EXPERIMENTAL FARMS.

REPORTS

OF THE

DIRECTOR - - - - - -	WM. SAUNDERS.
AGRICULTURIST - - - - -	JAS. W. ROBERTSON.
HORTICULTURIST - - - - -	JOHN CRAIG.
CHEMIST - - - - - -	F. T. SHUTT, M.A.
ENTOMOLOGIST and BOTANIST - - -	JAS. FLETCHER.
POULTRY MANAGER - - - - -	A. G. GILBERT.
SUPT. EXPERIMENTAL FARM, Nappan, N.S. -	WM. M. BLAIR.
do do Brandon, Manitoba.	S. A. BEDFORD.
do do Indian Head, N.-W.T.	ANGUS MACKAY.
do do Agassiz, B.C.	THOS. A. SHARPE.

FOR

1890.

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1891.

APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS.

OTTAWA, 10th February, 1891.

SIR,—I have the honour to submit for your approval my report relating to some portions of the work which has been done during the past year at the Central Experimental Farm in Ottawa, with brief references to that which has been accomplished at the the branch Experimental Farms in different parts of Canada.

You will also find appended Reports from the following officers of the Central Experimental Farm: From the Agriculturist, Mr. Jas. W. Robertson; from the Horticulturist, Mr. John Craig; from the Chemist, Mr. Frank T. Shutt, and from the Entomologist and Botanist, Mr. James Fletcher; also from the Poultry Manager, Mr. A. G. Gilbert. Accompanying these are reports of progress from Mr. Wm. M. Blair, Superintendent of the Experimental Farm for the Maritime Provinces at Nappan, Nova Scotia; from S. A. Bedford, Superintendent of the Experimental Farm for Manitoba, at Brandon; from Mr. A. Mackay, Superintendent of the Experimental Farm for the North-West Territories, at Indian Head; and from Mr. Mr. Thos. A. Sharpe, Superintendent of the Experimental Farm for British Columbia, at Agassiz.

These Reports are very full of information on many topics of special interest to farmers and fruit growers, since they cover almost all departments of agriculture and horticulture. They are submitted with the hope that they may be helpful to all those engaged in cultivating the soil, and that they may contribute towards the furthering of the great agricultural interests of the Dominion.

A Report will also be found attached to that of the Horticulturist, from a joint committee of prominent fruit growers from the Fruit Growers' Association of Ontario, and the Montreal Horticultural Society, who were invited, under your instructions, to examine the fruit plantations at the Central Experimental Farm, and to enquire into the merits of some of the new seedling fruits growing there.

I have the honour to be, Sir,

Your most obedient servant,

WM. SAUNDERS.

The Honourable
The Minister of Agriculture,
Ottawa.

ANNUAL REPORT

ON THE

EXPERIMENTAL FARMS.

REPORT OF THE DIRECTOR.

The importance of continued experimental work in agriculture is recognized by thoughtful men in every civilized country, and State and Government aid to carry on the work is now liberally given, for it is generally admitted that from oft-repeated experiment the largest part of our most useful and accurate knowledge of agricultural subjects has been derived. It is also undeniable that many of the best agricultural products now in cultivation are the result of skilful experiments in the line of selection or of cross-fertilization, or both combined, and equally true that the products, thus somewhat artificially raised by unusual care to a position of high estimation have, when relegated to the hands of the average farmer, gradually deteriorated. There are but few varieties of grain, roots or other farm productions that were in general cultivation fifty years ago which still hold their place in the farmers' estimation; most of them have enjoyed but a short-lived popularity, and given place to varieties having greater vigour, greater productiveness or better quality. A large proportion of agricultural products appear to have a life period, some short, some long, after which their vigour or vitality becomes gradually impaired until their cultivation can no longer be continued with profit. While these varietal changes are constantly going on, the specific forms remain for the most part unaltered.

The six-rowed barley of to-day (*Hordeum hexastichum*) has the same general characteristics as when cultivated by the ancient Egyptians thousands of years ago, but the particular varieties of this plant now most in esteem are of recent introduction. The two-rowedbarley (*Hordeum distichum*) has also been long in cultivation, and was largely used as food by mankind from an early period in human history, but this variety of grain did not attain the position it now holds as one of the most profitable of crops until, by careful experiment and selection, the plump, heavy and prolific varieties of modern times were originated. The potato is the same species as when introduced into Europe from America more than three centuries ago, but the varietal forms which have since been produced are past numbering, and so rapidly do these run their course and become enfeebled as to vigour and fertility that very few survive a period of twenty or thirty years. They "run out" and give place to their betters.

Cereals hold any improvement which may be imparted to them with much greater tenacity than many other cultivated products. Possibly this may arise from their being invariably self-fertilized, which may result in a greater sensitiveness to external conditions, and lead to greater permanence in the changes which altered conditions sometimes bring about. When we consider how vastly important cereals

are to mankind, and the great value to the agricultural world of every improvement, however small it may be, it seems a marvel that more effort has not been made in this direction by those who are most familiar with the methods by which such favourable changes are most frequently effected. While a great number of workers are bringing much intelligence and long experience to bear upon the production of new varieties of flowers, fruits and vegetables, by cross-fertilization and careful selection, those engaged in the same course of work among cereals have been but few; additional observers were needed, and are now being provided, to carry on promising series of investigations, to carefully watch the changes being brought about in important food products by varying climatic and other conditions, so that advantage may be taken of such improvements as may be found to occur, and provision also made to lessen the losses which would arise from continuing the cultivation of such varieties as have become enfeebled and infertile. By carefully conducted experiments such observers may ascertain what crops can be produced best and cheapest, and what new lines of work can be undertaken by the farmer in view of available markets which will be likely to bring him increased returns.

From the accompaning reports it will be seen that the Experimental Farms of the Dominion of Canada have already done good service in these advanced methods of experimental work having so important a bearing on agriculture; the sphere of their operations is being rapidly enlarged, and a wide field of usefulness lies before them in the future.

Every farmer is aware that there are many influences at work every year which bear on his crops, and which do much to determine the proportion of profits which his labour and skill shall bring. Some of these influences are more or less amenable to his control, while others are not so. The general character of the season, whether favourable or unfavourable, as far as this depends on the weather, it is beyond his power to influence; but by varying his methods, so as to gain every possible advantage, he may materially mitigate the evils which always accompany unfavourable seasons. By getting his land into a thorough state of preparation in the autumn the farmer can sow his seed at the earliest opportunity, and early sowing has a very important bearing on the yield, and more especially so on grain crops, in an unfavourable year. The reason for this is not far to seek. The rapidity of growth and development in grain depends very much on the quantity of root surface employed in absorbing the food required for growth. In the early days of spring root development goes on very rapidly, even if the weather be so cold and backward as to retard growth above, recently sprouted grain, under such conditions, will usually be found to have a vigorous cluster of roots.

RESULTS OF EARLY, MEDIUM AND LATE SEEDING.

Some experience has been gained at the Central Experimental Farm during the past season on this subject, which shows the importance of more general attention being paid to early seeding. The particulars connected with the experiments undertaken have recently been published in Bulletin No. 8, and the results are believed to be of sufficient importance to be again summarized here. Six varieties of grain were chosen for the tests, two each of barley, oats and wheat, and sufficient land of a uniform character provided to allow of six plots of one-tenth of an acre each being devoted to each variety. Six of these were sown on the 22nd of April, which was as early as the ground could be worked, and six more every week until all the plots were seeded. The following are the names of the varieties selected for the test: Barley—*Prize Prolific* and *Danish Chevalier* (both two-rowed sorts); Oats—*Prize Cluster* and *Early Race-horse*; Spring wheat—*Red Fife* and *Ladoga.*

At the first sowing a new spring wheat, the Anglo-Canadian, was substituted for the *Race-horse* oats, because these plots afforded the best opportunity at command for testing the relative earliness and fertility of this new introduction

alogside of the *Red Fife* and *Ladoga*. With this exception, the experiments were caried out as planned, and the results are given in the following table:

	Sown April 22nd. — Yield per Acre.		Sown April 29th. — Yield per Acre.		Sown May 6th. — Yield per Acre.		Sown May 13th. — Yield per Acre.		Sown May 21st. — Yield per Acre.		Sown May 28th. — Yield per Acre.	
BARLEY.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Prize Prolific	40	30	24	38	16	22	14	03	10	15	11	02
Danish Chevalier	33	26	22	14	19	38	15	10	10	30	9	28
OATS.												
Prize Cluster	37	02	33	23	30	20	27	17	20	10	17	22
Early Race-horse	..	..	35	05	31	26	28	13	18	18	19	04
SPRING WHEAT.												
RedFife	11	00	9	00	8	15	4	20	3	00	2	35
Ladga	10	45	9	15	8	00	3	55	2	50	2	30
Ango-Canadian	5	50	..	..	..	..	..	..	..	..	..	..

While it must be admitted that such tests will need to be repeated many times, in order to reach averages which may neutralize the variations brought about in crops by varying seasons, there is nevertheless such a regularity in the falling off in yield week after week, as to carry with it convincing proof of the heavy losses which are almost sure to occur where late seeding is practised. The loss on *Prize Prolific* barley by a delay of one week in sowing is nearly 16 bushels per acre, and on *Danish Chevalier* a little more than 11 bushels, while a delay of two weeks shows an average loss of more than half the crop. The area under barley in Ontario in 1890 is estimated at 701326 acres, and if but half of the average loss which was found to occur in the experiments with the *Prize Prolific* barley in Ottawa be taken as a basis for an estimate, it would appear that the farmers of Ontario may lose, by a delay of one week in the time of seeding, over two and-a-half millions of dollars on the barley crop alone, and by a delay of two weeks more than three and three-quarter millions, reckoning the barley at 50 cents per bushel.

The loss from similar delay in the wheat crop has proved proportionately less, being about one-sixth of the crop where seeding has been delayed one week, one-fourth where it has been deferred for two weeks, while a three weeks delay shows a loss of considerably more than one-half.

The oat crop appears to be less influenced by delay in seeding than either barley or spring wheat. In the case of the Prize Cluster it shows a falling off of about 3 bushels per acre for the first week, but with a delay of two weeks it is a little over 6½ bushels; but the oat crop is so very large that every bushel of loss per acre in Ontario alone, taking oats at 40 cents per bushel, is equal to $752,946.

DISTRIBUTION OF SEED GRAIN.

The efforts begun in the spring of 1888, shortly after the Experimental Farms were organized, to introduce among the farmers of Canada the best varieties of seed grain obtainable, have been continued, and a very general and lively interest has been awakened in this subject, which has already been attended with excellent results, and which must, in the course of two or three years more, bring about a marked improvement in the quality of the grain produced in Canada. It is also likely to lead to an increase in the average yield, and thus add to the prosperity of the farming community and to the general wealth of the Dominion. At the outset the distribution

consisted mainly of early-ripening wheat for the Canadian North-West, and the Ladoga wheat was brought prominently before the farmers of Manitoba and the North-West Territories. Since then the distribution has become more general, and varieties of wheat, barley and oats, which promise to be useful in any of the Provinces, have ben introduced and disseminated with the view of benefiting all parts of the county. These samples are sent free by mail, in strong cotton bags, containing 3 pounds each. The first season of distribution, the spring of 1888, they were sent to farmers in different parts of the country whose names were submitted to me by persons acquainted in the several districts as men likely to be interested in the subject. The number of samples sent that year was 2,150; of these 1,529 were Ladoga wheat, the remainder consisting of two-rowed and six-rowed barley and oats. In 1889 a different method of distribution was followed, and samples were sent only to those who applied for them. That year 2,760 three pound bags were distributed, consisting of 1,279 of Ladoga wheat, 947 of two-rowed barley and 534 of oats. During the past season, 1890, the same plan of distribution was followed—that of sending samples only on application; and the fact that requests were received and samples sent to the extent of 12,313, distributed among 5,896 individuals, will give some idea of the interest which farmers are taking in this branch of Experimental Farm work. The object aimed at is to influence favourably the entire grain crop of the country, by introducing beter varieties than those now in common cultivation, and this, result I believe, can and will be accomplished within a comparatively short time. A few words will suffice to show that this object is worth striving for. The oat crop of Ontario alone for 1890 is estimated by the Ontario Bureau of Industries to have occupied 1,882,366 acres and to have yielded 52,768,207 bushels, an average of 28 bushels per acre. Every bushel per acre which can be added to this is a gain to Ontario, reckoning oats at 40 cents per bushel, of $752,946, while a pound per bushel added to the average weight of the grain is a gain of $620,802. Barley is said to have occupied in the same Province 701,626 acres, yielding 15,600,169 bushels, being an average of 22·2 bushels per acre. Taking barley at 50 cents per bushel, a gain of 1 bushel per acre in this crop adds $350,663 to the returns of the Ontario farmers, while a pound added to the weight would be a gain of $162,501. Again, spring wheat occupied 601,753 acres, yielding 7,683,905 bushels, or 12·8 bushels per acre. A gain of 1 bushel per acre in this case at 90 cents per bushel, adds $541,577 to the returns, while 1 pound per bushel gives on the short crop of the past year $115,258. Fall wheat has occupied an area of 720,101 acres, giving a crop of 14,267,383 bushels, equal to 19·8 bushels per acre. A gain of 1 bushel per acre here, with fall wheat at $1 per bushel, amounts to $720,101, while an additiou of 1 pound per bushel gives $237,789. Taking into one estimate the entire acreage and yield of these four leading crops, we find that an addition of 1 bushel per acre all around would give to the farmers of Ontario $2,365,287, while an average gain of 1 pound per bushel in the weight of the grain would give $1,136,340.

