crop growing. I thought I would lose more in drying corn than in drying clover.

MR. BARNARD: Is it not your experience that by handling clover more than necessary, you will leave on the field the best part, the leaves and heads, and you are curing stalks only?

MR. DAWES: Yes, the difficulty in our markets is that clover is not properly cured. When I was selling my clover hay, I told people that I would give them it at $2.00 a ton more than ordinary hay, they said Timothy hay is worth more than clover, and I said: "You can buy it on the market, but you

(1) The exact compared values will be found further on.—ED. A. B.

cannot buy my clover hay unless you pay me $1.00 or $1.50 more than Timothy hay."

MR. BUCHANAN: Do I understand you allow fifteen dollars for manure on the two acres of corn. What does that mean? because that would be only seven and a half tons per acre, and would be difficult to raise twenty tons of corn or that. If you can raise it on that I would like to know.

THE PRESIDENT: I think what Mr. Dawes means was $7.50 per acre. There was more value of manure put on than this, but the crop did not take it all out the first year.

MR DAWES: That is the cost price of the manure laid down in the field, thirty loads per acre, single cart loads. The cart loads I found to be about 1000 lbs loads, and it cost me twenty five cents, or about fifty cents a ton laid down in my field.

MR. BUCHANAN: Green manure?

MR. DAWES: Yes it was green when I bought it, but it was allowed to rot in the field before I spread it, but I would not do that now, I would put it on the land and harrow it in.

MR. GARTH: You are taking no value for the manure?

MR. DAWES: Yes, $1.25 for the man and cart and 25cts for the manure delivered on the field. I may say that during those years, I kept a very strict account of the cost of the labor and everything else, and kept the time down to quarter days.

MR. MCBEAN: Is the corn cultivator an expensive machine?

MR. DAWES: I do not know the cost, it cannot be got here at present.

A VOICE: Do you think it would be advisable to put clover in a silo in the clover season and then put corn on top of it?

MR. DAWES: Once a silo is covered in, there is always a loss to take off the *covering*.

ON THE GROWING AND FEEDING OF ENSILAGE.

MR. MACPHERSON: I am sure a great deal of good will be disseminated throughout the country to those present and to those not present. This association in its first start can be congratulated upon the great success that has attended its efforts to the present time.

In coming before you, I do not pretend to be a speaker, nor able to follow in the wake of the addresses that have been given you.

Prof. Robertson has given you splendid information, solid facts in clear

perception of the requirements of this country in agriculture, and its bearing on all its needs, and left very little for me to say. I for the last years, have been employed in agriculture directly, and indirectly from my youth, having changed my occupation some twenty odd years ago, taking up the dairy business, and in that occupation having come in contact with the wants and requirements of the farmer, individually as well as collectively, it has given me considerable insight into the true circumstances of the farmer at the present time.

I found that farming was not successful, I found that farmers were not receiving a fair profit for the amount of labor, energy, time and capital they employed. I found that many farmers were going down hill, that they were not able to pay the expenses of their family and the requirements of carrying on their work, and they were not able to keep out of debt, hence mortgages and debts are even now increasing throughout the length and breadth of the land, which is a deplorable condition of things. This has occurred from the lack of receiving a profit from the work done on the farm. Having that before me so clearly illustrated, of the circumstances of the farmers for a number of years, it has started me to think and see if a remedy could not be found, a discovery made whereby a change, if not an improvement, could be made in the returns from the work on the farm. In striving to discover that remedy, I found it was necessary to know a few things and more, it was necessary to know a number of things as applied to the business of farming. It is necesary to understand the cost of production, to find out where the best market is, to find out what plant will give us the greatest return with the least cost, and to find out how it is possible to solve the problem of increasing the fertility of the land in the most rapid manner at the least cost. Now in striving to discover this important feature or business phase of farming, it is the most difficult question to understand, and after understanding it, is still more difficult to explain.

The cost of all production on the farm is the first thing that all farmers should know, and it is something that very few farmers do know, the cost of producing a bushel of grain, a pound of beef, or any product of the farm, and before an estimate can be made of the farm, and before an estimate can be made of the cost of producing any article, I think an effort should be made in the direction of taking a certain quantity of land. Now, when we buy a farm we buy it at so much per acre and, on the same principle, when we strive to find out how to produce the greatest profit on a farm, we should strive to find out how much per acre, such products cost. We should strive to find out the cost of producing an acre and then find out what plant will produce the greatest results, and then where we can sell that for the most money. Now, we cannot sell anything off a farm without selling two things, capital and labor, and I think ev ery-

thing can be estimated in those two lines, because the capital of the farmer is the fertilitity of the land, and the labor to convert that fertility into a saleable product is the cost of labor. The capital or the material that goes in the product is the capital. For illustration. If you sell a one thousand pound animal, you sell from four to five dollars worth of capital in the shape of farm fertility. The next point of expense is the labor. What labor does it take to convert the material of the soil into a one thousand pound animal? You can take one bushel of grain, an acre of corn, or any other product you wish to mention, and estimate and find out the fertility capital sold and the labor expended in producing that article. Now, it is necessary to find out where the best market is and what product we can sell to the best advantage for the most money and least expense of labor and capital. If we take an acre of grass land, we can convert that acre into hay; we can convert the same grass that makes the hay into milk; we can convert it into beef, and we can put it through several processes whereby we can make a profit. Take an acre of hay, which will produce two tons; we sell that off the field at a basis of eight dollars (that may be a little low for here, (Montreal City); but in the country where I live, it is a fair average for hay). I find that when we sell an acre of hay, producing two tons, we sell five dollars per ton of capital or ten dollars, and three dollars of labor. Now, if we sell a ton of hay for eight dollars, and it costs us eight dollars to produce it in capital and labor, where is the profit? These are facts, and the Professor will confirm that there is five dollars worth of actual fertility or capital in a ton of hay There is another way we can sell that product; we can sell it through animal products; we can either convert that grass into milk or beef in summer, or milk and beef in winter. As far as I can estimate, the profitable results of producing milk or beef is much the same(1), taking an average price of both for the past ten

(1)What a ton of hay (or its equivalents) should produce, (from JULES CREVET'S "ALIMENTATION RATIONELLE DU BÉTAIL.")

Fat matured ox	live weight			80 lbs.
" sheep	"			110 "
" pig	"			100 "
Young fattening ox	from birth to	28 months		146 "
" sheep	"	40 weeks		188 "
" pig	"	8 months		202 "
Raising colts	"	18 "		170 "
" working oxen	"			174 "
" sheep	"	8 "		270 "
" milch cows	"	2 years		172 "
Producing cows milk	say 6500 lbs. per annum	a calf of		14 "
		milk		966 "
" goats "	" 1400 lbs. per annum	two kids of		10 "
		milk		934 "

ED. A. B.

years. (1) What do we find, that an acre of hay, (producing two tons), will give in milk or beef? There is quite a material difference whether it is converted into milk in the summer, or milk and beef in the winter. I find that an acre of clover grass, in carefully estimating the cost of capital, and labor and selling it in milk will give sixteen to twenty dollars in summer, and eight to twelve dollars in the winter. I found out that selling our produce off the soil through the animal is the dear source to sell, or in other words we get more money for the capital and labor produced. I will not go into details to establish these things, because it would take too long. I will go on and make general statements, and if there is any desire to discuss such statements afterwards, I will be most happy to give an explanation. Now if we find that cattle produce the greatest results in money for the capital and labor expended, we want to find out how we are going to feed them well and cheaply. We cannot have an animal without feeding it, we must feed it cheap, and we must find out that plant which will feed the animal cheapest, so as to reduce the cost of production and reduce the labor of producing which is the main thing. We find on going over the list, taking wheat, pease, barley, oats, clover, hay and corn, that the profit on an acre of wheat is fifteen dollars, the profit on producing an acre of corn and turning it into milk and beef is from thirty to fifty dollars. I find that corn is the most profitable crop to feed the animal cheaply and well. I find that clover comes next, it is a plant that is very serviceable for feeding cheaply and feeding well. But I find also in feeding on an animal cheaply and well, there are two main conditions, bulk and nourishment; for the proper feeding of the animal, it must have sufficient bulk of food or dry matter as well as the proper amount of nourishment, or what is usually termed a balanced ration. In applying business principles in producing these two conditions, bulk and concentrated food, or nourishment, we should apply the rule that whatever we can buy cheaper than we can produce, we should buy, and whatever we can produce cheaper than we can buy, we should produce.

I find from practical tests and experience in a general way that the farmer can produce bulk cheaper than he can buy it, and he can buy nourishment cheaper than he can produce it. Well, if that is a fact, and the animal requires these two conditions, bulk and nourishment, and we can produce bulk cheaper and buy nourishment cheaper, then we should apply that principle, and in doing so we find that the cheapest articles to buy are concentrated food of the nature of oil cake, cotton seed meal, linseed meal, pea meal, etc.

(1) A ton of hay when equally well fed to good animals should produce an average of 80 lbs. of live weight increase of fatting matured beef or about 1000 lbs. of milk, or 50 lbs. of butter. The matured beef at 7½ cents live weight, would give six dollars, butter in winter at least $12.00.—E. A. B.

As the results obtained are a true test of any figuring, I will now give you the comparison of results. I shall designate as the old system the selling off the farm, the foods that contain most bulk, corn, clover, straw, hay, grain, vegetables, etc.

The producing of animal foods, and bulk nourishment, and feeding such to make sale of animal products, I shall designate the improved system. The producing or raising of bulk alone on the farm and buying concentrated foods of the farm, I shall call the new system.

Take two acres of rich land in the three cases: 1st selling all off the land; 2nd feeding all off the land; and 3rd producing bulk, buying concentrated foods to balance this bulk, and converting this into animal products.

The 1st two acres of hay or grain sold off the farm will barely pay expenses. The 2nd two acres, say one of hay and one of grain, will feed a milk cow and producing a good flow of milk for six months, and will give in clear profit about fifteen to twenty dollars. The 3rd two acres cultivated into corn ensilage, specially for bulk food will feed eight cows with sufficient bulk for six months; and by purchasing $15 to $20 worth of concentrated foods per cow, such as cotton seed meal, linseed meal, pea meal and bran will give a net profit of $100, viz: $40 profit in milk, and $60 in fertilizers in the manure.

I will give you an illustration. Take two acres, one of grain, the other of hay, that will feed a cow for six months during winter, producing a good milking ration. To explain the above, say 45 tons of corn is obtained off the two acres and $160 worth of concentrated food is purchased to balance the corn in order to make up for the deficiency of nourishment. I find it clears a net profit of $5 an animal which is very low but I think an average. Any one can produce $5 an animal, either on a milk cow or a steer, (it makes little difference whether you produce milk or beef in the winter as to results) (1). We will say that five dollars of net profit per animal is left after the purchased food is all paid for and after all the expense, both capital and labor is deducted, it will leave on eight animals at $5 each a profit of forty dollars net cash on the two acres. Does that represent all your profit? No, you have the fertilizers contained in $160 dollars worth of concentrated food. A fair estimate after such food is fed to the animal is to divide the cost of the food by two, where you give oil cake, cotton seed meal, linseed meal, bran and shorts. This gives the value of the fertilizers. This gives $80 as the value of the manure, so that you have forty

(1) It would make a vast difference if a speciality of winter milk was made, cows calving in August and September and fed for an abundance of milk. They should produce two dollars in butter against one in beef. Ed. A. B.

dollars cash in your pocket and $80 capital to go back to your land, increasing to that amount the fertility of the land (1).