The samples of grain sent out in 1890 were distributed as follows:—

Prince Edward Island.

Oats	223
Barley	242
Wheat	138
Peas	1
Total	604

Number of applicants supplied, 350.

Nova Scotia.

Oats	436
Barley	586
Wheat	244
Total	1,266

Number of applicants supplied, 584.

New Brunswick.

Oats	116
Barley	165
Wheat	101
Peas	3
Total	385

Number of applicants supplied, 132.

Quebec.

Oats	891
Barley	1,408
Wheat	699
Peas	41
Total	3,039

Number of applicants supplied, 1,457.

Ontario.

Oats	1,782
Barley	2,043
Wheat	766
Peas	51
Corn	2
Total	4,644

Number of applicants supplied, 2,278.

Manitoba.

Oats	481
Barley	478
Wheat	93
Peas	3
Corn	4
Total	1,059

Number of applicants supplied, 511.

North-West Territories.

Oats	525
Barley	530
Wheat	121
Peas	4
Corn	10
Total	1,190

Number of applicants supplied, 532.

British Columbia.

Oats	65
Barley	62
Wheat	38
Rye	1
Total	166

Number of applicants supplied, 52.

The following shows the total number of packages of the different varieties distributed :—

Oats

Prize Cluster	3,251
Victoria Prize	319
Flying Scotchman	204
Black Tartarian	198
Early Race-horse	143
Banner	21
Canadian Triumph	96
White Russian	277
Bonanza	8
Welcome	1
Hulless	1
Total	4,519

Barley—Two-rowed.

Carter's Prize Prolific	1,125
Danish Chevalier	2,139
Danish Printice Chevalier	793
Beardless	1,194
English Malting	74
Thanet	3
Saale	9
Peerless White	51
Swedish	1
Large Two-rowed Naked	83
Total	5,472

Barley—Six-rowed.

Rennie's Improved	5
Indian from Spiti Valley	23
Odessa Six-rowed	13
Total	41

Spring Wheat.

Ladoga	909
Red Fife	568
White Fife	329
Red Fern	291
Saxonka	53
White Russian	25
Campbell's White Chaff	26
Total	2,201

Peas.

Multiplier	99

Corn.

Mitchell's Early	9
Cinquantine	11
Total	20
Reading Giant Rye	1

Total number of samples distributed, 12,353.
Number of applicants supplied, 5,896.

REPORTS RECEIVED FROM SAMPLES DISTRIBUTED WITH SOME RESULTS OF FIELD CROPS

Prize Cluster Oats.

The results of field experiments with this promising variety of oats during the past year are as follows:—At the Central Experimental Farm the yield has varied on different soils (excluding those plots which were purposely sown late) from 37 bushels and 2 lbs. to 28½ bushels, weighing from 41 to 42 lbs. per bushel. On the Experimental Farm at Nappan, Nova Scotia, the yield has been 22½ bushels per acre, weighing 40 lbs. per bushel, at Brandon, Man., 54 bushels 14 lbs. per acre, weighing 42¼ lbs. per bushel, and at Indian Head, in the North-West Territories, 63 bushels per acre, weighing 45 lbs. per bushel. In time of ripening it has generally proved from two or three days to a week or more earlier than most other sorts. In the following summary of results by Provinces extracts are given from a few of the reports from those farmers who have had the largest yields from the 3-lb. samples distributed last spring.

PRINCE EDWARD ISLAND.

Number of reports received, 24; average yield, from 3 lbs. 65¾ lbs.; average weight per bushel, 40⅛ lbs. The heaviest sample weighed 43¼ lbs. per bushel, and was grown by J. Wismer, of Monagan, P.E.I., who reports a yield of 70 lbs.

James Corcoran of Piusville, Lot 4, P. E. I., reports a yield of 180 lbs. from 3 lbs. sown, and says: "Sown June 3rd, on sandy loam (date of harvesting not given); no rust, no smut, straw bright yellow. I will sow all these oats another season." The sample sent weighed 37¼ lbs. per bushel.

E. T. Wright, of Middleton, P.E.I., had a yield of 110 lbs. from 3 lbs. of seed. He says: "Sown 6th May, harvested 25th August. Though our oats were all, or nearly all, rusted more or less, this was bright and clean—no rust. Straw medium length, and stronger and stiffer than some other varieties of white oats that I have grown. This is the earliest ripening variety of oats that we have sown, and is as heavy as any other white oat grown here. I think this is the very best variety of white oats that we have tested on our farm; am well pleased with it." The sample sent weighed 39¼ lbs. per bushel.

NOVA SCOTIA.

Number of reports received, 16; average yield, 38 lbs.; average weight per bushel, 38 lbs. The heaviest sample weighed 42¼ lbs. This was grown by R. McDonald, of Indian Brook, N.S., who reports a yield of 16 lbs.

Frank Lindsay, of Gay's River, N.S., harvested 83 lbs. from 3 lbs. sown. He says: "Sown 14th May, on gravelly loam; harvested 27th August. There was no rust; very little smut; straw medium height, bright and stiff; about eight days earlier than other varieties, and a better crop. I like this grain very well, and will sow it again next year. The aphis attacked it some, but I don't think much harm was done." Sample sent weighed 39½ lbs. per bushel.

Jacob Weismer, New Germany, N.S., had 66 lbs. He says: "Sown 1st May; harvested 13th August; no rust or smut; the character of the straw was excellent;

it compared very favourably with other varieties, ripened earlier and weighed heavier. I consider it a promising grain." The sample sent weighed 41 lbs. per bushel.

NEW BRUNSWICK.

Number of reports received, 6; the average yield was 48 lbs; average weight per bushel, 39⅔ lbs. The heaviest sample weighed 41¾ lbs. This was grown by W. Jenkins, of Nashwaak, N.B., who had a yield of 40½ lbs.

Hiram H. Vesey, sr., North Lake, N.B., had 74 lbs. from 3 lbs. sown. He reports: "Sown 9th June on clay loam; harvested 13th September; no rust; a few heads of smut; straw tall and stout; it ripens in about the same time, but is a little heavier than other sorts that I had sown." Weight of this sample was 38 lbs. per bushel.

John Thomas, of Green Hill, Stanley, N.B., had 68 lbs. He says: "Sown 26th May; harvested 6th September; it was badly affected with rust, which was general all over New Brunswick with all varieties; straw strong and bright; stood up well. I cannot call it early, but would class it as second early; will be a valuable sort for New Brunswick, which is pre-eminently an oat growing country." The sample sent weighed 41¼ lbs. per bushel.

J. C. Murray, Central Kingsclear, harvested 50 lbs. from 3 lbs. of seed, and says: "Sown 22nd May on clay soil; harvested 28th August; there was no rust or smut; straw bright and well headed; earlier than other sorts. From the samples sent to me and Mr. Humbel, of Stanley, we took first and second prizes at the Fredericton Fair." In this case no sample was sent.

QUEBEC.

Number of reports received, 30; average yield, 45½ lbs.; average weight per bushel, 35⅗ lbs. The heaviest sample weighed 42 lbs. per bushel, and was grown by A. E. McCarthy, of Henryville, who also had the heaviest yield.

A. E. McCarthy, Henryville, Que., had 102½ lbs. from 3 lbs. of seed. He reports: "Sown 23rd May on heavy 'grey' soil; harvested 24th August; no rust or smut; straw medium coarse and 4 feet 9 inches long; ripens six to eight days earlier than other sorts; heavier than common sorts. I find the Prize Cluster oats to be well adapted to this section of country." Sample weighed 42 lbs. per bushel.

E. Lafierre, of St. Sebastian, had a yield of 90 lbs., and reports: "Sown 17th May on good sandy soil; harvested 8th September; no rust; good straw. It ripens about the same time as other sorts. The season has been unfavourable, and this grain has suffered." This sample weighed 40½ lbs. per bushel.

T. S. Evans, of Trenholmville, reports a yield of 85 lbs., and says: "Sown 17th May on heavy loam; harvested 19th August; there was no rust or smut; straw bright and stiff, 4 feet high; it was about eight days earlier than our common white oats. I consider it a valuable variety, and it appears to yield well." Sample weighed 38¾ lbs. per bushel.

ONTARIO.

Number of reports received, 161; average yield, 44¾ lbs.; average weight per bushel, 38⅕ lbs. The heaviest sample weighed 44¼ lbs. per bushel, and was grown by Mr. W. B. Hough, of Sillsville, Ont., who reports a yield of 40 lbs.

J. E. Noxon, of Hillier, Ont., had 156 lbs. from 3 lbs. sown. He reports: "Sown 18th April on clay loam mixed with limestone gravel; harvested 2nd August; no rust or smut; straw good length, coarse and strong; ripened early; a good, bright, heavy oat, which I thought yielded well." Sample weighed 43 lbs. per bushel.

Owen Robertson, of Mansewood, Halton County, Ont., had 130 lbs., and says: "Sown April 1st on clay loam; harvested August 5th; there was slight rust, but no smut; straw tall, very heavy, inclined to stool; ripens about same as New Zealand

oats. A rough storm took them down two weeks before harvesting, otherwise the yield would have been immense." This sample weighed 40½ lbs. per bushel.

R. M. Brown, of Clarksburg, Ont., reports a yield of 125 lbs. from 3 lbs. of seed, and says: "Sown 25th March and 1st April on loam, with a gravel subsoil; harvested 15th August; rust very bad, otherwise there would have been one-third more grain; no smut; straw very strong and tall, 5 feet, more like rushes than oat straw; some heads 17 inches long; equal, as to earliness, with other varieties, but had more rust." Sample weighed 38¼ lbs. per bushel.

MANITOBA.

Number of reports received, 27; average yield, 67½ lbs.; average weight per bushel, 38½ lbs. The heaviest sample weighed 43¾ lbs., and was grown by Mr. Steven, of Virden, Man., who says the blackbirds consumed a large part of the crop and left him only 49 lbs.

C. E. Porritt, of Treherne, Man., harvested 154 lbs. from 3 lbs. sown. He says: "Sown 29th May on strong black loam with clay subsoil; harvested 4th September; the straw was badly rusted, owing no doubt to the wet, dull weather; all oats in this section of the country were the same; straw very long and stiff. The past season was not suitable for testing grain as to early ripening, owing to continued cold wet weather in August. The weight per bushel is about the same as Clydesdale, but I think our land was too well worked, and that on old land a heavier sample of grain and less bulk of straw would be produced. I hope to have a better sample next year." The sample sent was very light, weighing only 26 lbs. per bushel.

E. McKeever, of Virden, Man., had 130 lbs., and reports: "Sown 6th May; on light loam, sandy subsoil, harvested 14th August,; there was a little rust; no smut; straw 5 feet 2 inches, very lank. They were the first to cut; the wind laid them flat to the ground, or I could have cut them a week sooner." The weight of this sample was 35 lbs. per bushel.

NORTH-WEST TERRITORIES.

Number of reports received, 36; average yield, 63¾ lbs.; average weight per bushel, 38 lbs. The heaviest sample, which weighed 44¼ lbs., was grown by John Stewart, of Red Deer, Alberta, who also had the heaviest crop.

John Stewart, Red Deer, N.-W. T.; reports a yield of 146 lbs., from 3 lbs., sown. He says: "Sown 29th April on sandy loam; harvested 18th August; no rust or smut; straw medium for coarseness, about 4 feet high. Ripened ten days earlier than Sandwich oats sown same time on same soil; only tried these two varieties. Heavy, fine grain; think very highly of it; shall sow all I have. I don't think the equal of it was grown in this settlement." Weight of sample, 44¼ lbs. per bushel.

W. Tingey, of Marieton, N.-W. T., had 120 lbs., and says: "Sown 26th April; harvested 13th August; no rust or smut; straw long, clean and bright, 3½ feet in height; grain plump and heavy; ripens about same time as Welcome, and about eight or ten days earlier than Black or White Tartarian; one half this plot was eaten off close to the ground by cattle, just as it was heading out. This part was harvested 1st September, from second growth." The weight of this sample was 42 lbs. per bushel.

BRITISH COLUMBIA.

Number of reports received, 5; average yield, 125 lbs.; average weight per bushel, 43⅔ lbs. The heaviest sample was grown by J. T. Hawks, Soda Creek, B. C., who reports a yield of 37 lbs. This sample weighed 46⅓ lbs. per bushel.

Wm. Tasker, of Ladner's Landing, B. C., had 220 lbs., from 3 lbs. sown. He says: "Sown 5th May; on sandy loam harvested 5th August; no rust, some smut, strong straw, was one week earlier than Black Tartarian sown alongside, but do not think it will yield as well." The sample sent weighed 45¾ lbs. per bushel.

Thos. Morgan, of Cache Creek, B. C., had 208 lbs. from 3 lbs. sown. He says: "Sown 21st May on sandy virgin soil; harvested 23rd August; no rust or smut; straw tall, strong and bright; compares well with other varieties. I consider it excellent, and intend keeping it all for seed." Sample sent weighs 45¼ lbs. per bushel.

Victoria Prize.

This recently introduced variety of white oats resembles in many respects the Prize Cluster, but is a little larger and longer in the kernel, and two or three days later in ripening. Like the Prize Cluster, it is a branching oat, a vigorous grower, with a plump and heavy kernel. In field crops on the several Experimental Farms the record for this variety during the past year is as follows: On the Central Experimental Farm at Ottawa three different plots have been grown with a yield ranging from 36¾ to 38¼ bushels per acre, weighing 41 to 41¼ lbs. per bushel; and at Nappan, N.S., the yield has been 31 bushels per acre, weighing 42¾ lbs. per bushel.

Mr. Heber Rawlings, of Ravenswood, Ont., had 110 lbs. from 3 lbs. sown. He reports: "Sown 12th April on clay loam; ripe 4th August; was rusted (all oats were rusted here); no smut; straw very good; about 5 feet high. It was a very good crop; I can tell no difference between these and the Prize Cluster;" weight of sample, 40½ lbs. per bushel. The heaviest sample sent from Ontario was forwarded by Mr. J. Johnston, of Auburn, Ont., and weighed 41¾ lbs. per bushel. Mr. Johnston reports a yield of 72 lbs.

Mr. Louis Dussault, of Yamachiche, Que., reports a yield of 51½ lbs. He says: "Sown 8th May on black soil; ripe 22nd August; there was a little rust, but less than ordinary; straw of fair quality; ten to twelve days earlier than other varieties here."

The heaviest sample from this Province weighed 40 lbs. per bushel, it was sent by Mr. G. Suggett, of Mystic, Que., who reports a yield of 40 lbs.

Robert Williams, Long Reach, King's Co., New Brunswick, harvested 81 lbs. from 3 lbs. of seed, and says: "It was sown 26th April on dry, light loam; ripe, 15th August; there was no rust or smut; it was affected with red leaf, but not so bad as other oats; straw strong and bright; grain heavier than other sorts, and ten days earlier; other oats very poor as a rule." The sample sent weighed 38¼ lbs. per bushel.

John Butcher, Upper Musquodoboit, Nova Scotia, had 60 lbs., and reports: "Sown on 17th May, on deep loam, with clay bottom; ripe 2nd September; there was a little rust but no smut; straw strong and stout, quite long; was better than some other kinds. I think this seed would be a good change for this Province." No sample was received from Mr. Butcher. The heaviest specimen received from this Province weighed 40 lbs.; this was from Wm. Horton, of Upper Musquodobit, who reports a yield of 45 lbs.

Other Provinces not yet heard from.

Flying Scotchman Oats.

This is also a plump, white oat, which has succeeded very well in many districts. At the Central Experimental Farm it has yielded from 36¾ to 40¼ bushels per acre, weighing 40¼ lbs. per bushel; at Nappan, N.S., 39¾ bushels per acre, weighing 36¼ lbs. per bushel; at Brandon, Man., 71 $\frac{14}{34}$ bushels per acre, weighing 39¾ lbs. per bushel; at Indian Head, 53 $\frac{20}{34}$ bushels per acre, weighing 42 lbs. per bushel; and at Agassiz, B.C., 6 lbs. yielded a crop of 69 lbs., weighing 39½ lbs. per bushel.

W. B. Terry, of Keswick, Ont., had a yield of 100 lbs. from 3 lbs. sown, and says: "Sown, 17th May, on loamy soil, which had turnips the year before; harvested, 1st September; no rust or smut; straw good and bright, with reasonably good weight to support the grain. I think it compares favourably in all respects with other varieties. It was sown rather late, and the sparrows destroyed some of it, yet the

yield was good." The sample sent weighed 33½ lbs. per bushel. The heaviest specimen received from Ontario weighed 37¼ lbs. This was sent by A. Stewart, of Kinmore, Ont., who reports a yield of 56 lbs.

J. B. Gauthier, of St. Irénée, Que., had 55 lbs. He says; "Sown 19th May, on sandy soil; ripe 22nd August; no rust nor smut; straw very good; fifteen days earlier than other varieties grown here."

Wm. Fox, of Middle Musquodoboit, Nova Scotia, had a crop of 72 lbs., and says: "Sown 12th May, on gravelly soil;"—date of harvesting not given—"there was a little rust, no smut; straw heavy; ripens about the same as other sorts, with a little better weight of crop; sample weighed, 36 lbs. per bushel."

Other Provinces yet to hear from.

Black Tartarian Oats.

A very fine lot of Black Tartarian was imported from Scotland in the spring of 1890, weighing 42 lbs. per bushel, but they did not succeed, on the whole, so well as was expected. At the Central Farm the yield was 26¾ bushels per acre, weighing 35 lbs. per bushel; at Nappan, N.S., 51 bushels per acre, weighing 33 lbs. per bushel; at Brandon, Man., the yield was 77 bushels, 14 lbs. per acre, weighing 34 lbs. per bushel; and at Indian Head, 74 bushels 30 lbs. per acre, weighing 40 lbs. per bushel. This variety was not tested at Agassiz, B.C.

From Ontario eight reports have been received, with an average yield of 54 lbs., weighing 31⅔ lbs. per bushel. From Quebec three reports, averaging 52½ lbs., weighing 34⅓ lbs. per bushel. New Brunswick, one report; yield, 31 lbs.; weight, 32½ lbs. per bushel. Prince Edward Island, six reports; average yield, 72½ lbs, weighing 33⅓ lbs. per bushel. From Manitoba, two reports; average yield, 51½ lbs.; weight, 34½ lbs. per bushel; and from the North-West Territories, one report; yield, 41 lbs.; weight, 31⅔ lbs. per bushel.

B. Birch, of Lambeth, Ont., reports a yield of 102 lbs. from 3 lbs. of seed and says: "Sown 1st May, on clay loam; harvested 10th August; no rust, no smut; straw large, strong and bright; a little on the late side, but a good heavy crop." The weight of the sample sent was 30½ lbs. per bushel. The heaviest specimen from Ontario weighed 36 lbs. This was from J. Marshall, of Pine Grove, Ont., who does not give the yield.

J. & C. Black, of Thurso, Que., had 64 lbs., and report as follows: "Sown 12th May, on clay soil; ripe 14th August; no rust, no smut; straw coarse, strong and bright." Sample sent weighed 36 lbs. per bushel.

H. Doney, of Johnston, N.B., had 31 lbs., and says: "Sown, 26th May, on clay loam; harvested, 30th September; leaves turned red, like all the oat crop about here; straw middling coarse. Oats were almost a total failure in this section of the country owing to bad weather setting in before they were fit to cut;" sample weighed 32½ lbs. per bushel.

A. E. Dewar, of Southport, P.E.I., had 120 lbs. from 3 lbs. sown. He says: "Sown, 12th May, on clay loam; harvested 14th September; no rust, no smut, straw very stout, later than other kinds; Prize Cluster gave 108 lbs. from 3 lbs. of seed. The season was the worst for oats we have had here for many years." This sample weighed 32 lbs. per bushel.

A. Grant, of Burnbank, Manitoba, reports a yield of 62 lbs., weighing 34½ lbs. per bushel, and A. S. Harding of Whitewood, N.W.T., 56 lbs., weighing 29 lbs. per bushel.

Banner.

This variety, grown on the Central Farm, gave on one plot a yield of 52¾ bushels per acre, weighing 32½ lbs. per bushel, on another plot 22¾ bushels, weighing 30¾ lbs. per bushel. At Nappan the yield was 47½ bushels, weighing 33 lbs. per bushel; at Brandon, Man., 73½ bushels, weighing 39 lbs. per bushel; at Indian Head, N.W.T., 58½ bushels, weighing 40 lbs., and at Agassiz 68 lbs were harvested from 6 lbs. sown

Very few reports have yet been received. Mr. Davy of Glendale, Ont., had 45 lbs. from 3 lbs. sown. He says: "No rust or smut, very stout straw, is the best oat in straw crop and the cleanest we ever sowed; will sow them again another year." The sample sent weighed 35 lbs. per bushel.

J. M. Crindle, of Ellershouse, Hants, N.S., had 36 lbs. and says: "Sown 14th May on a somewhat slaty soil, harvested 22nd August, badly rusted, a good deal of smut. The sample I send is very inferior. I had about an acre of Banner oats sown ten days later that did much better, not so much rust." The sample sent was very light, weighing but 24¾ lbs. per bushel.

L. O. Lemieux, of Oak Lake, Man., from 3 lbs. of the same lot of seed had a yield of 196 lbs. and says: "Sown 23rd May, on sandy loam, harvested 30th August, no rust, very little smut, straw very strong and long 5 ft. 1 inch, not so early as Prize Cluster, yield would have been better but for wet weather and wind which made it lodge." Weight of this sample, 33 lbs. per bushel,

But very few returns have been received of Bonanza, Early Race Horse, Canadian Triumph and White Russian, and a safe judgment can probably be formed of these varieties by comparing the yields obtained on the several Experimental Farms.

Two-Rowed Barley.

Prize Prolific (Carter's).

The yield per acre and weight per bushel of this promising variety of two-rowed barley has been as follows:—Central Farm on different plots, from 24 to 40½ bushels, weighing 52 lbs.; Nappan, N.S., 25 bushels, weighing 49¼ lbs.; Brandon, Man., 42½ to 59¾ bushels, weighing from 50½ to 51¾ lbs., and at Indian Head, N.W.T., 49⅛ bushels, weighing 52¼ lbs.

The average yield as given by forty-one reports from Ontario is 49 lbs.; of nine from Quebec, 57 lbs.; five from Nova Scotia, 48⅕ lbs.; one from New Brunswick gives 23 lbs.; thirteen from Prince Edward Island, 57¼ lbs.; nine from Manitoba, 70¾ lbs., twelve from the North-West Territories, 74 1/12 lbs., and four from British Columbia, 132½ lbs.