Now, gentlemen, this is a fair comparison of the three systems; the first selling off the land everything, and getting from uothing to four dollars an acre or eight dollars for two acres; the second in producing everything on the land, nourishment and bulk, which gives sixteen to twenty dollars for two acres, or eight to ten dollars per acre; and by the third method you get forty dollars in cash and from 40 to 50 dollars in producing increased fertility, making about one hundred dollars return on two acres.

Now, gentlemen, there is an illustration for you, and if any one can analyze that problem,—the comparison of these three conditions,—he has the basis of successful farming, he has an idea of the condition of things, which if put into practice will change the nature of farming, throughout the length and breadth of the land. He has an idea which, if put into practice from year to year would increase the fertility of the land, increase the crops, increase the profits and increase the prosperity of the farmer, throughout the breadth of the land, as well as the prosperity of every mechanic, merchant and business man. By such improved system, the large Railroad Companies which travel over our Country would become prosperous and it would create a new area in their existence; it would change the condition of things and would come to a point that would show great progress. We would see the mortgages disappear, see the debts being paid, we would see our merchants become successful, and we would see every man receiving a fair reward, a good reward for his services.

Now, I hold that when we are selling anything off the farm, that we are selling some capital and some labor, and we must adopt some means of returning that capital, not only the same amount, but an increased amount, we must adopt a system that will change the downhill system to one that will run up, and increase the fertility of the land from year to year. If we can find out a system, if we can so change the condition of things from selling more capital than we buy, if we can give back to our land ten dollars capital for every dollar we take out, if not more,—this system will even increase in a great ratio, we will have that condition of things we are seeking to obtain, which we are all striving for and which we are all aiming to get. We are aiming to get more profit from our work, we are aiming to make ourselves more prosperous, and how are we going to do it? Gentlemen, by putting more capital in our land, making our land fertile, by making our crops

(1) Unfortunately, it is very seldom indeed that the estimated value of fertility contained in the manure is found in the soil. So much is lost, in various forms, that this estimate might be safely reduced by our half more by most farmers.—Ed. A. B.

increase, and by finding out the crop that gives the greatest profit, the crop that will enable the farmer to put more capital in the soil. And here is where it comes. The corn plant is a plant that takes least from the soil and gives the greatest results. But one feature in relation to it, and the most valuable, is that it enables you to produce bulk at the least cost, enables you to buy nourishment at the least cost, and produces results we are all aiming to obtain.

Perhaps I am not making it plain, but I would like to repeat and emphasise this question of crop. It is not the real intrensic value of the corn we must appreciate, it is not the mere material of which the corn is composed, it is the opportunity the corn gives us of securing capital which costs us nothing and making money out of producing cattle. Now if we can grow an acre of corn and feed it through the animal and we get eighty dollars worth of capital from the residue, making forty dollars cash in our pocket and eighty dollars capital in our land, we have, I think, solved the problem of succesful farming in the future.

I ask the question, what has been the cause of the lack of success in the past? It is selling more capital from the farm than we buy, and it is selling more labor and more capital than we received money for in return. It is depleting the soil of fertility, it is running down the condition of things for us to produce crops and drain our land. Now if we can change the condition of things and can increase our capital from year to year, we have found the secret of success in farming.

I will give you an illustrotion:

Two men start out in life with $1,000 capital each—They start out for a period of ten years—one men by his work and cunning direction of work is able to add one hundred dollars to his producing capital each year, the other man so works his brains that he takes one hundred dollars each year for his producing capital. At the end of ten years, how do those two men stand relatively? Can you compare them by figures? No! At the end of ten years, one man has no capital, no profit, no returns, the other man has increased his capital more than double and his profits thereby increase. The old system of farming is taking from the capital of the farm each year, and going down. And what do we find? Farmers leaving the country, young men leaving the country, farmers compelled to leave their farms, nothing to produce, nothing left behind them, nothing but discouragement and no capital. They have sold their capital with their labor, and have nothing in return. We must change that course, so that we will be able to add one hundred dollars or one thousand dollars, if possible, to our capital and increase the fertility of our land, and thereby increase the production of the land, and receive a profit from that capital. Not only that

but you will have a condition of things which will increase the value of our capital.

Now the business phase of farming can be applied in the value of capital, in the fertility of the land, in the same way as the value of stocks of the Banks of this City, of the value of railway stocks, and of the value of the brain power of any single individual, in each way just in proportion by what it produces. All stocks are valued according to what interest or what dividend they pay. The Bank of Montreal to-day pays ten per cent and is quoted at a high premium, other Banks cannot pay so much, and they are down at a discount. Why is it that these different quotations are given in regard to Bank stocks? One pays a premium and the other pays a small dividend. Hence the capital value is small. You take land and apply the same principle to it, you take land that produces small profits and the value of that land is high. Now if you adopt a system that will increase the products of the soil, you thereby increase the value of that soil. If you increase the net returns annually, as dividends to the farmers, you thereby increase the value of the land as the capital. As an illustration: If on an ordinary farm at, say fifty dollars, an acre, a dividend of three per cent is made, and if by a system of work six per cent can be paid, you increase the value of that land to one hundred dollars yearly, you increase the results one hundred per cent per acre, on fifty dollars, you increase the value of that land to one hundred dollars, which would be twelve per cent on fifty dollars.

I believe the business phase of farming must be calculated on the real products of the farm and thereby increase the value of the land. Now, how are we going to do this. ? Gentlemen, is it only by buying concentrated food to feed animals, to sell animal products and make the animal pay for them, thus buying such feed and having the fertilizers from such cattle free of all expense.

I hold that the farmer's capital is in the fertility he restores to the soil, and the cheapest way to obtain such capital is by feeding cattle. The corn crop is so important that it enables us to get fertilizing capital in the cheapest market, so as of increase the value of our land. What do we see to-day ? The decreased value of farm land is throughout the country, which proves that land is not paying as much profit as it did in the past; but if we can change this, if we can adopt a system that will change the results of farming, increase the profits of working, what do we do ? we increase the value of the land.

I believe every farmer should be a business man, every farmer should know what it costs to produce a bushel of corn, a pound of beef or any other product of the soil, and every farmer should apply those business principles in every day life, the same as any sharp, shrewd business man does in his business. Bankers and Managers of our large corporations in every way apply business

principles in their dealings, and so should the farmer. We must find out that plant which will give us the greatest result per acre, and we must find that market where we can sell the products of that plant for the most money, at the least possible cost. When we accomplish that, we will accomplish a condition of things we are aiming and striving to obtain.

On the lines I have just stated I would like to give you what I have produced in the last four years, on a small farm of 130 acres I have in Ontario. I strove to find out that plant which would give me the greatest results, and that market which would give me the greatest profit. By experiments I found that the corn crop was the most profitable to grow, and that the animal products were the best to sell, because they gave the greatest amount of money from the least amount of capital and labor. In applying that principle, I started with twenty-five head of cattle on a 130 acre farm that was run out, that had not paid a profit of one per cent on forty dollars an acre for years past. By adopting the corn crop and buying my capital through concentrated food, making the animal pay for it, in four years I have changed the capacity of the farm from being able to feed twenty-five cattle to feed one hundred and eighty heads.

The grass product sold yearly then was six to eight hundred dollars per annum, and left no net profit. Last year, the 4th year, the inventory of value produced in the summer of 1891 was over four thousand and five hundred dollars. I have not yet obtained the maximum I expect, I think it will take me three or four years longer, when I really believe carrying on these operations in these lines through the corn crop and through the animal, I will get a net return of fifteen dollars per acre after paying all expenses of capital and labor. What does that mean in regard to the value of the land? If you have land that will give you fifteen dollars an acre net profit, it makes the value of the land $150 to $200. Estimate in four years a change from forty dollars to one hundred dollars an acre, what does that mean on one hundred and thirty acres? sixty dollars an acre of increased value, on capital account. Besides this it means a change from a loss my farm was giving me four years ago, to a profit of about one thousand dollars a year. I have got the figures, but on the first of May I expect to show a dividend, a balance sheet of $1,000 from the one hundred and thirty acres. It is not what I expected to attain, but this is what has been accomplished in four years, with the aid of corn and with the aid of the animal. Another point, I find, is that if we can produce something cheaper than we can buy it, we should produce it. I have been buying cattle on which another man had made a profit. It is a question with a number of people whether the Western Ontario farmers can sell their store steers for twenty-five or thirty dollars and make a profit. I have heard farmers here say how ruinous

it is to raise store steers and sell them for twenty-five or thirty dollars. I have been buying them for thirty dollars and making a profit out of these steers, thinking I was making a profit out of these men's losses, but I find that is not a fact. I find that the capital and labor expended in producing a one thousand pound steer amounts to only fifteen dollars. If I pay thirty dollars for an animal off my farm that I can produce on my farm for fifteen or say twenty dollars, I am buying in a dear market. That is where the business phase of farming comes in, we must find the cost of production, we must find the cheapest market, and buy in the cheapest market. A bushel of corn we produce on our farm we buy with our labor and capital, and if we produce a one thousand pound animal, it is just the same as if we bought it out of our own farm, the difference is we buy one on our own farm and the other off the farm. I hope the time is coming when every farmer will know the cost of producing an article, so that he will be able to buy in the cheap market and sell in the dear, that every farmer acting on that point of information will produce every animal that he sells, that he will milk all the cows he can possibly milk, to produce animal products, to sell either in milk, cheese or butter, that he will then at the same time have the best of means for producing animals, and associate beef products with milk production in the winter, that in that way by buying in the cheap market and selling in the dear, he will associate beef with milk production in the summer and winter, and he will make an almost sure profit of $15 to $20 an acre. Finding what rotation or system of work on a farm will give the greatest results, I think bears with my subject. We recognize the importance and value that the corn crop gives, the opportunity it gives us, not only the material of which the corn is composed, but the opportunity it gives us in producing results. We find we cannot grow corn every year, we find it is necessary to associate something with corn in order to obtain the rotation which will give the greatest results.

What we want is to sow crops in rotation which will make the greatest use of the material that is in the soil; that will give us the greatest product to convert into cash, and will give us the opportunity of turning the most capital in the land, increasing the value of the land and increasing the profits from working the land. These are questions, gentlemen, which should stir us up with enquiry, stir us up with action and put that knowledge into practice.

It is not enough to come here and find out certain points of knowledge ; it is not enough to read books and find out the theory of farming ; it is only enough when that knowledge is put into every day practice on our farms, and then we will be able to change the vocation of farming from being unprofitable to one of profit, and also increase the capital producing value of the land.