M. Heselwood, of Londesboro', Ont., had a yield of 130 lbs. from 3 lbs of seed, and says: "Sown 25th April, on clay loam; harvested 4th August; no rust or smut: straw long and clean; not so early as some varieties. Am well satisfied with the barley." The weight of this sample was 53½ lbs per bushel.

D. Currie, of Queen Hill, Ont., had 108 lbs. He says: "Sown 5th May; harvested 1st August; no rust or smut: straw clean." Mr. Currie says that this barley weighs 54 lbs. per bushel, but the sample sent was not sufficient to enable us to determine the weight.

David Ferguson, of Constance, reports a yield of 5 bushels from 3 lbs. of seed, and says: "Sown 15th April, on well prepared clay loam; harvested 8th August; no rust or smut; straw bright and coarse; ten days later than other sorts; it is very good barley." The weight of this sample was 51½ lbs.

George Ashby, Ste. Marie de Monnoir, Que., had 170 lbs., from 3 lbs. of seed. He says: "Sown 12th May on clay soil, harvested 25th August; no rust, no smut, straw short." The sample weighed 52¼ lbs. per bushel.

A. E. McCarthy of Henryville, Que., had 67½ lbs. from 3 lbs. sown and reports as follows: "Sown 23rd May on heavy grey soil; harvested 3rd Sept.; no rust or smut, straw medium coarse, ripens 15 days later than common sorts, but weighs 3 to 4 lbs. more per bushel. As this has been an exceptionally poor year for barley, I consider this a fair yield." The sample sent weighed 48½ lbs. per bushel.

Rev. M. Le Curé, St. Joachim, Que., reports a yield of 1¾ bushels and says: "Sown 15th May on grey gravel soil, harvested 15th August, no rust, no smut, nice straw." Sample weighed 48 lbs. per bushel.

M. J. B. Alise, St. Marie de Monnoir, Que., had 40 lbs. He says: "Sown 26th April on clay soil, harvested 8th August, no rust, no smut, straw good; later than other kinds." This sample weighed 50¼ lbs. per bushel.

J. B. Lane, of Dorchester, New Brunswick, reports a yield of 75 lbs. from 3 lbs. of seed, but no sample has been received from him.

F. Lindsay, Gay's River, Nova Scotia, had 74 lbs. from 3 lbs. of seed, and says: "Sown 14th May on gravelly loam, harvested 27th August, no rust, some smut; straw short and bright; like this barley well and will sow it next year." Sample weighed 45 lbs. per bushel.

C. Newcomb, Weymouth, N. S., had a yield of 60 lbs. and reports: "Sown 10th May on heavy loam, harvested 10th October, no rust; no smut; straw bright but very short, compares favourably with other varieties." Sample weighed 50¼ lbs.

J. J. Wismer, Monaghan Road, P. E. I., reports a yield of 90 lbs. from 3 lbs. sown. He says: "Sown 17th May on clay soil (over rich, as one half of barley lodged badly); harvested 25th August, no rust or smut; straw dark on account of being lodged." Weight of sample, 49½ lbs.

John McDonald, West St. Peters, P. E. I., had 80 lbs. and says: "Sown 16th May on sandy loam; harvested 20th August; no rust or smut; straw good." Weight of sample, 50½ lbs. per bushel.

T. B. Gerry, of Sourisford, Manitoba, reports a yield of 135 lbs., and says: "Sown 10th May on black loam, clay subsoil, harvested 25th August, no rust or smut, straw 3 feet long, stood up well for the year with so much rain; one week later than six-rowed sown same time, but gave much more grain, would have had one-third more, but the birds eat a great deal of it." Weight of sample, 52 lbs. per bushel.

C. Shaw, of Heaslip, Man., had 104 lbs. He says: "Sown 8th May on stiff black loam, harvested 20th August, no rust or smut, straw rather soft, it went down with the heavy rains." Sample weighed 51 lbs. per bushel.

Wm. Tingey, Marieton, N. W. T., reports a yield of 200 lbs. from 3 lbs. sown, and says: "Sown 7th May, on sandy loam, harvested 25th August, no rust or smut, straw strong and very bright; height 3 feet, ripens in about the same time as the common six-rowed; is a much heavier cropper; grows a larger and plumper grain. I think the Prize Prolific barley will greatly improve if grown again next year." Sample weighed 49⅔ lbs. per bushel.

James Russell, of Longlaketon, N.W.T., had a yield of 130 lbs., and says: "Sown 5th May on black loam with clay subsoil, harvested 20th August, no rust or smut, straw rank and soft, it may be a few days late, but nothing to hurt. I consider it far superior to any other sort." No sample was received from Mr. Russell.

Thos. Morgan, of Cache Creek, British Columbia, reports a yield of 218 lbs. from 3 lbs. of seed. He says: "Sown 24th April on sandy loam, with some gravel, harvested 9th August, no rust or smut, straw bright and tall. I like it very much." Weight of sample, 52 lbs. per bushel.

D. Graham, of Spillamacheen, B. C., had 160 lbs., and says: "Sown 22nd April on clay loam, harvested 9th August, no rust or smut, straw very fair, stands up better than English Malting received last year; both very similar to Chevalier. Sowed about 110 lbs. of English Malting barley on two acres adjoining and threshed 5,500 lbs." Sample of Prize Prolific weighed 53½ lbs. and English Malting 54½ lbs. per bushel.

J. Tolmie, Cloverdale, Victoria, B. C., had a yield of 77 lbs. and says: "Sown 22nd April on red clay soil, harvested 11th August, no rust, 4 heads smut, straw clean and bright, some lodged, about the same as other barley for earliness." This sample weighed 55½ lbs.

Danish Chevalier.

The results of field crops of this variety on the Experimental Farms during the past season are as follows: Central Experimental Farm, from 23½ to 25⅔ bushels per acre, weighing from 51 to 52 lbs. per bushel; at Brandon, Man., 51½ bushels per acre, weighing 53 lbs. per bushel; and at Indian Head, N. W. T., 46$\frac{10}{48}$ bushel per acre, weighing 47¾ lbs per bushel.

The average yield, as far as given in one hundred reports from Ontario, is 52½ lbs.; [illegible] twenty-two from Quebec, 39¾ lbs.; thirteen from Nova Scotia, 52½ lbs.; three [illegible]

from New Brunswick, 33⅛ lbs.; nine from Prince Edward Island, 68⅛ lbs.; ten from Manitoba, 60¼ lbs.; twenty-five from the North-West Territories, 77⅛ lbs.; and one report from British Columbia, 33 lbs.

Henry Stall, Rob Roy, Ont., reports a yield of 160 lbs. from 3 lbs. sown, and says: "Sown 6th May on loamy soil in orchard, harvested 8th Sept., no rust or smut, straw tall and stout. It is later than other kinds, but weighs heavier, is a good barley to raise in this part of the country." Sample sent weighed 47¾ lbs., very light, probably due to late sowing.

R. M. Brown, of Clarkesburg, Ont., had 152 from 3 lbs. of seed. He says: "Sown 1st April, on loam with gravel subsoil, harvested 14th August, no rust or smut, straw large, bright but weak, twelve days later than six-rowed sowed same date. I never saw grain stool like it before, some plants had 27 heads." The weight of this sample was 52 lbs. per bushel.

J. E. Noxon, of Hillier, Ont., had 131 lbs., weighing 50 lbs. per bushel. R. W. Bass, of Oxford Centre, 110 lbs., weighing 53 lbs. per bushel, and Robert Martin, of Lucknow, 93 lbs, weighing 53¼ lbs. per bushel.

E. Laffierre, of St. Sebastien, Que., reports a yield of 100 lbs, and says: "Sown 31st May on new land, yellow and grey soil, harvested 2nd Sept., no rust, straw of good quality. This grain has suffered from bad weather in the autumn." Sample weighed 47 lbs. per bushel.

Mr. H. Batchelder, of Hatley, Que., had 62 lbs. He says: "Sown 20th May on medium light loam, harvested 20th August, no rust, no smut, straw rather short, firm and stands well, as early as any other varieties here and extra heavy weight." Weight of this sample 51⅛ lbs. per bushel.

John Foster, of North Kingston, N.S., had 84 lbs. from 3 lbs. sown, and says: "Sown 27th May, on deep dark loam; harvested 10th September; no rust or smut, straw good, heads long, well-filled, in every way satisfactory." Sample sent was very light, weighed only 45¾ lbs per bushel, due probably to late sowing.

Jacob Weismer, New Germany, N.S., had 76 lbs. He says: "Sown 10th May, on light loam; harvested 19th August; very slightly rusted, no smut, straw good. Ripened earlier than other kinds and better weight; consider this a choice grain." This sample weighed 48 lbs per bushel.

Robert Williams, of Long Reach, King's Co., N.B., had 52 lbs., and says: "Bag was torn on arrival, did not have 3 lbs to sow. Sown 26th April, on light dry loam; harvested 17th August; no rust or smut, straw rather weak, broke down considerably, earlier and heavier than other varieties; think very much of this grain." Sample sent weighed 51¼ lbs. per bushel.

Wellington Mutch, of Eldon, P.E.I., had 100 lbs. from 3 lbs. sown, and reports: "Sown 17th May, on light but fairly rich soil; harvested 28th August; no rust or smut, straw light and short; very little barley sown here, but think this better than barley generally sown here." The weight of this sample was 50 lbs. per bushel.

James Brown, of Stanley Bridge, P.E.I., had 85 lbs. and says: "Sown 5th June, on heavy soil, summer fallowed; harvested 9th September; no rust or smut; straw dark with continued wet weather." Weight of sample, 49¼ lbs.

T. B. Gerry, of Sourisford, Manitoba, had a yield of 130 lbs. from 3 lbs. sown, and says: "Sown 10th May, on black loam, with clay subsoil, harvested 25th August; no rust or smut; straw about 3 feet long; in ordinary years would stand up well, but this year much rain has partially lodged it; is a week later than the six-rowed, but a heavier yielder." Sample weighed 49¾ lbs per bushel.

L. O. Lemieux, of Oak Lake, Man., had 68 lbs., and says: "Sown 23rd May, on sandy loam; harvested 24th August; no rust or smut; good heavy straw; did not lodge as badly as some others." Weight of sample 48½ lbs per bushel.

Mr. C. H. Macwatt, of Royal, Man., sent a sample weighing 50½ lbs. per bushel, but did not give the yield, he says, however: "I have two bushels for seed, it made good growth and is a good bearer, but I prefer Carter's Prize Prolific.

John Dunn, of Ellesboro, N.W.T., had 168 lbs. from 3 lbs. of seed, and says: "Sown 19th April on black sandy loam; harvested 10th August; no rust or smut;

straw long and coarse; is hardly as early as other sorts, but bears double the crop." Weight of sample, 46 lbs. per bushel.

Wilfred Wilde, of Grenfell, N. W. T., had 144 lbs. and says: "Sown 20th May on black sandy loam with clay subsoil; harvested 24th August; no rust or smut, straw, strong, light colour about 3½ feet high, not any earlier but much better than other sorts; am very much pleased with it. I took four first prizes with it at four different Agricultural Exhibitions, and it was much admired by all who saw it." Weight of sample, 48¾ lbs. per bushel.

J. F. Hawks, Soda Creek, B.C., reports a yield of 33 lbs. from 3 lbs. of seed. He says: "Sown about 12th May, on gravelly loam, harvested about 1st September; no rust or smut; straw bright and of good length; had no extra care or attention." The weight of this sample was 54½ lbs. per bushel.

Beardless.

This variety has received the name of Beardless for the reason that when fully ripe many of the heads partly or wholly lose their beards. The yield of this variety in field plots on the Experimental Farms has been as follows: At the Central Farm, Ottawa, from 25¾ to 26¼ bushels per acre, weighing 51½ lbs. per bushel; at Brandon, Man., 48¼ bushels per acre, weighing 52¼ lbs. per bushel, and at Indian Head 45 bushels per acre, weighing 51½ lbs. per bushel.

Special prizes were offered by the proprietors of the Canadian Live Stock Journal, Toronto, for the largest yield and best quality of Beardless barley raised from a 3 lb. sample, which has had the effect of stimulating effort in this direction and hence larger yields are reported in Ontario for this barley than for any other variety.

The average yield as given in 65 reports from Ontario, is 70¾ lbs.; of 26 from Quebec, 34 lbs.; three from Nova Scotia, 25⅔ lbs.; one from New Brunswick, 76 lbs.; three from Prince Edward Island, 63 lbs.: four from Manitoba, 60¼ lbs.; and two from the North-West Territories, 42 lbs.

J. B. Lawrie, of Mongolia, Ont., reports a yield of 378½ lbs. from 3 lbs. of seed sown on a plot of 420 by 20 feet, in drills about 8 inches apart. He says: "Sown 24th April on clay loam; harvested 12th August; straw bright; pretty stiff and of fair length." Weight of sample, 53 lbs. per bushel.

Roger Wilson, of Goring, Ont., had 5 bushels and 14 lbs. (say 254 lbs.) from 3 lbs. of seed. He says: "Sown 3rd and 7th May on limestone loam in drills; harvested 22nd August; no rust or smut; straw long and bright, two weeks later than four-rowed." Sample weighed 50½ lbs. per bushel.

Banwell Foote, of Zephyr, Ont., reports a yield of 228 lbs.; John Renwick, of Lakenhurst, 155 lbs.; and George S. McKee, of 140 lbs. These very large yields from the 3 lb. sample bags show what can be done to increase a new variety rapidly by extra care and attention.

E. McMillan, of Notre Dame du Laus, Que., had a yield of 73 lbs. from 3 lbs. of seed. He says: "Sown 6th May on loamy soil; harvested 29th August; no rust or smut; straw short, not strong. The season was very wet and unfavourable; this barley was later in ripening than other sorts and did not ripen evenly." The sample weighed 46 lbs. per bushel.

A. F. Bower, of Learned Plain, Que., had 67 lbs. and says: "Sown 14th May on strong loam; harvested 29th August; there was a little rust, no smut; straw strong and bright; season very unfavourable." Sample weighed 47½ lbs. per bushel. The heaviest sample received from the Province of Quebec weighed 53 lbs. per bushel, this was sent by E. Dupont, of St. Sévére, who reports a yield of 22 lbs.

W. J. Symonds, of Linwood, N.S., had 40 lbs. from 3 lbs. sown and says: "Sown 3rd June on light loam; harvested 20th September; straw bright; as to earliness ripens about the same as other barley." Sample weighed 48½ lbs. per bushel.

Bayard Williams, of Long Reach, N.B., had 76 lbs. from 3 lbs. of seed and says: "Sown 27th May on sandy loam; harvested 23rd September; no rust or smut; straw good and heavy." Sample was light, weighing only 46¼ lbs. per bushel.

Hugh McQueen, of Orwell, P.E.I., had a yield of 40 lbs. and reports: "Sown 23rd May on a rich mellow soil; harvested 10th September; no rust or smut; straw white and clean." Sample weighed 49⅓ lbs. per bushel.

A. E. Cook, of Dundee, Man., had 86 lbs. from 3 lbs. sown: "Sown 9th May on black clay loam; harvested 21st August; no rust or smut; straw long and fine, lodged badly. I think if sown thin on good land it would be a heavy yielder, mine gave at the rate of 60 bushels per acre, and had I made it cover twice as much ground it would have gone 90 to 100 bushels." Weight of sample 49 lbs. per bushel.

The reports received concerning the other varieties distributed are comparatively few in number and may be briefly summarized as follows:—

Danish Printice Chevalier.—From Ontario seven reports have been received, the average yield being 30 lbs.; from Quebec thirteen reports with an average of 25 lbs., and from Prince Edward Island one report with a yield of 70 lbs.

Peerless White.— Two reports of tests of this variety were received from Quebec, the average yield being 57½ lbs.; one from Nova Scotia of 13 lbs., and four from Prince Edward Edward Island, yield 47¾ lbs.

English Malting.—Concerning this there were seven reports from Ontario with an average yield of 38 lbs., and one from the North-West Territories with a yield of 20 lbs. With this latter sample the statement is made that "there was much wasted as the harvest time was very wet."

Thanet.—Two reports were received from Ontario regarding this barley, the average yield being 69 lbs. There was one also from the same Province on the New Zealand barley, the yield reported being 55 lbs.

Large Two-rowed Naked.—The average yield of three reports from Ontario on this large grained feeding barley was 22⅓ lbs., and from one test in Manitoba 25 lbs.

Six-rowed Barley.

Rennie's Improved.—One report only has been received on this promising variety, it comes from Ontario and the yield is given as 62 lbs.

Spiti Valley Barley.—This is a six-rowed, hulless variety, the grain being of a bluish colour, and in some districts gives promise of being a valuable barley for feeding purposes. Four reports from Ontario give an average yield of 27½ lbs., one from Nova Scotia 23 lbs. and one from the North-West Territories 60 lbs.

Ladoga Wheat.

This early ripening wheat which was imported from Northern Russia, under instructions of the Minister of Agriculture, in the spring of 1888, is rapidly gaining in favour in the Canadian North-West, and while maintaining its relative earliness appears to be improving in quality and yield. In most parts of Ontario and some other localities East this variety seems very liable to rust, but from the northern parts of Ontario and Quebec and from Prince Edward Island the reports are much more favourable. At the Central Farm nearly all the leading varieties of spring wheat have given a poor yield, the Ladoga with its crop of 10¼ to 10¾ bushels per acre, weighing 56¼ lbs. per bushel, comparing favourable with many others. At Nappan, N. S., the yield has been 19 bushels per acre, weighing 62 lbs. per bushel, at Brandon, Man., 21⅓ bushels, weighing 59½ lbs. per bushel, and at Indian Head, N.W.T., 30 bushels per acre, weighing 59¼ lbs. per bushel.

From Ontario twenty-one reports have been received, giving an average of 30½ lbs., from Quebec twenty-three, averaging 29½ lbs., Nova Scotia eight, with an average of 32⅛ lbs., New Brunswick six, averaging 29⅚ lbs., Prince Edward Island five, giving an average of 59⅘ lbs., Manitoba three, with an average of 31⅓ lbs., North-West Territories eleven, averaging 68¾ lbs., and one report from British Columbia, where the yield is said to have been 634 lbs. from 3 lbs. of seed.

Jas. Madill, of Dunedin, Ont., had 90 lbs. from 3 lbs. sown. He says: "Sown 30th April on light clay soil, harvested 20th August, there was some rust and some

smut, straw of medium length, rusted; weak, did not ripen earlier than other sorts." Sample sent was too small to determine weight per bushel.

Thos. Easton, of Acton West, Ont., had a yield of 52 lbs. from 3 lbs. sown. He says: "Sown 18th April on gravelly loam, harvested 31st July. There was a little rust and some smut, but not much, straw of fair length, a week earlier than other wheat in this neighbourhood and about the same weight of crop." Sample weighed 58 lbs. per bushel.

Owen Robertson, of Milton, Ont., had 50 lbs. and says: "Sown 17th April on clay loam, harvested about 18th August, rusted very badly, no smut, straw of good height, stood up well; the first spring wheat we have grown here." Weight of sample, 59 lbs. per bushel.

Edward McMillan, of Notre Dame du Laus, Que., had 61 lbs. He says; "Sown 6th May on high loamy soil, harvested 29th August; a little rust and a few heads of smut, straw long and even, is good for the season." In this instance the sample did not reach us.

T. G. Evans, of Trenholmville, reports a yield of 51 lbs. and says; "Sown 17th May, harvested 25th August; no rust whatever, no smut, straw good, stiff and bright; was about a week earlier than the White Russian, weight about 60 lbs. to the bushel." No sample received. The heaviest sample sent from Quebec was from M. Florent Dufour, of Baie St. Paul. This weighed 62¾ lbs., and the yield was said to be 20 lbs.

John Butcher, of Upper Musquodoboit, N. S., had 50 lbs., and says: "Sown 12th May on clay loam, harvested 24th August; it was rusted, but rust was very prevalent in the province. There was no smut, straw tall and hard. I think it will do well in good years." The sample sent was very light, weighing only 55 lbs. per bushel.

S. Landray, of Tracadie, N. S., had 44 lbs. from 3 lbs. sown and says; "Sown 24th May, on dry gravelly soil; harvested 4th September; there was no rust, but some smut; good straw." Weight of sample, 60⅓ lbs.

Joseph de Grace, St. Louis, N. B., had 35½ lbs. He says: "Sown 22nd May, on strong land; fairly rich; harvested 30th August; there was a little rust; no smut; fine straw; 8 to 10 days earlier than other varieties; I find the heads very short." Sample received weighed 59½ lbs. per bushel.

W. Jenkins, of Nashwaak, N. B., had 35 lbs. and says: "Sown 8th May, on a light clay loam; harvested 3rd September; there was some rust, but none to hurt; no smut; straw much like other sorts but coarser; a heavy grain; think it is earlier than other kinds." This sample weighed 62¼ lbs. per bushel.

J. D. McIsaac, of Clear Spring, P. E. I., had 94 lbs. from 3 lbs. sown and says: "Sown 19th May, on new land; harvested 30th August; no rust, but considerable smut; straw not as rank as White Russian. I cut it six days earlier than White Russian and in crop it was far ahead." Sample weighed 57¼ lbs. per bushel, sent just as threshed, without cleaning.

John McDonald, of West St. Peters, had 90 lbs. He reports: "Sown 16th May, on sandy loam; harvested 29th August; no rust or smut; straw fairly good; heavy growth; 5 days earlier than Red Fife." Sample weighed 61 lbs. per bushel.

Wm. Hembroff, of Russell, Manitoba, had 49 lbs. He says: "Sown 18th April, on clay loam with a small proportion of sand; harvested 19th August; there was slight rust and some smut; straw long and strong, but not so hard as Fife; it was 10 days earlier than Red Fife, which was sown on stubble a week sooner. The yield was fully double the amount given, but the fowls and birds destroyed the balance. I like it well and think it will suit this country." Weight of sample, 58¼ lbs.

Maurice Wilson, of Pincher Creek, Alberta, N. W. T., had 90½ lbs. from 3 lbs. sown. He says: "Sown 25th April, on dark sandy loam; harvested 1st September; no rust or smut; straw medium; had no opportunity of comparing it with other varieties as to earliness. This has been an unfavourable year for all grain, on account of drought." The sample sent was very light, weighing only 54½ lbs. per bushel.

E. Fitzgerald, of Grenfell, Assa., N. W. T., had 73 lbs. and says: "Sown 3rd May, on light sandy loam; harvested 23rd August; no rust or smut; straw long, fine; ripened 15 days earlier than my earliest field of Red Fife; weight, 62 lbs. to the bushel; suits me well; if you have any to sell I would like to buy some."

H. E. Richardson, of Balgonie, Assa., had a yield of 60 lbs. He says: "Sown 1st May; on light sandy soil; harvested 15th August; no rust, very little smut; straw strong, 4½ feet long. It was ripe when Red Fife sown on the same day was still green. I think it is the best wheat for this country." This sample weighed 61⅓ lbs. per bushel.

Thos. Morgan of Cache Creek, British Columbia, reports an extraordinary yield, 634 lbs. (10 bushels 34 lbs) from 3 lbs. of seed. He says: "Sown 5th May, on rich sandy loam, on which potatoes were grown last year; in a high state of cultivation; sown broadcast on a little less than ⅙ of an acre; harvested 20th August; no rust or smut; straw tall, over 5 feet high; very strong; much earlier than other sorts. Parties who saw it before it was cut, said they never saw anything like it; all my grain is grown by irrigation." The sample sent was very fine and weighed 63½ lbs. per bushel. This is the largest yield ever reported from a 3 lb. sample, it is equal to nearly 70 bushels per acre—50 bushels of wheat per acre is not uncommon in that district on irrigated land.