There are many other points I might take up, but I think I am trespassing on the time allotted to me. However, allow me to give you a few points in connection with the relative amount of capital in different products, and the labor required to produce a one thousand pound fat animal, or five thousand pounds of milk. I have striven to establish the fact that milk and beef, or animal products, are the most profitable products to sell off the farm. That being the case, we must find out the capital and labor cost os producing milk and beef. What are they ? I find the same fertilizing value in a ton of hay or in a thousand pound animal, or in five thousand pounds of milk. The labor cost of producing one thousand pound steer is ten or fifteen dollars, hence, if a farmer sells a ton of hay he is selling off fertility equivalent to a one thousand pounds animal or five thousand pound of milk. A one thousand pound animal will sell for from forty to sixty dollars and five thousand pounds of milk from forty-five to fifty dollars, the net results from milk and beef are so close, I have found out from practice, that it astonishes me (1) and I think it would be one of the best experiments that our professeors could try on our experimental farms, and they might establish it in this way, by taking four steers and four milk cows, side by side and feeding the four steers with the same class as the four cows, charging the steers with their labor feeding and cost of purchase or production, and charging the cows with the same and crediting the steers with beef or value produced and also crediting the cows with their net produce. So far as I have been able to figure, there is very little, if any difference, and if there is any, it is in favor of the milk, but there is extra labor in producing milk. I never came across any experiment that has practically established and set forth how to feed a steer, or a number of steers, with the cheapest food to produce the greatest results, or how to feed a number of milk cows under the same condition with a comparison of results. It would be one of the best experiments that could be made. I have never come across an experiment practically carried out on that basis to decide the merits of the two. In my experience I find very little difference, but I must frankly confess it is the general expression of experience through the country, that there is more money in milk than in beef.

The experiments and results of feeding for milk and beef proves to me, so far, that there is more money in beef and milk combined. You cannot separate the two to produce best results, they must be associated together.

(1) At best, it takes about 8¼ tons of hay equivalents to feed a ripe young steer to 1,000 lbs. live weight, whilst the same quantity of hay equivalents should produce about 8,500 lbs. of milk under equally favorable circonstances which should produce 425 lbs. winter butter at 25c.; giving $45 for beef and $106.25 for butter.—ED. B.

If this Ensilage Association for the economic feeding of cattle will bear out or bring about a result of increased capital to the land, increased fertility to the land, increased crops and therefore increased value of the land, if it has a tendency to produce these results, then, Gentlemen, the benefit of this association to the people of this country and to the whole Dominion cannot be estimated under millions of dollars.

MR. CURRY: Have you any experience in feeding corn ensilage to dry cattle? I have seen them fed on it and come out much better in the spring.

MR MACPHERSON: It is quite possible to maintain an animal on corn ensilage, but, gentlemen, you cannot afford to work for the animal, but you can afford to have the animal work for you. If you only maintain the animal in its present condition, you are working for the animal, no man can afford it. It makes a big difference to me in feeding one hundred and eighty head of cattle, whether they are working for me or I am working for them. The only way to make the animal work for you is to feed it to the full limit, either for milk or beef. Then in regard to cotton seed meal, I do not limit it to cotton seed meal, I limit it to the market value, if cotton seed meal is higher than anything else I take the cheapest. I have discovered this from practical results, that no farmer can change his circumstances, increase profits and increase the fertility of his land, when he sells cattle each year without buying manure, and there is no way of buying manure cheaper and better than buying food, that is my cheap market for manure, hence buying food and making the animal pay for the food, and have the residue for capital is I beleive the true course for farmers to pursue. Every farmer has his own peculiar conditions and things to study out, and to make the most, he must know his circumstances and conditions, and then when he understands his conditions to the best advantage, he will put them into practice and make the most out of them.

THE PRESIDENT: We have now got to the end of our programme. Some may think it has been a little too long, but it is not possible that so much information could have been given without having a good effect. I think our Association will be a success. We are young and probably lack experience, but I know if you patronize us by joining the association, we will be able to make better arrangements in the future, and treat you better.

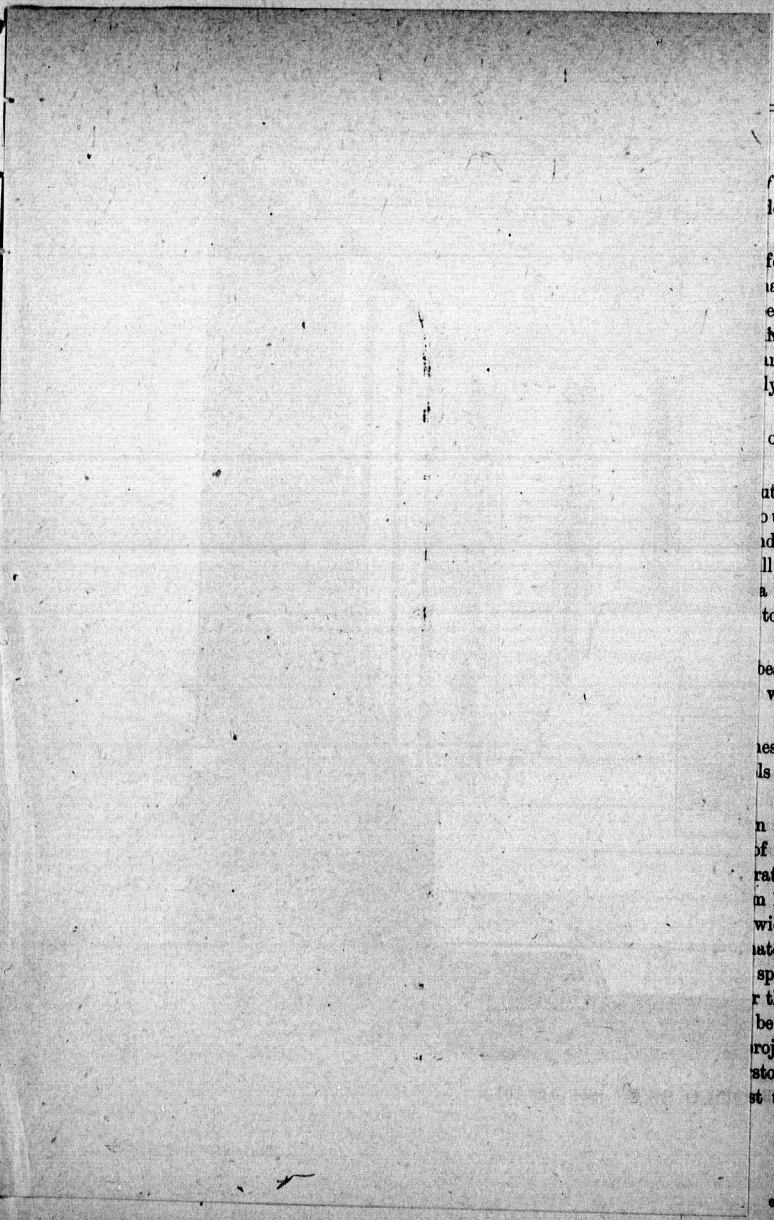
MR. MCBEAN: Mr. President and gentlemen: This is the first occasion on which I had the pleasure of discussing these subjects. I have done a little farming during the past few years, but I have not had time, in consequence of my

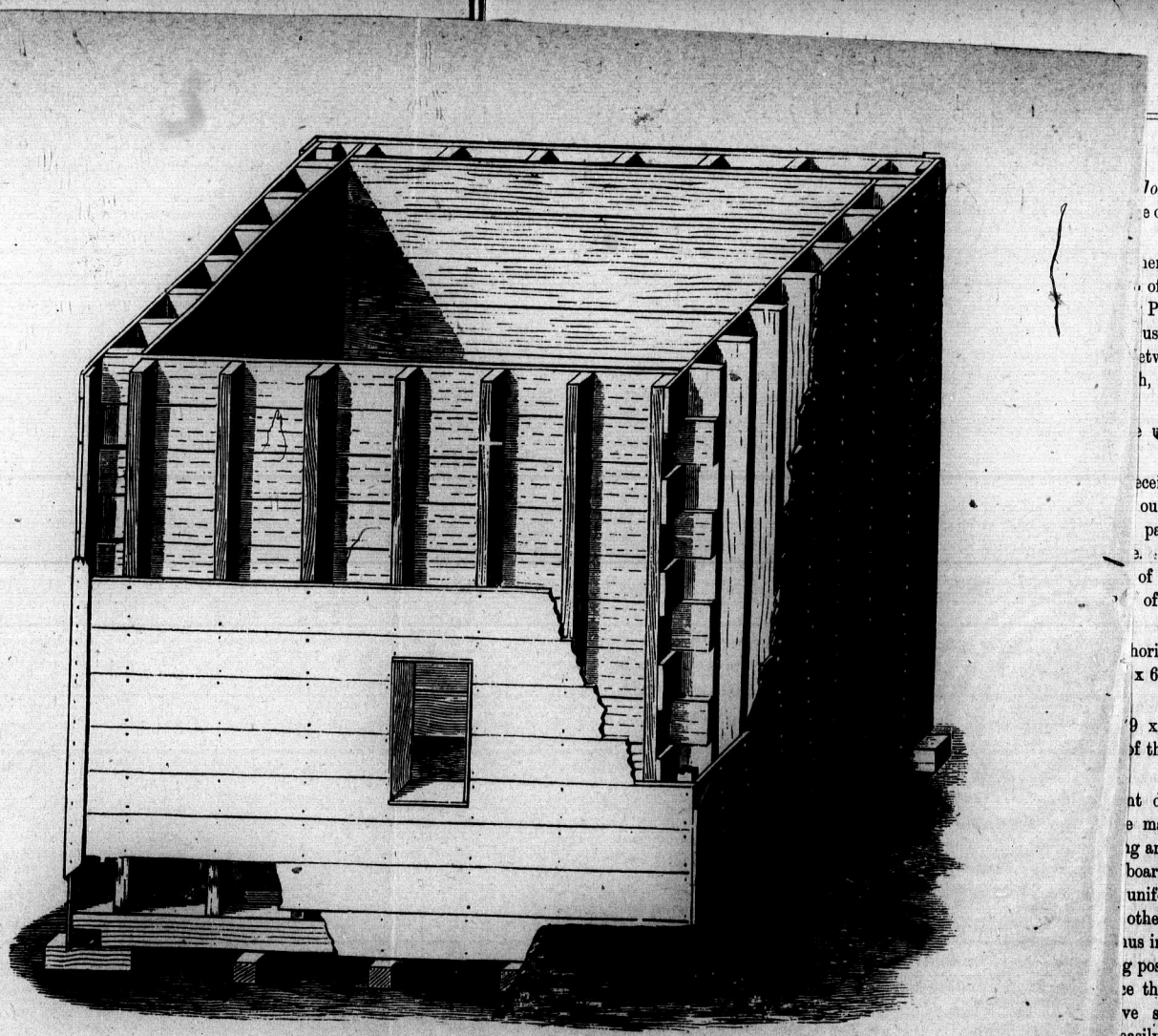
other business, to attend these meetings and I will say this, that I have been more enthused, in fact some of the statements made here by those who addressed us have astounded me. When we consider the mode of farming which has been carried on in the past and the mode suggested by those present here who have addressed us, it is wonderful. Even if we divide the result by two, that is dividing it in halves, it certainly brings to my mind the conviction that we must adopt this new mode of farming, and more than that, every Canadian must become interested in bringing about this change if possible.