In consequence of the injury done to wheat by early frost in the North-West during the past autumn more attention has been called to early ripening varieties, and the Ladoga has been much sought after for seed for next spring—for the reason that it has ripened early enough to escape all injury from frost. There must be many farmers now who have more or less of this wheat for sale, and its cultivation from this time forward promises to be more general. Mr. Samuel Hanna, of Griswold, Man., has been one of the most successful growers of this variety. He began with a 3-lb. sample the first year of its distribution from the Experimental Farm, and this has increased so rapidly, that during the season just closed, he has grown fifty acres which has given him an average yield of 30 bushels to the acre, or 1,500 bushels in all, most of this he is now offering for sale for seed. A sample of this grain sent for inspection weighs 60 lbs per bushel. Mr. Hanna's Red Fife yielded him an average of 30 bushels also, but most of that had the advantage of being sown on summer fallow, while the Ladoga was all put in on fall or spring ploughing. The Ladoga, he says, has never been injured by frost with him, and in his opinion it is ten days earlier than Red Fife. The wheat buyers have graded his samples as No. 1 hard, but they would prefer Red Fife if equally sound because it is more plump in the kernel. While Mr. Hanna is a strong advocate of Red Fife, he believes that every farmer in the North-West should have part of his crop in Ladoga, as it escapes frost, and the farmer can begin his harvesting of this grain at least a week earlier than Red Fife.

In the issue of *The Commercial*, of Winnipeg, dated 2nd February, reference is made to a very fine lot of Ladoga wheat grown in Prince Albert. The writer says:

"A representative of *The Commercial*, when in Prince Albert recently, came across a sample of wheat which was a surprise to him. He had seen nothing like it among hundreds of samples examined this season in other parts of the country. A bag of this wheat was procured by the publisher of *The Commercial*, and samples of the grain were forwarded to grain exchanges, milling publications, and leading wheat and flour dealers and experts in Canada, the United States and Great Britain. Replies have not yet been received from some who were forwarded samples, but will be published when they come to hand. The wheat we refer to was grown by William Plaxton, whose farm is six miles from Prince Albert. The samples sent out were not hand picked, as is usually the case with such, but just as it came out of the farm granary. The wheat was grown in 1890, which is generally regarded as the most unfavourable year experienced for almost a decade so far as producing a fine quality is concerned. The wheat is of the "Ladoga" variety, which was imported from Russia by the Dominion Government a few years ago, for testing in Canada. This wheat it is claimed ripens considerably earlier than Red Fife, which is an important factor in the northern region. By cultivation in the hard wheat region of Canada

this wheat becomes harder and is generally improved in quality. This was shown by comparing the wheat grown each year in succession from the original seed. The sample sent out was a pure hard wheat, bright and clean, weighing 66½ pounds to the imperial bushel and yielded about 35 bushels per acre. We requested a statement from Mr. Plaxton as to his experience in growing the wheat, and following we give it in his own words :—

"'In 1888 I got three lbs. and sowed it on the 7th May, and harvested it on the 30th of August; thrashed 96 lbs. of good clean grain. In 1889 I sowed 96 lbs. on the 16th April, covering about an acre of land, sowed broadcast. Harvested it on the 6th of August and threshed 14 bushels 68 lbs. of first-class wheat. The crop was light this year on account of the drought. In 1890 I sowed five acres on the 22nd of April, sowed broadcast about two bushels per acre and harvested it on the 15th of August and threshed 172 bushels of which you have a sample. This year (1890) I had Red Fife wheat, White Russian and Ladoga, sown side by side on the same kind of soil. The Ladoga ripened and was cut five days earlier than White Russian and ten days earlier than the Red Fife.

"'Yours truly, WM. PLAXTON.

"Following are some of the replies received to the samples sent out :—

"From the *Northwestern Miller*, of Minneapolis, the leading milling journal of the United States : 'Truly a remarkable sample.'

"From *Daily Business*, the grain trade paper of the Chicago Board of Trade : 'The *Daily Business* has received from the Winnipeg *Commercial*, a sample of "Ladoga" wheat, raised in the Prince Albert district, territory of Saskatchewan, 350 miles north of the international boundary line. It is a beautiful wheat, weighs about sixty-five pounds to the measured bushel, and is said to be equal, for flouring purposes, to any wheat grown. It was raised on the farm of William Plaxton, and is the third crop raised from the imported seed. It was sown about 22nd April, and harvested 15th August. It has many of the qualities of Red Fife, but ripens ten to fifteen days earlier. With each year of cultivation the grain improves, growing thinner in hull and harder.'

"E. Seckel & Co., grain commission merchants, Chicago, write : 'Your favor received, and also sample of wheat, for which accept our thanks. We exhibited same on 'Change and it attracted quite a good deal of attention. We must say that it is the finest sample of spring wheat we have laid our eyes on. One of our millers here would like to know the value of this wheat in your market, and the rate of freight to Chicago, if you can kindly give us the same.'

"A. C. Buell & Co., a leading Chicago grain firm, write : 'I have your letter accompanied by a sample of splendid wheat. A country that can raise such wheat as that sample will be sought after before many years, as the product of Minnesota and Dakota is fast deteriorating.'

"Kirkpatrick & Cookson, grain commission merchants, of Montreal, say: 'Your favor duly received and noted, as well as the sample of "Ladoga" wheat. It is certainly a very handsome sample and has been greatly admired. Is the bulk all as clean as this sample ? At what could a car or two be sold, as an introduction of the variety ?—We might be able to use a little bye-and-bye.'

"From the publisher of the *Miller's Review*, Philadelphia : 'With reference to the sample of wheat grown in the Prince Albert district, my people at the office report it to be something entirely outside of their experience, and they know pretty well what fine wheat and large crops of it are. I desire to show this wheat on our Exchange, and I will report to you the opinions of some of its members. It seems to me the wheat matures in a remarkably short time from the date of sowing. I will be pleased to write you what our dealers have to say about it. Yours very truly,

"'H. L. EVERELL.'

"*Millers' Review*, Philadelphia, Pa.: 'Among the samples displayed by Hancock & Co., of the Philadelphia Commercial Exchange, recently, was a small one from the territory of Saskatchewan, nearly three hundred and fifty miles north of the boundary line between the United States and the British possessions. It excited considerable attention, partly from the fact that the samples on the tables of Hancock & Co. usually are of interest to buyers, and partly, too, from the fact that the grain in the little blue box was of an exceptionally fine type of red spring wheat. The letter appended gives the history of our getting it, and as we do not wish to keep the sight of such beautiful stock from the appreciative gaze of millers and commercial men, we submitted it to Maj. Hancock, and through his offices it was introduced to the Chamber and to the notice of the members on 'Change. The Major pronounced the wheat as handsome as any he had ever seen, and he was sorry that the machinations of freight combines and tariffs so effectually kept such stock away from millers and grain men in this section and prohibited any substantial investment in this fine product of the far North.'

"These letters speak for themselves. Prince Albert has established its claim, and further comment is unnecessary."

Mr. Plaxton has sent a sample of this wheat to the Central Experimental Farm it is the finest sample we have ever received and weighs 66 lbs. per bushel.

Wm. Gibson, of Wolseley, N.W.T., another practical farmer to whom a sample was sent in the spring of 1888, has also had good success with this wheat. His 3-lb. sample produced him the first year 236 lbs. and his second crop thinly sown gave him over 100 bushels. In a letter dated 22nd November, 1890 he says: "My Red Fife wheat sown on the 8th of April was frozen and I think will grade No. 1 or No. 2 frozen, harvested on the 24th of August, this suffered from hail and yielded me only 13 bushels to the acre. The Ladoga wheat sown 10th April and harvested 18th August has escaped the frost, this also suffered from hail and yielded only 14 bushels per acre. This season's experience shows the necessity of every farmer sowing a part of his grain Ladoga. I shipped over 100 bushels to the United States last year for seed, as farmers here were willing to stick to Red Fife. This year I have had a lot of orders for Ladoga for seed next spring."

Similar favourable experiences might be multiplied, but enough has perhaps been said to show that the introduction of the Ladoga wheat has been a good thing for the North West-Territories, that it is probable that this wheat from its early ripening properties, will to a great extent afford a solution of the probelm of early frost, and from its high quality and productiveness in the northern portions of the great plains, help materially in extending the area for successful wheat culture, and in building up such a reputation for wheat-growing there as shall aid in the settlement of the country.

The reports received regarding the tests of other varieties of wheat may be summarized as follows:

Red Fife—Ten reports from Ontario show an average yield of 27 lbs. Sixteen from Quebec, 25½ lbs. One from Nova Scotia, 29 lbs. Two from New Brunswick, 48¼ lbs, and two from Prince Edward Island, 55 lbs.

White Fife—Eight reports from Ontario give an average yield of 24¼ lbs. and four reports from Quebec an average of 31¼ lbs.

Red Fern—Three reports from Ontario give an average yield of 20⅔ lbs. Six from Quebec, 33⅓ lbs.; two from Nova Scotia, 24 lbs.; one from New Brunswick 30 lbs., and two from Prince Edward Island with an average of 88½ lbs.

EXPERIMENTS WITH OATS.

During the past season 28 varieties of oats have been tested in field plots and 28 others in small plots, making 56 in all. Of these, 16 varieties were sown on plots of one-tenth acre each, alongside of each other, on the same day, on a clay loam of fairly uniform character. The results obtained from grain grown under such conditions may be compared, the one with the other, with much less probability of error

than when comparisons are made between varieties sown at different periods and on different soils on the same farm. The field referred to was in hay when the farm was purchased; it yielded fair crops in 1887 and 1888; the sod was ploughed under early in the autumn of 1888 and a crop of oats taken off in 1889. The land was ploughed soon after the oat crop was harvested and sown with experimental plots of oats, barley and wheat in the spring of 1890. No manure or other fertilizer has yet been used on this land since the purchase was made. The results are given in the appended table, following which particulars will be found relating to larger field plots of these and other varities. On all the tenth-acre plots the oats were more or less rusty, and in most instances they were much injured from this cause.

——	Date of Sowing.	Date of Harvesting.	Number of Days Maturing.	Yield per Acre.	Weight per Bushel.
				Bush.	Lbs.
American Triumph	April 25	Aug. 11	108	37¼	35¼
Banner	do 25	do 8	105	52¾	32½
Black Tartarian	do 25	do 12	109	28¼	25¾
Bonanza	do 25	do 5	102	42½	41½
Canadian Triumph	do 25	do 2	99	30¼	43½
Cream Egyptian	do 25	do 8	105	30¾	38
Egyptian	do 25	do 8	105	31¾	35½
Early Blossom	do 25	do 14	111	23½	31
Early Race-horse	do 25	do 5	102	30½	41
Flying Scotchman	do 25	do 5	102	36¾	38½
Giant Swedish	do 25	do 14	111	33¾	29
Poland White	do 25	do 5	102	33½	41
Prize Cluster, imp. 1889	do 25	do 2	99	33¾	41¼
do do 1890	do 25	July 30	96	34¾	41
Rennie's Prize White	do 25	Aug. 4	101	25¾	41
Victoria Prize	do 25	do 4	101	36¾	41
White Russian	do 25	do 16	113	34¼	32

It will be seen that the Banner heads the list in this series, but the grain is light. Bonanza stands next in yield, with a heavy sample, followed among the oats of heavy weight by Victoria Prize and Prize Cluster. The Canadian Triumph, although a smaller yield, gives the heaviest sample.

LARGER FIELD PLOTS.

American Triumph (Carter's).—On sandy loam; manured in spring of 1889; two acres. Sown 21st April; 2 bushels per acre; ripe 12th August; time to mature, 113 days; yield per acre, 31¼ bushels; weight per bushel, 36¼ lbs.

Banner.—On sandy loam; no manure; 2½ acres. Sown 29th April; 1¾ bushels per acre; ripe 12th August; time to mature, 105 days; straw bright and strong; very little rust; stands well; height, 3½ to 4 feet; yield per acre, 22¾ bushels, weighing 30¾ lbs. per bushel. A second plot, on sandy clay soil, no manure, ¼ acre, was sown 7th May; 1½ bushels per acre; ripe 12th August; time to mature, 97 days; straw dark; stands well; height, 3 to 3½ feet; yield per acre, 31¼ bushels, weight per bushel, 30¼ lbs.

Black Tartarian.—This seed was imported from Scotland in the spring of 1890. It was a very fine sample, weighing 42 lbs. to the bushel. On sandy clay soil, without manure; 7 acres; sown 9th May, 2 bushels to the acre; harvested 15th August; time to mature, 98 days; medium growth; poor colour; much rust, and red leaf; yield, 26¾ bushels per acre, weighing 35 lbs. per bushel.