Now it has struck me that this society should adopt some means of bringing before the intelligent people of Montreal, the merchants of Montreal, some of the facts that have been presented to us here for the last two days, and present them in such a manner as would bring home conviction to every mind, and it has struck me that a very good method would be for this Association to see if the Board of Trade would permit, and I have no doubt they will permit, and we should ask the board of trade to get Prof. Robertson and a few of these other gentlemen who addressed us, to address the Board of Trade on some Saturday afternoon. The leaders in most of our financial institutions close at one o'clock, and a great many merchants also close at the same time, so that the principals themselves and their subordinates would have the opportunity of understanding the facts and figures, which have been presented to us within the last two days. If this association will take the initiative, I am a member of the Board of Trade myself, and I have no doubt I can influence a good many others to co-operate with this association in bringing about what I consider so desirable a result as a representation of these facts to the leading merchants in the city of Montreal. I have been so impressed with them myself, that I think I would be derilect in my duty if I did not make these remarks.

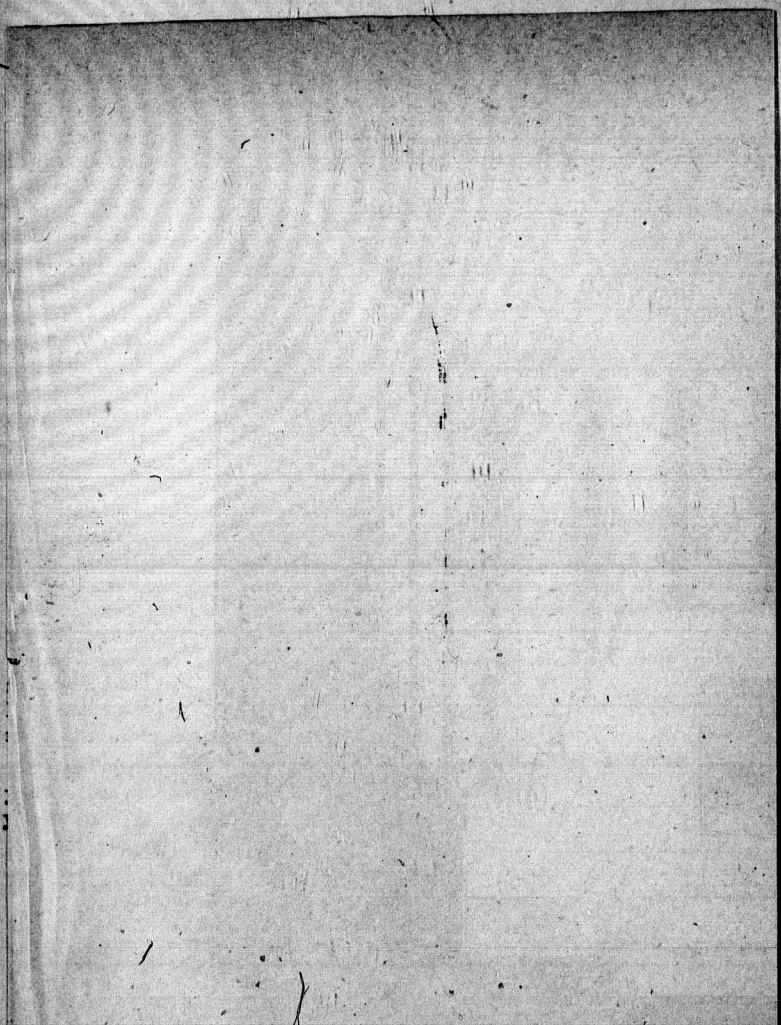
MR. PRESIDENT: Gentlemen, there is nothing more to do now, but to thank you for your attendance to express the hope that we will all meet here next year again.

And the meeting was then closed.





A WOODEN SILO. (See page 101.)



CONSTRUCTION OF A SILO.

The following engraving and article, from the *Illustrated Journal of Agriculture* will prove useful to new silo builders. It is the outcome of considerable experience.

The silo can be built of any kind of cheap timber. If there is no fear of frosting the ensilage, it may be lined inside with a single board of good matched timber and require no outside lining. This is recommended by Prof. Robertson, from experience. In our cold climate, the writer advises to use two linings, which may be made of even rough boards, provided the space between boards be filled up with some non-conducting material such as dry earth, especially dry muck which has many advantages.

The sills may be made of 8 or 9 inch square timber. The uprights of 3 x 8, the lining being one inch thick.

In order to reply to all the questions which we so often receive about the practical and rational construction of a good silo, we have done our best to unite in one engraving (see eng.) all the details of the frame, the panels and the bottom of an average silo, say, 12 x 12 x 12 feet, inside measure. This will hold enough corn-silage to feed 12 cows for 200 days, at the rate of 20 lbs. a head each day. The cut shows the general view of a silo on a scale of $\frac{1}{8}$ inch to the foot.

FRAME OF THE SILO.—The ground-plate is formed of four horizontal beams, 9 x 9 inches and rests on wooden blocks two feet long and 6 x 6 inches wide. These blocks are placed at intervals of 3 feet from one another.

On the plate are erected the posts; these are planks 9 x 3 inches, at intervals of 2 feet from one another, and to them the boards of the panels are nailed.

THE INTERIOR BOARDING AND CORNERS.—An important detail in the building of a silo, and one which is too often neglected, is the making of the four corners solid enough to prevent the side-walls from opening and separating from one another. The way to prevent this is as follows: the boards (from 1 to $1\frac{1}{4}$ inches thick) forming the interior panel ought to be perfectly uniform in width (say ten inches wide), their ends, at the corners, should cross each other alternately, as shown in the cut; the ends of the boards that penetrate thus into the space between the side-walls can be easily nailed to the corresponding posts. For this, it is not necessary to have the boards of unequal length, since they can be so arranged that if one projects to the right, the one above shall project further to the left, and so on. In order to make this more easily understood, we have, in the engraving, raised part of the outside panel to show almost the

whole of the right and left corners with the arrangement we recommend. This easy, simple plan gives great solidity to the silo.

THE OUTER PANEL.—This consists of common boards nailed from without to the posts. Inside the four corners of the panel a post is placed to which the boards are nailed. For greater security, the extremities are covered, outside, with a narrow board in a vertical position.

In the cut is seen a door, 3 x 2 feet, 3 feet above the ground-plate. Lastly, in the engraving, the base of the silo is shown perfectly earthed up, while the left part has been left naked, up to the level of the bottom of the silo, to show the blocks of wood on which the plate rests.

The advantage of this arrangement is the drying of the interior timbers, through ventilation, as soon as the silo is emptied and the frost out of the ground. The wall-plate has been left out, to avoid hiding the space between the side-walls.

THE RATIONAL FEEDING AND CARE OF MILCH COWS.

The following notes, to which allusion was made at the meeting, will be found important. They are the fruit of considerable labor, and many years of practice (1).

An intelligent dairyman feeds with a view to the largest net returns from his cows. How to obtain the greatest quantity of rich milk, per annum, from each cow, at the lowest cost for food and care, is the subject of this paper.

It is admitted by the best practical men that a cow which gives ten times its weight of normal milk in the year is a superior cow. Exceptionally, however, cows are known to have given thirteen times their weight of normal milk, and even more, per annum. It is also admitted that such large returns are not to be expected from a whole herd, even from the best of cows: some will be farrow; some may be in worse health, at times, through the year, &c.

It is also a well known fact that some breeders aim at obtaining the greatest yield of butter, no matter at what cost of production.

This sort of speculation, however, has but little real interest for the practical dairyman.

The following table, computed from high dairy authorities, shows the

(1) This paper is, in great part, a reprint of an article written for the *Journal of Agriculture* and reproduced in several important Agricultural papers in America and in Europe.—ED. A. B.

averages to be expected from the best herds of milch cows, of various breeds, according to their respective average live weights: (1)

TABLE 1ST. ANNUAL RETURN FROM HERDS OF SUPERIOR MILCH COWS.

Average weight of cows. lbs.	Total lbs. of milk given in the year.	Number of times their live weight.
440	3564 lbs	8 times.
660	4664 "	7 "
880	5676 "	6.5 "
1100	6600 "	6 "
1320	7436 "	5.6 "
1540	8228 "	5.3 "
1760	9020 "	5.1 "

It will here be observed that, although the yield of milk increases with the size of equally good milch cows, yet the percentage of increase is not the same: small cows, as a rule, give an average of about 40% more milk,—weight for weight, the cows being equally good,—than the largest cows will give. On the other hand, it is well proved that the smaller the cow the larger the ration it will absorb, for maintenance, per 100 lbs. live weight, whilst the ration for production remains the same, whatever be the weight of the animal, and should be composed from the very same chemical elements which form the produce. This will be more fully exemplified further on.

Table No. 2 is a very important one to farmers and to feeders of stock generally. It gives the full *average* quantity of hay, or equivalents, which animals do absorb for a full productive ration. Of course, such figures can only be approximate, the ration which animals do absorb depending on many contingencies, viz: appetite, activity of temperament, nature of work produced, proper selection and preparation of food, size of animals, etc, etc. Farmers knowing the average weight of their stock, and the elements of produce required, can thus make up an approximate ration in hay equivalents, by means of tables 2, 3 and 4.

(1) For most of the tables which follow, and for the general principles which may appear novel in this paper, I am indebted to Jules Crevat's book: "NOUVELLE MÉTHODE DE RATIONNEMENT," OUVRAGE COURONNÉ PAR "LA SOCIÉTÉ DES AGRICULTEURS DE FRANCE, 1885." Jules Crevat, in his work, refers to the following authorities, which he has consulted: Boussingault, Payen, Isidore Pierre, Reiset, Allibert, A. Samson, Barral, Magne, Grandeau, Parsez, Dumas, in France; Frankland, Lawes and Gilbert, A. Voelcker, in England; Liebig, Hanneberg, Stohmann, Crusius, Stoeckhardt, Mayer, Weekerlin, Haubner, Grouven, Voit, Pettenkofer, J. Kühn, E. Wolff, in Germany, &c.

This table, shows that one animal of 3,000 lbs. live weight;—or 90 animals of 10 lbs. each,—or 900 lbs. in the aggregate—; or 50 small animals, weighing 8 lbs. each, or 400 lbs. in all, &c., &c., consume exactly the same productive ration per day. Thus 50 young turkeys, of 8 lb. each may be made to gain half a lb. each per day, or 25 lb. of flesh, with the same ration exactly in equivalents, as would fat the immense ripe ox of 3000 lbs., gaining perhaps 3 lbs. a day. Again, in a large granary, 500 young mice would consume, per day, as much food as would fatten the above mentioned ox.

TABLE 2. FULL AVERAGE RATION OF ANIMALS OF VARIOUS WEIGHTS.

Live weight of animals in lbs.	Hay (equivalents)		Equivalents in number of animals and rations. Animals.	
	Per day lbs.	Per 100 lbs. live weight	Number.	Weight. lbs.
		lbs.		
10.000	146.2	1.46	Large.	Elephant.
3.000	65.4	2.18	1.00	3000
2.000	50.0	2.50	1.30	
1.000	31.5	3.15	2.08	2080
900	29.5	3.27		
800	27.1	3.39		
700	25 0	3 56	2.60	1820
600	22.4	3.73		
500	20.0	4.00	3.25	1625
400	17.1	4.27		
300	14.5	4.83	4.50	1350
200	10.7	5 35		
100	6.8	6.80		
90	6.4	7.05		
80	5.9	7.30	10.00	900
70	5.4	7.65	11.00	880
60	4.8	8.00	12.00	840
50	4.3	8.60		
40	3.7	9.20	15.20	760
30	3.1	10.18		
20	2.3	11.16	21.00	630
10	1.5	14.60		
9	1.4	15.30	43.33	433
8	1.3	15.80		
7	1.2	16.05	50	400
6	1 1	17.30		
5	0.93	18.60	60.	360
4	0.79	19.90	70.	350
3	0.67	22.50	82.	328
2	0.50	25 —	98.	294
1	0.32	31.50	130.	260
0.5	0.27	54.	205.	205
0.1	0.15	146.	242.	121
0.05	0.13	250.	436.	43.6
			500.	25.-

(*) The grass ration is computed at four times its weight in hay.

I have shown in connection with *table* I, what superior cows may be expected to do, either separately or in herds, per annum. It may be added that the worst milch cows give about double their own weight, or less, in twelve months. Thus the extreme figures, for the yield of milk per annum, are from twice to thirteen times their live weight, from the worst to the best milch cows. With these facts in mind, a farmer can easily find out, by weighing his milk at regular intervals during the year, how each individual animal in his herd ranks, and whether it is profitable or unprofitable to his owner.

Of course, the yield of milk does not depend exclusively on the milking qualities of the herd; the proper care of stock, the quality, quantity and intelligent preparation of the needed food will make all the difference in the world in the milk yield. In fact, the greatest knowledge and care are required to keep up a herd to a its highest possible achievements, especially where perfect economy is aimed at.

As to care, I would rank perfect, frequent milkings as the first of indispensible needs; then, cleanliness, pure air, water, and an abundance of light in the stables. Next comes a moderately warm temperature, where economy of food is aimed at. *Table* 3 shows the quantity of food consumed, for a simple maintenance ration, at various temperatures, ranging from 32° to 66° Fahr. It is there shown that 50% of the maintenance ration can either be saved or lost where animals are in a constantly changing temperature, and exposed to sudden cold, and even more than 50%, where frost enters the stable.

It should be added, however, that in a state of nature animals change their coat according to the season, and then the need of food to maintain life is not affected at all in the proportions given in table 3. But this natural protection does not affect our milch cows, which, if left to nature, would shrink at once in their milk as soon as the cold winds of the fall affected them.

Table 3.—MAINTENANCE RATION AT VARYING TEMPERATURES. (1)
(Calculated for animals of 1000 lbs live weight.)

TEMPERATURE		DIGESTIBLE		
Centigrade	Farenheit	Sugar	Protein	f
		lbs	lbs	
0°	32°	13.2	0.836	The quantity of food saved or lost is about 4 p. c. per degree centigrade, or about 2.2 per degree Farenheit.
5°	41°	11.4	0.720	
10°	50°	9.6	0.608	
15°	59°	8.0	0.506	
20°	68°	6.6	0.418	

(1) The mentioned ration for maintenance only, supposes an animal in perfect quietude. Where work is exacted, in the production of MILK or otherwise, a larger maintenance ration is required as will be explained further on.

As to food and its preparation, all dairymen admit that an abundance of sweet June grass, from the side hills if possible, is the best of food for the production of abundant milk. How to secure, during eleven months out of twelve, a ration equal to the June grasses becomes an important objective to all practical dairymen. We should have to deal with some of the most abstruse scientific principles for a full elucidation of the subject. But this is not the author's object. However, agricultural readers are now too far advanced and wide awake to doubt the usefulness of scientific principles, as applied to the feeding of stock. For the last fifty years, the proper selection and preparation of food have been made the constant study of learned practitioners. A set of rules of the highest usefulness have been thus secured. June grasses have been scientifically analysed, after exact returns in milk solids had, by numerous observations, been obtained. After careful analysis of such grasses, giving the contents of digestible and undigestible foods, most of the fodders, grains, cakes and varieties of food to be found on the farms, or in the food markets of the world, were compared, both in their digestible and undigestible forms, and very valuable tables prepared. But the last link seems now obtained,—through Jules Crevat's remarkable book,—giving us the exact proportions of solids, of sugar, of purely heat producing food, of digestible protein and fats required by animals, for the various animals products. We are also told in what proportion to feed and how to best prepare such foods in order to obtain, from them the largest amount of digestibility. From general tables lately published under the highest authorities of Europe, table 4 has been drawn up, showing the amount of normally digestible foods in most of the fodders, grains, grasses, etc., in use in Canada. The analysis of such foods, however, are of those from Europe, and may differ, even considerably, from the analysis of such as are grown here. Later on our various experimental stations in North America will no doubt give us exact information as to the amount of digestible food contained in our own fodders, etc., in their various condition of growth, soil, climate, etc., which will make the usefulness of such tables complete.

Table 4.—CHEMICAL ANALYSIS AND CONTENTS OF VARIOUS FOODS.

Proportion per 1000 lbs.

	NAME OF FODDER CROPS.	Dry substances.	Sugar.	Digestible protein.	Digestible fat.	Nutritive equivalent. (1)	Fertilising value per 2200 pounds consumed.
Dry fodder.	Good mixed hay	857	400	57	16	100	$ 7 40
	Aftermath "	850	423	86	16	82	8 80
	Red-clover	850	381	77	15	91	9 40
	Alsike "	840	327	102	22	81	9 60
	White "	835	339	100	24	80	10 40
	Vetches and oats	833	332	84	16	92	11 20
	Timothy 1st bloom	857	458	71	22	83	9 00
Green fodder.	Young pasture-grass	200	92	27	6	304	For fertilising value, count about ½ of dry fodder of the same kind.
	" ready to bloom	250	131	28	6	277	
	Timothy	300	163	24	8	236	
	Rye in bloom	240	104	22	5	320	
	Oats " "	190	83	16	3	432	
	Vetches in bloom	180	66	24	4	372	
	Pease " "	185	76	22	4	372	
	Buckwheat in bloom	150	64	17	4	451	
	Horse-beans " "	127	61	20	2	479	
	Red-clover " "	220	95	22	5	332	
	White " " "	195	72	24	5	352	
	Alsike " " "	180	63	22	4	397	
	Indian corn " "	180	106	10	3	444	
	" " ensilage	187	110	9	4	430	
	Sorghum	227	117	18	5	330	
	Artichoke leaves	200	98	27	7	284	
	Cabbages hearted	99	53	22	8	390	
Roots.	Potatoes	250	206	20	3	241	2 40
	Jerusalem artichokes	200	154	19	3	290	2 20
	Mangels	134	100	11	1	484	1 40
	Sugar-beets	185	154	9	1	381	
	Carrots	150	108	12	2	434	1 60
	Swedes	130	95	12	1	485	1 40
	Parsnips	200	130	20	4	307	2 20
	Leaves do do	200	95	26	8	286	

(1) The figures in this column must be understood to mean that *in a well balanced ration*, containing the right proportion of solids, of heat producers, flesh formers and fat,—or in other words, of sugar, protein and fat,—100 lbs. of meadow hay may be replaced by 82 lbs. of aftermath, or 96 lbs. of red clover, &c. &c. What is meant by a *well* balanced ration will be found explained further on.

(2) Protein is that matter in food which alone forms flesh, which neither heat formers nor fat can do. It has also the power of being transformed into heat formers and fat in proportions explained further on.

Grain, etc.						
Wheat	860	618	165	18	50	
Rye	857	674	106	19	59	8 40
Barley	857	639	92	23	66	7 60
Oats	857	557	107	53	57	8 20
Maize	856	621	93	60	50	7 20
Buckwheat	860	590	95	17	67	6 80
Pease	857	525	208	19	46	13 40
Horse beans	855	459	227	14	46	15 20
French beans	852	495	252	21	42	15 60
White beans	850	488	261	29	40	16 80
Vetches	857	458	253	28	41	15 20
Lentils	855	492	219	24	45	13 20
Linseed	817	196	187	337	25	13 65
do cake	885	373	249	88	36	17 60
Cottonseed decorticated do	899	274	305	98	33	27 00
Wheat bran	869	459	112	30	65	13 40
Pollard	887	509	179	40	48	0
Brewer's grains	234	106	36	4	252	3 20
Cummins	920	422	207	20	49	16 60
Wheat-germs free of flour	885	222	348	111	30	
Ground meat	885		728	120	18	
Cow's milk	127	40	40	40	163	
" " skimmed	100	42	41	8	260	
Butter-milk	100	44	1	10	256	
Whey	61	44	8	3	770	
Straw.						
Fall wheat straw	857	326	15	7	176	4 00
Rye "	857	298	11	6	201	4 00
Spring barley "	857	362	21	7	155	4 80
Oat	857	342	17	10	160	4 80
Vetches	840	290	38	5	153	6 60
Pease	840	340	36	5	142	6 40
Bean	840	342	61	6	114	8 60
Maize	850	367	16	6	162	
Clover-haulm	840	250	47	10	143	9 00

In order to more fully elucidate the various qualities of fodders and in common use the following *Table No.* 5 has been prepared. It shows the relative value of the three main elements of digestible food, viz: heat formers, protein—or albuminoids—and fat, the comparative value of each being as one for heat formers to five for protein and six for fat. And as good mixed meadow hay is considered as a complete food, the common price of such in the province of Quebec has been taken as a basis of comparison.

Having enunciated the subject so far, from general principles, let us see what has been obtained from milch cows, in the colder regions of the province of Quebec; on what food rich milk is thus obtained, in each of the twelve months in the year, and how such rations are prepared, in accordance with the above principles. We can thus better compare and appreciate the value of scientific European teachings, as applied to America, in its northernly regions.

18	50	
19	59	8 40
23	66	7 60
53	57	8 20
60	50	7 20
17	67	6 80
19	46	13 40
14	46	15 20
21	42	15 60
29	40	16 80
28	41	15 20
24	45	13 20
337	25	13 65
88	36	17 60
98	33	27 00
30	65	13 40
40	48	0
4	252	3 20
20	49	16 60
111	30	
120	18	
40	163	
8	260	
10	256	
3	770	
7	176	4 00
6	201	4 00
7	155	4 80
10	160	4 80
5	153	6 60
5	142	6 40
6	114	8 60
6	162	
10	143	9 00

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Table

Register No.	Day
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No. 5.—Comparation table of the value of various fodders, grain, &c.