Bonanza.—On sandy loam; no manure; 2½ acres. Sown 29th April; 1¾ bushels per acre; ripe 3rd August; time to mature, 96 days; straw bright, rather weak; considerably rusted; height, 4½ to 5 feet; yield per acre, 31 bushels, weighing 42½ lbs. per bushel.

Canadian Triumph.—On light, sandy clay; no manure; 1¼ acres. Sown 26th April; 1¾ bushels per acre; harvested 3rd August; time to mature, 99 days; even growth; straw bright; very little rust; yield per acre, 25¼ bushels; weight per bushel, 43 lbs;

Canadian White.—On sandy clay soil; no manure; 1 acre. Sown 24th April; 2¼ bushels per acre; ripe 5th August; time to mature, 103 days; straw bright; stands well; height, 3½ to 4 feet not much rust; yield per acre, 28¼ bushels; weight per bushel 36 lbs.

Early Archangel.—On sandy clay soil; no manure; ¼ acre. Sown 3rd May; 1½ bushels per acre; ripe 7th August. time to mature, 96 days; uneven growth; straw bright; stands well; a little rust and some smut; height 3 to 3½ feet; yield per acre, 24¼ bushels; weight per bushel, 39 lbs.

Early Racehorse.—On sandy loam; manured in spring of 1889; 4½ acres. Sown 21st April; 1¾ bushels per acre; ripe 2nd August; time to mature, 103 days; straw a little dark, lodged in some spots; considerably rusted; height, 4 to 5 feet; yield per acre, not ascertained; weight per bushel, 42 lbs.

Egyptian.—On sandy clay; no manure; one acre. Sown 24th April; 2¼ bushels per acre; ripe 5th August; time to mature, 103 days; even growth; very little rust; height, 3½ to 4 feet; yield per acre, 36½ bushels; weight per bushel, 41¾ lbs.

Flying Scotchman.—On sandy loam; manured in spring of 1889; 2 acres. Sown 22nd April; 1¾ bushels per acre; ripe 2nd August; time to mature, 102 days; even growth; very little rust; height, 3½ to 4½ feet; yield per acre, 40¼ bushels; weight per bushel, 39½ lbs.

Georgic Early White.—On sandy clay soil; no manure; one acre. Sown 24th April; 2¼ bushels per acre; ripe 2nd August; time to mature, 100 days; even growth; straw bright; stands well; very little rust; height, 3½ to 4½ feet; yield per acre, 26½ bushels; weight per bushel, 42 lbs.

Holstein Prolific.—On sandy clay soil, no manure, ¼ acre; sown May 7th; 1½ bushels per acre; ripe August 10th; time to mature 95 days; straw weak and considerably rusted; height 3 to 3½ feet; yield per acre, 19½ bushels; weight per bushel 30½ lbs.

Hazlett's Seizure.—On Sandy clay soil; no manure; ¾ acre. Sown 7th May; 1½ bushels per acre; ripe 12th August; time to mature 97 days, straw dark; considerably rusted; height, 3 to 3½ feet; yield per acre, 16¾ bushels; weight per bushel, 36 lbs.

Hungarian White.—On sandy clay soil; no manure; 1 acre. Sown 24th April; 2¼ bushels per acre; ripe 2nd August; time to mature, 100 days; even growth; considerably rusted; height, 3½ to 4 feet; yield per acre, 24¾ bushels; weight per bushel, 40½ lbs.

Longfellow.—On sandy loam; no manure; 3½ acres. Sown 1st May; 1¾ bushels per acre; ripe 6th August; time to mature, 97 days; straw rather dark; a little rusted; height, 2½ to 3½ feet; yield per acre, 27¾ bushels; weight per bushel, 36½ lbs.

Poland White.—On light sandy clay; no manure; 1¼ acres. Sown 26th April; 1¾ bushels per acre; harvested 4th August; time to mature, 100 days; even growth; straw bright; very little rust; yield per acre, 23 bushels; weight per bushel, 42¾ lbs.

Potato English.—On sandy clay soil; no manure; 1 acre. Sown 24th April; 2¼ bushels per acre; ripe 5th August; time to mature, 103 days; straw bright; stands well; height, 3½ to 4½ feet; not much rust; yield per acre, 34¾ bushels; weight per bushel, 39 lbs.

Prize Cluster.—On sandy loam and partly peaty soil; no manure; 8 acres. Sown 23rd April; 1¾ bushels per acre; ripe 4th August; time to mature, 103 days; straw bright, rather soft; more inclined to lodge than some other varieties; but little rust; height, 3½ to 4½ feet; yield per acre, 30¼ bushels; weight per bushel, 42½ lbs.

Rennie's Prize White.—On light sandy loam; no manure; 1¼ acres. Sown 9th May; 1¾ bushels per acre; ripe 9th August; time to mature, 92 days; of even growth; straw very rusty; height, 3½ to 4 feet; yield, 31 bushels per acre; weight, 42¼ lbs. per bushel.

Rosedale.—On sandy clay soil; no manure; ¼ acre. Sown 3rd May; 1½ bushels per acre; ripe 10th August; time to mature, 99 days; of uneven growth; straw rather weak; height, 3 to 3½ feet; yield per acre, 30½ bushels; weight per bushel, 36¾ lbs.

Siberian—On sandy loam; 18 to 20 tons manure per acre; ¼ acre. Sown 16th May; ripe 14th August; time to mature, 90 days; yield per acre, 23¼ bushels; weight, 28¼ lbs per bushel.

Victoria Prize.—On sandy loam mixed with clay; no manure; 1¾ acres. Sown 22nd April; 1¾ bushels per acre; ripe 2nd August; time to mature, 102 days; straw stands fairly well; considerably rusted; height, 4 to 5 feet; yield per acre, 38¼ bushels; weight per bushel, 41¼ lbs.

Waterloo.—On sandy soil; no manure; 4 acres. Sown, 2nd May; 2 bushels per acre; ripe 13th August; time to mature, 103 days; straw bright; stands well; not much rust; height, 3 to 4 feet; yield per acre, 20½ bushels, weighing 34 lbs. per bushel. A second plot of 1 acre, on sandy clay soil, no manure, was sown 24th April; 2¼ bushels per acre; ripe 4th August; time to mature, 102 days; yield per acre, 26 bushels; weight per bushel, 34 lbs.

Welcome.—On sandy clay soil; no manure; 4 acres. Sown 28th April; 2 bushels per acre; ripe 29th July; time to mature, 92 days; straw rather dark, but strong; a little rust and some smut; height, 3 to 3½ feet; yield per acre, 38¾ bushels; weight per bushel, 42½ lbs.

White Russian.—On mixed sandy and peaty soil; no manure; 1½ acres. Sown 2nd May; 2 bushels per acre; ripe 12th August; time to mature, 102 days; straw fairly bright and strong; not much rust; height, 3½ to 4½ feet; yield per acre, 37¾ bushels, weighing 32½ lbs. per bushel. A second plot of 1 acre of mixed sandy and clay soil, no manure, was sown 24th April; 2 bushels per acre; ripe 5th August; time to mature, 103 days; yield per acre, 42½ bushels.

A third plot of 8 acres, on sandy clay soil, with from 18 to 20 tons of manure per acre, was sown 6th May; ripe 13th August; time to mature, 99 days; yield per acre, 36 bushels; weight per bushel, 32 lbs.

EXPERIMENTS WITH BARLEY.

TWO-ROWED VARIETIES.

Adjoining the one-tenth acre plots of oats, all sown the same day, was a similar series of plots of barley, consisting of eleven two-rowed varieties and five six-rowed. Particulars as to the character of the soil, treatment of the land and preceding crops will be found under "Experiments with Oats." The grain on all these plots was more or less rusted, and in most instances it was badly affected. The following table gives the results of these barley tests.

—	Date of Sowing.	Date of Harvesting.	Number of Days Maturing.	Yield per Acre.
				Bush.
Beardless	April 25	Aug. 14	111	26¼
Danish Chevalier	do 25	do 10	107	23¾
Danish Printice Chevalier	do 25	do 10	107	26¾
Early Minting	do 25	do 10	107	19
English Malting	do 25	do 14	111	24¼
Golden Melon, Imported 1888	do 25	do 14	111	20½
do do 1890	do 25	do 8	105	16
Goldthorpe do 1890	do 25	do 12	109	14¼
Peerless White do 1888	do 25	do 10	107	22½
do do 1890	do 25	do 9	106	18¼
Prize Prolific do 1889	do 25	do 8	105	28
do do 1890	do 25	do 5	102	27½
Saale do 1889	do 25	do 8	105	24¼

For weight per bushel of these varieties see larger field plots.

In comparing the results here given it will be observed that in every instance where the material has been available for comparison, recently imported two-rowed barley, that of 1890, has produced a smaller crop than when grown from the same sort after being under cultivation here for one or two years. In former experiments results confirming this same point were obtained, from which we may gather that increasing crops may be looked for as these barleys become acclimatized. There are, however, two exceptions in the other field plots—one of Selected Chevalier, imported 1890, and one of Golden Melon, imported 1890, both of which gave a much larger yield. These two plots, however, were sown on an exceptionally good piece of clay loam, extending to a roadway and along the margin of the road; the land was manured in the spring to the width of about 10 feet. In point of productiveness the variety known as Prize Prolific heads the list. There is an unexpected difference in the time of ripening; the more recent importations mature in from one to six days less time, than those samples which have been grown in this climate for a year or two, which is another evidence of the importance of early seeding. The varieties named in the table are, from the English standard, all malting barleys, and most of them very highly esteemed for this purpose. With the exception of the Goldthorpe they are all of the Chevalier type, with long, pendulous heads. The Goldthorpe is more erect, and resembles the Duckbill, with a shorter and somewhat flattened ear.

LARGER FIELD PLOTS.

Beardless.—On sandy loam; no manure; 3 acres. Sown 23rd April; 2 bushels per acre; ripe 8th August; time to mature, 107 days; straw bright, stands well; very little rust; height, 3 to 3½ feet; yield per acre, 25¾ bushels; weight per bushel, 51½ lbs.

Chevalier Selected.—Imported 1890; on good clay loam; a part of this was manured in spring of 1890, before sowing; ¼ acre. Sown 26th April; 2 bushels per acre; ripe 5th August; time to mature, 101 days; straw bright, stands fairly well; but little rusted; height, 3 to 3½ feet; yield per acre, 46½ bushels; weight per bushel, 51½ lbs. A second plot of 2 acres, on a soil of mixed sand and clay, was sown 2nd May, 1¾ bushels per acre; ripe 5th August; time to mature, 95 days; straw bright, stands well; considerably rusted; height, 2½ to 3½ feet; yield, 24 bushels per acre; weight per bushel, 51½ lbs.

Danish Chevalier.—On mixed sandy and clay loam, without manure; 1¾ acres; Sown 2nd May, 2 bushels per acre; ripe 12th August; time to mature, 102 days; straw dark; considerably rusted; height, 3 to 3½ feet; yield per acre, 25⅛ bushels; weight per bushel, 51¾ lbs. On same soil and adjoining, ½ acre sown at the same time was fertilized with 200 lbs. (400 lbs. per acre) of a special barley fertilizer; in this instance the yield was 25⅔ bushels. Another ½ acre adjoining received an application of 200 lbs. of odorless phosphate; this yielded 25 bushels per acre; while in the case of a fourth plot of ⅙ of an acre, which had received an application of 66 lbs. of fish manure, the yield was 23½ bushels per acre. The land on which these experiments were tried appeared to be very uniform and the results are certainly very puzzling.

Danish Printice Chevalier.—On mixed sandy and clay loam, without manure; ¾ of an acre. Sown 3rd May, 2 bushels per acre; ripe 12th August; number of days to mature, 101; straw rather dark, but standing well; height, 3 to 3½ feet; considerably rusted; yield per acre, 30 bushels; weight per bushel, 51¾ lbs. A second plot was sown on heavy sandy loam; no manure; 1¾ acres. Sown 24th April, 2 bushels per acre; ripe 9th August; time to mature, 107 days; straw bright; stands fairly well; very little rust; height, 3½ to 4 feet; yield per acre, 27¼ bushels; weight per bushel, 51¾ lbs.