AS FEED AND AS FERTILIZERS. (1)

VALUE PER LB.		HAY.												CORN.	
		Timothy 1st bloom.		Oats and Tares.		White Clover.		Alsyke Clover.		Red Clover.		Mixed Hay.		Large Ensilage Corn.	
	$ c.	lbs.	$ cts	lbs.	$ cts	lbs.	$ cts	lbs.	$ cts	lbs.	$ cts	lbs.	$ cts	lbs.	$ cts
Sugar	0.00½	45.8	0.23	33.2	0.17	33.9	0.17	32.7	0.17	38.1	0.19	40.0	0.20	11.0	0.06
Protein digestible	0.02½	7.1	0.18	8.4	0.21	10.0	0.25	10.2	0.26	7.7	0.20	5.7	0.15	00.9	0.03
Fat digestible	0.03	2.2	0.07	1.6	0.04	2.4	0.08	2.2	0.07	1.5	0.05	1.6	0.05	.4	0.02
Feeding value p. 100 lbs			0.48		0.42		0.50		0.50		0.44		0.40		0.11
" " " ton			9.60		8.40		10.00		10.00		8.80		8.00		2.20
Fertilizing value p. ton			9.00		11.20		10.40		9.60		9.40		7.40		
Total value			18.60		19.60		20.40		19.60		18.20		15.40		

VALUE PER LB.		ROOTS.												GRAIN.			
		Potatoes.		Fodder Beets.		Sugar Beets.		Fresh Beet Pulp from diffusion.		Carrots.		Sweedish Turnips.		Rye.		Barley.	
Sugar	0.00½	20.6	0.11	10.	0.05	15.4	0.08	3.3	0.02	10.8	0.06	9.5	0.05	67.4	0.34	63.9	0.32
Protein digestible	0.02½	2.0	0.05	1.1	0.03	0.9	0.03	0.4	0.01	1.2	0.03	1.2	0.03	10.6	0.27	9.2	0.23
Fat digestible	0.03	0.3	0.01	0.1	0.01	0.1	0.01	0.1	0.01	0.2	0.01	0.1	0.01	1.9	0.06	2.3	0.07
Feeding value p. 100 lbs			0.17		0.09		0.12		0.04		0.10		0.09		0.67		0.62
" " " ton			3.40		1.80		2.40		0.80		2.00		1.80		13.40		12.40
Fertilizing value p. ton			2.40		1.40				0.60		1.60		1.40		8.40		7.60
Total value			5.80		3.20				1.40		3.60		3.20		21.80		20.00

VALUE PER LB.		GRAIN AND PULSE.													
		Oats.		Indian Corn.		Buckwheat.		Peas.		Tares.		Horse Beans.		White Beans.	
Sugar	0.00½	55.7	0.28	62.1	0.32	59.0	0.30	52.5	0.27	45.8	0.23	45.9	0.23	48.8	0.25
Protein digestible	0.02½	10.7	0.27	9.3	0.24	9.5	0.24	20.8	0.52	25.3	0.64	22.7	0.57	26.1	0.66
Fat digestible	0.03	5.3	0.16	6.0	0.18	1.7	0.06	1.9	0 06	2.8	0.09	1.4	0.05	2.9	0.09
Feeding value p. 100 lbs			0.71		0.74		0.60		0.85		0 96		0.85		1.00
" " " ton			14.20		14.80		12.00		17.00		19.20		17.00		20.00
Fertilizing value p. ton			8.20		7.20		6.80		13.40		15.20		15.20		16.80
Total value			22.40		22.00		18.80		30.40		34.40		32.20		36.80

VALUE PER LB.		VARIOUS FEEDS.													
		Linseed.		Cotton Seed Meal.		Linseed Cake.		Wheat Bran.		Middlings.		Spent Grains.		Malt Germs.	
Sugar	0.00½	19.6	0.10	27.4	0.14	37.3	0.19	45.9	0.23	50.9	0.26	10.6	0.06	42.2	0.22
Protein digestible	0.02½	18.7	0.47	30.5	0.77	24.9	0.63	11.2	0.28	17.9	0.45	3.6	0.09	20.7	0.52
Fat digestible	0.03	33.7	1.02	9.8	0.30	8.8	0.27	3.0	0.09	4.0	0.12	0.4	0.02	2.0	0.06
Feeding value p. 100 lbs			1.59		1.21		1.09		0.60		0.83		0.17		0.80
" " " ton			31.80		24.20		21.80		12.00		16.60		3.40		16.00
Fertilizing value p. ton			13.60				17.60		14.40				3.20		16.60
Total value			45.40				39.40		26.40				6.60		32.60

COW'S MILK. STRAW.

Total value			5.80		3.20				1.40		3.60		3.20		21.80		20.00		

GRAIN AND PULSE.

VALUE PER LB.		Oats.		Indian Corn.		Buckwheat.		Peas.		Tares.		Horse Beans.		White Beans.	
Sugar	0.00½	55.7	0.28	62.1	0.32	59.0	0.30	52.5	0.27	45.8	0.23	45.9	0.23	48.8	0.25
Protein digestible	0.02½	10.7	0.27	9.3	0.24	9.5	0.24	20.8	0.52	25.3	0.64	22.7	0.57	26.1	0.66
Fat digestible	0.03	5.3	0.16	6.0	0.18	1.7	0.06	1.9	0 06	2.8	0.09	1.4	0.05	2.9	0.09
Feeding value p. 100 lbs			0.71		0.74		0.60		0.85		0 96		0.85		1.00
" " " ton			14.20		14.80		12.00		17.00		19.20		17.00		20.00
Fertilizing value p. ton.			8.20		7.20		6.80		13.40		15.20		15.20		16.80
Total value			22.40		22.00		18.80		30.40		34.40		32.20		36.80

VARIOUS FEEDS.

VALUE PER LB.		Linseed.		Cotton Seed Meal.		Linseed Cake.		Wheat Bran.		Middlings.		Spent Grains.		Malt Germs.	
Sugar	0.00½	19.6	0.10	27.4	0,14	37.3	0.19	45.9	0.23	50.9	0,26	10.6	0.06	42.2	0.22
Protein digestible	0.02½	18.7	0.47	30.5	0.77	24.9	0.63	11.2	0.28	17.9	0,45	3.6	0.09	20.7	0.52
Fat digestible	0.03	33.7	1.02	9.8	0.30	8.8	0.27	3.0	0.09	4.0	0.12	0.4	0.02	2.0	0.06
Feeding value p. 100 lbs			1.59		1.21		1.09		0.60		0,83		0.17		0.80
" " " ton			31.80		24.20		21.80		12.00		16.60		3.40		16.00
Fertilizing value p. ton.			13.60				17.60		14.40				3.20		16.60
Total value			45.40				39.40		26.40				6.60		32.60

COW'S MILK.

VALUE PER LB.		Natural.		Skimmed.		Whey.
Sugar	0.00½	4.	0.02	4.2	0.03	4.4	0.03
Protein digestible	0.02½	4.	0.10	4.1	0.11	0.8	0.02
Fat digestible	0.03	4.	0.12	0.8	0.03	0.3	0.01
Feeding value p. 100 lbs			0.24		0.17		0.06
" " " ton			4.80		3.40		1.20
Fertilizing value p. ton.							
Total value							

STRAW.

VALUE PER LB.		Winter Wheat.		Barley.		Oats.		Winter Rye.	
Sugar	0.00½	32.6	0.17	36.2	0.19	34.2	0.18	29.8	0.15
Protein digestible	0.02½	1.5	0.04	2.1	0.06	1.7	0.05	1.1	0.03
Fat digestible	0.03	0.7	0.03	0.7	0.03	1.0	0.03	0.6	0.02
Feeding value p. 100 lbs			0.24		0.28		0.26		0.20
" " " ton			4.80		5.60		5.20		4.00
Fertilizing value p. ton.			4.00		4.80		4.80		4.00
Total value			8.80		10.40		10.00		8.00

STRAW.

VALUE PER LB.		Tares.		Peas.		Horse Beans.		Indian Corn.		Clover Haulms.		Dried Meat.	
Sugar	0.00½	29.0	0.15	34.0	0.17	34.2	0.18	36.7	0.19	25.0	0.13		
Protein digestible	0.02½	3.8	0.10	3.6	0,09	6.1	0.16	1.6	0.04	4.7	0.12	72.8	1.80
Fat digestible	0.03	0.5	0.02	0.5	0.02	0.6	0.02	0.6	0.02	1.0	0.03	12.0	0.36
Feeding value p. 100 lbs			0.27		0.28		0.36		0.25		0.28		2.16
" " " ton			5.40		5.60		7.20		5.00		5.60		43.20
Fertilizing value p. ton.			6.60		6.40		8.60				9.00		
Total value			12.00		12.00		15.80				14.60		

(1) This table is mainly republished from Jules Crevat's Book. The feeding values are taken from the average market prices in this province paid for hay, at $9.00 a ton. The fertilizing values are estimated according to the wholesale prices of similar fertilizers in the market but suppose that no particle of the animal droppings is wasted.

Table 6.—MILK RETURNS ETC., FROM CANADIAN-JERSEY COWS

(registered)

FROM DECEMBER 1888 TO NOVEMBER 1889.

Register No.	DATE. Birth. Day	Mth	Yr.	Last calving. Day	Mth	Yr.	AGE. Years	Mths.	lbs. of milk per day per cow 1889. May.	Nov.	Live weight of animal	Proportion of Jersey blood	Total lbs. of milk obtained from the whole herd. Month.	No of cows milk.	Total lbs.
											lbs.				
16	16	3	1887	9	4	1889	2	1	22	13	594	7/8	Decem. 1888	3½	1567
19	22	3	1885	22	12	1888	3	8	38	.....	713	7/8	Janua. 1889	4	2493
15	15	1	1886	16	1	1889	3	....	41	14	815	7/8	February..	4	3258
17	4	5	1885	31	3	1889	3	10	37	19	598	7/8	March	6½	4696
21	27	3	1885	15	3	1889	4	....	41	17	623	7/8	April	11	7964
13	27	3	1885	11	3	1889	4	....	36	22	713	7/8	May	12	8686
18	2	4	1884	20	4	1889	5	....	45	18	722	7/8	June.....	12	8752
14	2	6	1883	3	2	1889	6	....	41	18	645	7/8	July.....	12	8819
22	2	5	1883	10	3	1889	6	....	40	21	693	7/8	August	11	8645
12	12	5	1882	15	3	1889	7	....	42	.....	776	7/8	September.	11	8338
11	6	6	1882	14	7	1888	7	....	22	18	887	7/8	October....	11	7145
				24	6	1888		....			688	—	Novem.ber..	10	5425
10			1879	9	10	1889	10	....	18	29					
											8467				75,788 lbs.
											*705				

We have in *Table 6*, the exact yield of a herd of twelve head, six of which were too young to count as matured animals. In fact, this herd hardly represents 10 adult cows, although I allow that number, making the average 7578 lbs. of milk per annum, per *matured* cow.

Table 7 shows what was the average ration per day, and what its cost would be with most farmers. It also shows the profit and loss account, taking milk at the low average price of 1 cent per lb through the year, and allowing the manure—liquid and solid which, with us, is all saved—to go as a fair compensation against the labor account.

(*) This average may be a little low, the cows having been weighed but once and under special circumstances.

Table 7.—PROFIT AND LOSS ACCOUNT FOR HERD, 1888-1889.

The exact cost of the winter ration for 210 days averaged per cow (see details below. See foot note (1).	$	18 38
The cost of green food for 155 days in summer, was estimated at $10 per cow, being the full crop value of such meadows, etc..	$10 00	
to which add the cost of 3 lbs of bran per day, actually paid..	3 26	
		13 26
Total cost of food	$	31 64

(1) The rations have varied, at different times, from uncontrollable circumstances. They were, from November 1888, to 20th of March 1889 composed as follows, per day per cow.

10 lbs Common meadow hay finely chaffed (450 lbs per day for 46 heads.
13½ " Ensilage..... (612 " " "
36 " straw finely chaffed
50 " Cotton seed meal } made into a warm mash and given to 30 milking cows.
50 " Bran.

After the 20th of March, the ensilage having given out was replaced by 50 lbs Cotton seed meal and 30 lbs of bran to the 46 animals.

This winter (1890) the Canadian-Jersey receive :

25 lbs Ensilage at	$ 2.50 a ton	=	3c.12.
5 " Hay at	8.00 a ton	=	2c.
36 " Straw at	4.00 a ton	= 7.2	
75 lbs Cotton seed meal	25.00 a ton	= 94.	
50 " Bran	14.00 a ton	= 35.	
fed to 22 milch cows of various breeds, size etc., or per cow.			6.20
Average cost of ration per day, for cows in milk.....			11c.32.

At the following prices : hay, $8 a ton ; straw, $4 ; ensillage, $2.50 ; cotton seed. meal $25 and bran at $14, the winter rations for the herd of milking cows averaged about 9c. a day, the first winter, and now, with *increased feed*, as above, the ration costs 11c. 3 per day.

The estimate of 1 c per lb for milk, the year round, takes in the value of butter and cheese of the best quality, and also the value of skimmed milk or whey for feeding purposes. Most, if not all farmers in Canada, are in a position to average at least that much with their milk, no matter how distant they may be from a good market. But for all who reside in the proximity of a town or city, milk will sell for fully double that price, winter milk selling generally from 5 to 8 cents per quart of 2½ lbs, according to locality, &c.

The account therefore stands thus :

7500 lbs milk at 1 cent	$75 00
Food consumed	31 64
Net profit per cow (2)	$43 36

(2) It should be stated here that this herd had been poorly cared for until it was placed, in October 1888, under the special care of the Reverend Sisters of the Sacred Heart Hospital, at Quebec. Here, arrangements were made by which the cows were thoroughly milked, even three times a day when needed, and the food and milk weighed very carefully, the latter at each milking, throughout the year, and an official return made monthly to the Departement of Agriculture, at Quebec. The improvement still going on can best be judged from the milk returns obtained in the ten months previous to registration in the Golden Register of milk cows for the province of Quebec.

Table 8.—OFFICIAL RETURNS, FROM 10 JERSEY CANADIAN COWS IN 10 MONTHTS.

NAMES.	No. in register.	Date of birth.	Last calving but one.	Last calving.	Weeks giving milk.	Lbs. milk a day.			Lbs. milk in the 10 mo'ths following last calf.	REMARKS.
						Max.	Min.	Average.	Max. & Min.	
Rioters' B. Montcalm I	19	June /82	14/7/88	4/4/90	88	57	18	37	11,100	Gave 9 lbs. milk day before calving, after 22 months constant milking.
Rioters' Brodeur de Varenne I	22	May /82	15/3/89	12/10/90	81	46	19	32	9,600	
Reine Fléchée de St L.	18	27/3/85	10/3/89	24/7/90	70	42	25	33	9,900	
Rioters' B. Montcalm II	20	21/6/83	3/2/89	28/3/90	53	40	14	27	8,100	
Reine Malo de St L. II	9	15/1/86	16/1/89	30/1/90	52	41	10	25	7,500	
Rex "Rex" Rioter	32	16/3/87	9/4/89	22/5/90	55	41	18	29	8,700	410 lbs. in 10 cons. days.—15 lbs. day before last calving
Rex Rioters' Bretonne I	14	2/4/84	25/4/89	10/5/90	54	46	16	31	9,300	
Rex Rioters' Bretonne II	13	22/3/85	22/12/88	30/12/89	52	43	27	35	10,500	
Reine de St Lambert	12	12/4/85	15/3/89	4/3/90	50	35	10	22½	6,750	
Rioters' Brodeur de V. I	21	2/5/83	11/3/89	1/6/90	53	43	19	31	9,300	395 lbs in ten cons. days.
Medée	182									350 lbs. in ten cons days—first known date of calving: 27 Sept. 1890.

Certified agreeably to the record showing the weekly yield of the cows of the Hospital of the Sacred-Heart, Quebec.

(Signed) Sr. Ste. Anne.

QUEBEC PROVINCIAL GOLDEN REGISTER OF MILCH COWS.

CERTIFICATES OF ENTRIES.

The cows bearing the numbers 19, 22, 18, 20, 9, 32, 14, 13, 12, 21, in the Herd-book (Jersey-Canadian section), and No. 182 of pure-bred Canadians, are entered in the Golden register.

All the undermentioned animals are the property of the Rev. Ladies of the Hospital of the Sacred-Heart, at Quebec.

(Signed) S. LESAGE, President.
J. A. COUTURE, Secretary.

On a further examination of *table* 6, it may be observed that from April to October no fresh cows came in, although the yield was remarkably uniform and large. This is the more striking since the herd had not the advantage of fresh pastures, having been stall-fed the whole summer. The full herd numbered 26 heads, and the number of acres under cultivation—inside the city limits of Quebec—do not exceed 14 in all, which supplied about 100 tons ensilage for winter feed, besides the summer food, as above.

This herd is stall-fed the year round. For seven months out of twelve the cows are tied to a stanchion all the time, except at calving, when they are allowed the range of a comfortable box, for from one to three weeks, this being the average time these cows go dry. As soon as the after birth has come away, the cow goes back to her stanchion (1).

When the warm weather comes, the cows are allowed an airing in the sun of about two hours in all per day. In the heat of summer they are turned out early in the morning. When colder weather sets in, about September, they go out at noon, and early in October—generally, in Quebec,—they take to their winter quarters entirely, until late in May.

In the summer and fall, of 1889 they had to provide temporarily for their stock and used a shed roofed in and entirely opened on both sides. This answered very well until the September winds and rains prevailed, when the cows suddenly shrank greatly in milk, and thus continued until late in October, when their winter quarters were made ready; proving that in such climate as Quebec, heavy milking cows need full protection from the weather as soon as the wet fall-weather sets in.

(1) The calf is removed immediately after birth, before the cow has seen or perhaps even heard it, and thenceforth is entirely hand-fed.

Crops for soiling—How situated (1).

Crops for soiling, being watery, are heavy to carry, containing as they do about three times as much water as those grown to maturity, or for hay, &c. It is therefore indispensable to grow such crops in a special rotation, and in such fields as immediately surround the stables. In the Quebec Herd above mentioned the bull and milking cows are stabled perhaps for 22 hours out of 24, and, to be profitable, every comfort, such as thorough cleanliness, light, ventilation, pure water, and every convenience for feeding, milking and stable cleaning—besides proper husbanding of all droppings—must have been provided for, in order to reduce to a minimum the amount of manual and other labor required, and of possible loss.

After mature consideration, and several years of experimental work in this direction, I have adopted a special rotation for soiling crops, as follows:

First year: Maize—of a variety *sure to mature* in our climate, and sown—according to its height, very much as if grown for seed, and only when the ground is thoroughly warmed up, viz: when the white oak is coming well into leaf;—if possible, on a rich meadow lea, well manured, early in the previous fall and to which about 300 lbs. of plain superphosphate per acre has been added, to hasten and enrich the crop in solids. If the season has been favorable, a light crop of grass, from 10 to 12 inches high, is cut and fed, or ensiled, the plough started, followed immediately by the *acme* or the spading harrow, and, if possible again, the corn sowed in rows, but on the flat—*the same day as ploughed* (2).

This maize is neither fed nor ensiled until the ears are fairly well glazed. The cultivation in the mean time—done entirely with horses, mostly with the smoothing harrow—is thoroughly carried on, in order to keep the soil perfectly clean and aerated, until the crop allows no more interference with it.

As soon as the crop is removed, the land is carefully fall ploughed and treated to from 8 to 10 bushels of quick lime per acre, put into small heaps

(1) The following article, by the same author, is here reproduced from his previous writings, but with some considerable additions. It explains more fully the exact system followed out in summer, in the feeding and care of the above mentioned herd and can therefore be recommended to farmers in general.

(2) With our frequent droughts, we think it advisable to sow the superphosphate *on growing grass* in the fall, in order to secure its more perfect solubility for the coming corn crop.

covered with earth, and finally when entirely pulverised, shovelled over the whole field (1).

2nd Year.—As soon as the soil is fit, in the spring, four to five bushels, of a mixture,—of oats and rye (half and half), and tares and peas (half and half)—is sown, thorougly harrowed in over this, and 15 lbs. of mixed red clovers are *bushed* in and rolled,—if light land and *pressed* down with the *acme harrow and leveller*,—if heavy soil, likely to cake (2). This crop is used for food, or ensiled, as soon as necessary, and *always* carried away entirely before the crop can possibly get laid and rot at the bottom; this is in order to have better food, and save clover killing. In good time a second crop, mainly clover, is carried away to the stock, or to the silo, the same season. As soon as this second crop is carried away, a half dose of manure—or more, if the soil be not sufficiently rich—is given, with the Kemp manure distributor.

3rd Year.—Three cuttings of clover, in order to obtain rich, palatable food, by no means woody and over fibrous. A more or less heavy coat of manure is given in the fall, with 200 lbs. of plain superphosphate to the acre, after the last cutting is removed.

4th Year.—A light crop of early grass being removed—maize follows,—exactly as above (see 1st year).

5st Year.—A mixture of seeds,—oats, rye, tares and peas—exactly as in the 2nd year, the clover seed being here replaced by 25 lbs. of the best hay seed mixture, according to the nature of the soil; but without any red clovers, this, to avoid clover *sickness* in the future.

6th, 7th and 8th Year.—Mixed grasses—cut *thrice* each season, and manured, more or less heavily, every second year at the latest.

I count that good land so treated should feed two cows and produce from 14,000 to 15,000 lbs. of milk, per acre, provided from 4 to 5 lbs. of good straw, finely chaffed be mixed with the green food every day, and about 1250 lbs. of

(1) In most parts of the province of Quebec, lime is found wanting, and therefore should be added, as above, once in six years or so. Lime, moreover, acts as a disaggregator of solubility in the soil and, as such, is most beneficial.

(2) Drayner's spade harrow is the best implement we know of to prepare the soil after the plow. It has 156 cutting edges and can mellow any soil. We recommend it highly.—Ed. A. B.

cotton seed meal and 350 lbs. of bran be added per annum, per cow (1) I must say here that I *want* cows to give the largest possible percentage of rich milk, with a minimum expenditure of the necessary food, and therefore, I act accordingly.

But let me say, here again, that to make soiling profitable, (1st) proximity to the stables, (2nd) thorough cultivation, (3rd) heavy manuring, (4th) systematized, intelligent, persevering labour are indispensable. Under these conditions, soiling means heavy cash returns, provided the produce—be it calves, pork, poultry, and milk, butter or cheese—be properly managed as well. Successful soiling, also, means the production and proper husbanding of an abundance of farm manure, which will grow—besides soiling crops—heavy crops of grain, roots, hay, etc., provided too much grain cultivation and too scanty manuring be not attempted on that portion of the farm.

Farmers may ask where all the farm manure mentioned above will come from. The answer is plain: From your cows, provided all the droppings, solid and liquid, be saved and properly utilized and provided the cows be sufficiently fed with some purchased food, such as bran, cotton seed meal, etc.

Knowing now how this herd was cared for, how much milk it gave and on what rations, let us compare such rations with what cows are supposed to obtain on the best June pastures. Taking an average herd of good cows, calved some time during the winter months, the average quantity of milk yielded on such pastures is from 20 to 30 lbs. per day.

(1) With us, the food elements in bran cost more than in cotton-seed meal, and hence the latter is used, mainly, in preference. However, a mixture of both is highly recommended, as more appetizing and thus better digested. In all cases, farmers should study out the comparative food constituents to be found in table 4 and 5, observing, however, that sugar, or purely heat producers, is abundant in nature and generally much cheaper than the proteins and fats. As a rule, sugar is counted as representing 1, whilst protein counts as 5, and fat as 6.—(See table 5.)

Table 9.—BASIS FOR A MILK PRODUCING RATION.

—	Dry matter.	Sugar.	Digestible.	
			Protein.	Fat.
	lbs.	lbs.	lbs.	lbs.
39.5 lbs. Hay contain	26.9	12.60	1.79	0.496
126.0 " June grass or 4 times the weight of hay	25.2	11.59	3.40	0.756
On the other hand, it has been proved by the highest authorities on such matters, that an average cow weighing 1,000 lbs. live weight requires for a full maintenance ration from 2% to 4% dry matter and	.....	10.00	0.70	0.20
That to the maintenance ration must be added the elements of milk, which for 10 lbs., amount to	.....	0.40	0.40	0.40
And for 20 lbs. more, or 30 lbs. in all, amount to (see table 4	.....	0.80	0.80	0.80
		11.20	1.90	1.40

Referring now to *table* 2, it is there shown that an animal of 1000 lbs. live weight can absorb, on an average, about 31.5 lbs. of hay equivalents for a full ration, or 126 lbs. of grass, computing grass at one-fourth its weight in hay. By referring to *table* 4, the details contained in the following table will be found exact.—(See table 10).

Now, if we compare the June grass ration as above with the scientific ration, we find that the proportion of dry matter and sugar fully agree. But apparently, the protein of the grass ration is in excess by 1.50 lbs. whilst the fat seems short by 0.644. However, science teaches us also that protein can be changed into fat, and is actually so changed—according to the requirements of the animal, in the proportion of 1 of protein to 0.485 of fat. Therefore, by transforming the excess of 1,50 of protein into 0.727 of fat, and adding this to the .756 already mentioned, we have for the June grass ration:

Dry matter: 2.5% of live weight.
Protein used as such: 1.90.
Total fat: 1.48.

showing that the full June grass ration should produce about 30 lbs. of milk, without any loss of flesh.

Before closing this paper, it is necessary to note down a few simple rules, of great importance however in the rational feeding of milch cows:

1o Sugar or purely heat producing food should never be fed in excess of

the requirements of the animals, as it is then more than useless—having to be *burnt out* and washed out of the animal system by the absorption and evaporation of 6.13 lbs. of water for every lb. of sugar thus uselessly absorbed. (1)

2o The protein of the ration can replace heat producers in the proportion of 100 to 139; that is 1 lb. of protein can be counted in the ration as equal to 1.39 of heat producers.

3o As stated above, protein can replace fat in the proportion of 1 of protein to .485 of fat.

4o Fat also can be made to replace heat producers, in the proportion of 1 of fat to 2.76 of sugar; but fat can, in no ways, replace protein.

5o Sugar can neither replace protein nor fat, and therefore as emphasized before, all excess given in the food is more than a waste: it is positively injurious.

6o Phosphates are indispensable to milch cows and must be fed, either by means of fodder rich in phosphates, such as bran, cotton seed meal, etc., or directly, in the form of *bone meal*. A cow giving 35 lbs. of milk requires in its food 60 grammes or about 2 oz. of phosphate of lime, and about 8/10 of an oz. of common salt, per day, besides other salts, such as potash, etc., which are generally found in all fodders.

It may be observed, in table 7, how deficient in digestible elements the hay ration is when compared with four times its weight of rich June grasses. This fully explains why cows may on grass give large returns in milk, and even gain in weight, whilst it is next to impossible to produce much milk on dry hay alone.

We have seen what a full ration of June grass should produce in milk, and the theory on which such returns are based. Let us now show how the winter rations of the Quebec herd compare with the June grass rations.

(1) This has been demonstrated by the well known experiments by Allibert, in France. Dogs, in similar conditions, were put into separate kennels. One lot was fed on sugar and water, whilst the other lot was kept without food or water. Yet the latter lived several days longer than those having all the sugar and water they would absorb.

Table 10—FULL RATION OF A CANADIAN-JERSEY HERD (1889) Weighing about 725 lbs.

Table 10—FULL RATION OF A CANADIAN-JERSEY HERD (1889) Weighing about 725 lbs. average.

Daily ration.	Solids (1).		Sugar (1).		Digestible protein (1).		Digestible fat (1).	
		lbs.		lbs.				
10 lbs. hay	$\frac{857 \times 10}{1000}$	= 8.57	$\frac{400 \times 10}{1000}$	= 4	$\frac{57 \times 10}{1000}$	= 0.57	$\frac{16 \times 10}{1000}$	= 0.16
13.1 Ensilage	$\frac{187 \times 13.3}{1000}$	= 2.48	$\frac{110 \times 13.3}{1000}$	= 1.46	$\frac{9 \times 13.3}{1000}$	= 0.12	$\frac{4 \times 13.3}{1000}$	= 0.04
1.2 Straw	$\frac{857 \times 1.2}{1000}$	= 1.02	$\frac{342 \times 1.2}{1000}$	= 0.41	$\frac{17 \times 1.2}{1000}$	= 0.02	$\frac{10 \times 1.2}{1000}$	= 0.01
1.66 Cotton Seed Meal	$\frac{899 \times 1.66}{1000}$	= 1.49	$\frac{274 \times 1.66}{1000}$	= 0.45	$\frac{305 \times 1.66}{1000}$	= 0.50	$\frac{98 \times 1.66}{1000}$	= 0.16
1.66 Bran	$\frac{869 \times 1.66}{1000}$	= 1.44	$\frac{459 \times 1.66}{1000}$	= 0.76	$\frac{112 \times 1.66}{1000}$	= 0.18	$\frac{30 \times 1.66}{1000}$	= 0.05
		15.00		7.08		1.39		0.42
Normal ration for 1000 lbs. " " " 725 " (2) and giving 20 lbs. of milk a day, on an average.	2% = 15.00		10.80 less 20%	= 8.64	1.50 less 20%	= 1.20	1.00 less 20%	= 0.80

1) The figures on the left in these columns show how to calculate the right proportion of solids, sugar, digestable protein and fat by referring to the contents of the various foods given in table 4 page 107.

(2) Table 2, page 6, shows that the ration for animals weighing 725 is about 20% less than for 1000 lbs. animals.

Referring again to table 2, it is there shown that animals weighing 725 lbs. require 20% less, for their full productive ration, than animals of 1000 lbs. At the foot of table 8 it will be seen what a normal ration for our our stock should have been. According to these figures, however, our rations appear short; but in looking back to *table* 3, it is there seen that fully 3 lbs. of sugar and 0.190 of protein are saved by having the stables at 63° instead of 45°. We aim to have 60° on an average all the winter. Adding therefore this saving on heat and flesh producers to our rations, it will be shown that they fully agree with the theory given above.

Something is also gained, most decidedly, by the preparation given to our food, which is cut up fine, mixed up appetisingly, and warmed; whilst a *normal* food is merely the average of naturally prepared food such as hay, without chaffing, softening it with hot water, &c.

My aim has been all through this paper to be concise, and practical, and sufficiently plain to be useful to all intelligent, progressive farmers. By following the rules given, cows can be fed more economically than was general, thus far, and they may be made to produce an abundance of rich milk the year round. Table 8 even shows how the necessary calculations for the preparation of any required ration may be made in connection with table 4. The author therefore hopes that this paper will be found to contain a concise account of the principles on which the care and feeding of milch cows depend, which, if closely followed, may cause very considerable economy in food, and increase of production in milk, in most of the cow stables of Canada and America.

ED. A. BARNARD.

P. S.—The above paper, on the Rational Feeding of Milch Cows was forwarded to Sir John B. Lawes for his appreciation. His answer shows clearly that up to that time "WE HAD NO ACTUAL STANDARD TO MESURE THE FOOD." He adds: "I have very little opinion in regard to the importance of what is called THE NUTRITIVE RATIO."

To this letter was added the following table showing the quantity of milk given on an average by about 50 short horns, their weight and their ration.

The results given below show that Sir John B. Lawes' herd gave exactly the return in milk which the ration according to Jules Crevat's rules should produce. This is a most important showing in confirmation of the principles enunciated above.

ROTHAMSTED DAIRY (of about 40 to 50 Shorthorn cows). *Average yield of milk per head per day for 6 years.*

	Lbs.
January	20.31
February	21.81
March	24.19
April	26.50
May	31.31
June	30.51
July	33.56
August	25.00
September	22.94
October	21.00
November	19.19
December	23.51
Mean	23.51

The cows are in pasture about six months, May until November, but receive cotton cake, in a shed the remaining six months and consume the following food per head:

		Approximative cost.
Cotton cake	4 lbs.	5 cents.
Bran	3½ "	2
Hay chaff	3.6 "	3.6
Oat straw chaff	7.2 "	3.6
Mangels	51. "	10.2
		24.4 cents. (1)

Weight of cows: 1200 lbs.

The daily food calculated in the dry state amounts to 25 lbs. 70, or calculated upon an animal weighing 1000, 20 lbs. On an average 46 1/7 weeks, gave 756 gallons of milk per cow, or 7509 lbs. or 24.2 lbs. per head per "milking" day.

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(1) We here add what we suppose may be the cost of such food at Rothamsted.—ED. A. BARNARD.

Quebec, May 10th 1890.

SIR J. B. LAWES, Bart., Rothamsted, England.

Dear Sir,—Allow me to state the pleasure you so kindly conferred upon me, by your letter just received.

I myself never could make much of the so called: nutritive ratio. Your figures giving the milk returns and exact food of your Rothamsted dairy will prove particularly valuable to me, and to your numerous American readers.

I was anxious to compare your statement with the theory of Jules Crevat's book on the "Rational feeding of stock" (French) as contained in the printed notes I had the honor of sending you lately. The results of such comparison may prove interesting, bringing out, as they do, in a most favorable manner, the exactness of Crevat's theory. He recommends, for a cow of 1200 lbs. weight for a full maintenance ration:

	Dry matter.	Sugar.	Digestible proteine.	Digestible fat.
From 2 to 4		11.20	0.79	0.22
To which must be added the chemical elements of about 20 lbs. of milk for your six winter months		0.80	0.80	0.80
Giving a total according to Crevat, of.....		12.00	1.59	1.02

Now, taking the chemical digestible contents of your rations, according to the table I sent you, we have:

	Dry matter.	Sugar.	Digestible proteine.	Digestible fat.
4 lbs. cotton cake.....	3.596	1.096	1.220	0.392
3½ " bran.....	3.041	1.606	0.392	0.105
3.6 " hay chaff.....	3.085	1.400	0.199	0.056
7.2 " oat straw chaff.....	6.170	2.462	0.122	0.072
51 " mangels.....	6 834	5.200	0.572	0.052
Actual ration	22.726	11.764	2.505	0.677
Theoretical ration.....	.....	12.000	1.590	1.020
Difference.....	.....	—0.236	+0.915	—0.343
Which is equalized by transforming 0.915 of protein into fat (x.485) or.....				+0.437
				+0.094
Now transforming this surplus of +0.594 of fat into sugar (x.272) gives in sugar.....		+9.257		
Leaving a surplus of sugar of.....		+0.021		

Thus making your actual ration exactly equal to the theoretical ration according to Crevat.....

Thanking you again for your great kindness in helping my studies on this difficult problem and the encouragement I gather from your precious letter.

Believe me, Dear Sir John,

Your most respectfully,

ED. A. BARNARD.