Early Minting.—On sandy loam; no manure; 2½ acres. Sown 2nd May, 1¾ bushels per acre; ripe 5th August; time to mature, 95 days; straw bright, but soft; breaks easily slightly rusted, height 2 to 2½ feet; yield per acre, 25 bushels; weight per bushel, 51 lbs.

Golden Melon.—Importation 1890. On good clay loam, a part of which was manured in spring of 1890 before sowing, $\frac{1}{12}$ acre. Sown 26th April, 2 bushels per acre; ripe 6th August; time to mature, 102 days; straw bright, stands well; not much rust; height, 3 to $3\frac{1}{2}$ feet; yield per acre, $46\frac{3}{4}$ bushels; weight per bushel, 52 lbs. Another plot of 1 acre was sown with seed grown from importation of 1888 on sandy loam mixed with clay, without manure. Sown 24th April, two bushels per acre; ripe 2nd August; time to mature, 100 days; even growth; straw bright; stands well; very little rust; height, $3\frac{1}{2}$ to 4 feet; yield per acre, $35\frac{3}{4}$ bushels; weight per bushel, 52 lbs.

Peerless White.—Importation 1890. On good clay loam, partly manured; $\frac{1}{5}$ acre. Sown 26th April, ripe August 6th; time to mature, 102 days; straw bright; stands well; but little rust; height, 3 to $3\frac{1}{2}$ feet; yield per acre, $46\frac{3}{4}$ bushels; weight per bushel, 51 lbs.

Goldthorpe.—On sandy loam; no manure; $2\frac{1}{2}$ acres. Sown 26th April, 2 bushels per acre; ripe 6th August, time to mature, 102 days; straw bright, and stands well; height, $2\frac{1}{2}$ to $3\frac{1}{2}$ feet; yield per acre, $20\frac{3}{4}$ bushels; weighing 52 lbs. per bushel.

Prize Prolific.—On soil mostly clay, with some peat; no manure; 7 acres. Sown 30th April, $1\frac{3}{4}$ bushels per acre; ripe on higher land, 4th August, on lower peaty soil, 12th August; time to mature, 96 to 104 days: straw bright and strong; stands well; height, 3 to $3\frac{1}{2}$ feet; very even growth; yield per acre, 32 bushels; weight per bushel, 52 lbs. One-half acre of this plot was measured off and sown with 200 lbs. of a special barley fertilizer, (400 lbs. per acre) the yield from which was $31\frac{1}{2}$ bushels per acre. A third plot on another part of the farm, on heavy sandy loam; no manure; $1\frac{3}{4}$ acres; was sown 26th April, 2 bushels per acre; ripe 6th August; time to mature, 102 days; yield per acre, 24 bushels.

Saale.—On heavy sandy loam; no manure; $1\frac{1}{2}$ acres. Sown 24th April, 2 bushels per acre; ripe 9th August; time to mature, 107 days; even growth; straw bright; stands well; very little rust; height, $3\frac{1}{2}$ to 4 feet; yield per acre, 30 bushels; weight per bushel, 51 lbs.

Large Two-rowed Naked.—This is a naked barley, not suitable for malting, but valuable for feed, producing a large, heavy grain. Grown on sandy loam; no manure; 2 acres. Sown 1st May, 2 bushels per acre; ripe 4th August; time to mature, 95 days; straw rather weak; considerably rusted; breaks down easily; height, 3 to $3\frac{1}{2}$ feet; yield per acre, $28\frac{1}{2}$ bushels; weight per bushel, $60\frac{1}{4}$ lbs This barley should be sown thicker, on account of the large size of the grain—not less than $2\frac{1}{2}$ bushels per acre.

SIX-ROWED VARIETIES.

The following were sown on one-tenth acre plots adjacent to those of the two-rowed sorts :—

——	Date of Sowing.	Date of Harvesting.	Number of Days Maturing.	Yield per Acre.	Weight per Bushel.
				Bush.	Lbs.
Baxter's Six-rowed	April 25	July 31	97	25	48
Indian, from Spiti Valley	do 25	do 25	91	$21\frac{1}{4}$	55
Mensury	do 25	do 31	97	$20\frac{3}{4}$	$44\frac{1}{2}$
Odessa Six-rowed	do 25	do 31	97	$18\frac{1}{4}$	$46\frac{1}{2}$
Petschora	do 25	do 29	95	$19\frac{1}{4}$	$43\frac{1}{4}$
Rennie's Improved	do 25	do 30	96	$25\frac{3}{4}$	$47\frac{1}{2}$

These are all of the ordinary type of six-rowed barley, excepting the Indian from Spiti Valley, which is a hulless sort, of a dark bluish colour and very heavy. It is one of the varieties of grain which was sent to Canada for test by the Govern-

ment of India in 1888 ; it is an early ripening sort, rather short in growth, with a compact, heavy head, and, although it has not yielded heavily here, promises to be a valuable variety for feeding purposes.

LARGER FIELD PLOTS.

Indian from Spiti Valley.—On sandy loam ; no manure ; 2½ acres. Sown 1st May ; 1¾ bushels per acre ; harvested 26th July ; time to mature, 86 days ; straw rather soft and weak ; many heads bent over ; height, 1½ to 2 feet ; very little rust; yield per acre, 16½ bushels ; weight per bushel, 54½ lbs.

Guymalaye.—On sandy loam ; no manure ; $\frac{1}{10}$ acre. Sown 14th May ; 2 bushels per acre ; ripe 7th August ; time to mature, 85 days ; straw bright ; stands well ; very little rust ; height, 3 to 3½ feet ; yield per acre, 36¼ bushels ; weight per bushel, 56 lbs. This is also a hulless barley, which seems to be identical with what is known as "six-rowed wheat barley." It is a very productive variety, and promising for feed ; the kernel is of a dark amber colour.

Hulless Black.—On sandy loam ; no manure ; ¼ acre. Sown 14th May, 2 bushels per acre ; ripe 3rd August ; time to mature, 81 days ; straw very dark in colour ; stands well ; very little rust ; height, 2½ to 3 feet ; yield per acre, 22 bushels ; weight per bushel, 62 lbs. This is a very heavy hulless barley, with a black kernel, which is worthy of more extended trial as a feed barley.

Odessa Six-rowed.—On mixed clay and sandy loam ; no manure ; ⅛ acre. Sown 15th May ; 1½ bushels per acre ; ripe 14th August ; time to mature, 91 days ; straw bright, with very little rust ; height, 2½ to 3½ feet ; yield per acre, 31¼ bushels ; weight per bushel, 49¼ lbs.

EXPERIMENTS WITH SPRING WHEAT.

The wheat plots enumerated in the following table, complete the series of one-tenth acre plots of grain on similar clay loam, all sown on the same day and without manure. The season proved to be very unfavourable for spring wheat, almost all varieties showing a light yield. In most instances the third and last maturing kernel in each group on the ear was empty, and those clusters forming the top of the ear were in a similar condition. This has probably resulted from unfavourable hot and dry weather, occuring just at the time when the floral organs within the husk were in a soft and critical stage of development, causing them to shrink and wither. In all these plots the straw was much rusted, in some instances worse than others.

——	Date of Sowing.	Date of Harvesting.	Number of Days Maturing.	Yield per Acre.	Weight per Bushel.
				Bush.	Lbs.
Campbell's White Chaff	April 25	Aug. 8	105	19	58
Campbell's Triumph	do 25	do 10	107	11¼	57
Carter's Cross-bred I or Anglo-Canadian	do 25	do 14	111	4	54¾
Green Mountain	do 25	do 16	113	8¾	57
Indian Hard Calcutta	do 25	do 5	102	10¼	59¼
Judket	do 25	do 10	107	21	58½
Ladoga	do 25	do 7	104	10¼	56¼
Red Fern	do 25	do 11	108	12	55½
Rio Grande	do 25	do 16	113	17	59
Russian Hard Tag	do 25	do 8	105	20¼	60¾
Saxonka	do 25	do 11	108	12	55½
White Delhi	do 25	do 7	104	12	56½
White Russian	do 25	do 14	111	10¼	56¼
White Fife	do 25	do 12	109	18¾	55¾
Red Fife	do 25	do 12	109	12	56¾

These plots show a wide difference in yield. The most prolific are Judket, Russian Hard Tag, Campbell's White Chaff and White Fife. The Russian Hard Tag is a bearded sort, with a ricy kernel of inferior quality, much like goose wheat; the other varieties named are all of good quality, and beardless. The Campbell's White Chaff is particularly promising, as will be seen from the records of the larger field plots. It also proved a heavy yielder in 1889, giving 36¾ bushels per acre, being 3¾ bushels more than any other sort tested. At the branch Experimental Farms it has done well during the past season, at Nappan, N.S., the yield has been 32 bushels per acre; at Brandon, Man., 24 bushels 36 lbs.; at Indian Head, N.W.T., 32 bushels 4 lbs.; and at Agassiz, B.C., 3 lbs. gave a return of 48 lbs.

LARGER FIELD PLOTS.

Campbell's White Chaff.—On sandy loam; no manure; ½ acre. Sown 23rd April, 1½ bushels per acre; harvested August 13th; time to mature, 112 days; even growth, straw bright; stands well; height, 4 to 4½ feet; yield per acre, 21¾ bushels; weight per bushel, 57½ lbs. One-half acre adjoining, sown at the same time, which was treated with 200 lbs. of special fertilizer (400 lbs. per acre) yielded 18¾ bushels per acre. A third ½ acre, next adjoining, treated with 200 lbs. of odorless phosphate, gave a yield of 14 bushels; while a fourth ½ acre in the same series, without fertilizer, yielded 17 bushels per acre. This soil was of variable character, which may account for these anomalous results. There is no doubt that had the soil been uniform in fertility the addition of the fertilizers would have increased the yield.

Campbell's Triumph.—On sandy loam; no manure; 1½ acres. Sown 23rd April, 1½ bushels per acre; ripe 13th August; time to mature 112 days; even growth; straw bright, and stands well; height, 3 to 4 feet; yield per acre, 12¾ bushels; weight per bushel, 59¾ lbs.

Carter's Cross-bred I or *Anglo-Canadian.*—On sandy loam; no manure. Sown 23rd April, 1 bushel per acre; ripe 13th August; time to mature, 112 days; even growth; straw bright, and stands well; height, 3½ to 4½ feet; yield per acre, 5 bushels, weighing 51 lbs. per bushel. A third plot was that of one-tenth of an acre, already reported on among the series of plots sown one week apart to test the advantage of early seeding. This was sown 22nd April; was ripe 13th August; time to mature, 113 days; yield per acre, 5 bushels 50 lbs.

This new hybrid wheat, originated by James Carter & Co., of London, England, and which has produced such large crops in Great Britain, has made but a poor record here. It is of strong and vigorous growth, with a large bearded ear, which gave promise of a good yield early in the season, but as the time of harvest approached a considerable part of each head was found to be empty. The plants themselves were so promising that I look for much better results another year, when the conditions will probably be more favourable and the grain somewhat acclimatized. That the yield obtained at Ottawa is not normal is shown by the larger crops at the branch Experimental Farms. At Nappan, N.S., the yield was 29¾ bushels per acre; at Brandon, Man., 26 bushels; at Indian Head, N.W.T., 16 bushels 28 lbs.; and at Agassiz, B.C., 35 lbs. were obtained from 1 pound sown. In time of ripening it is six or seven days later than Ladoga.

Judket.—On mixed clay and sandy loam; no manure; 2 acres. Sown 12th May, 1½ bushels per acre; harvested 16th August; time to mature, 96 days; fair growth; not much rust; yield per acre, 11½ bushels; weight per bushel, 59 lbs.

Rio Grande.—On sandy loam; no manure; 2 acres. Sown 23rd April, 1½ bushels per acre; harvested 15th August; time to mature, 114 days; straw bright, and stands well; height, 3½ to 4½ feet; yield per acre, 14 bushels, weighing 62 lbs per bushel.

SPRING WHEAT IN ROWS 2½ FEET APART.

It has been stated that wheat yields large crops when grown in drills 2½ feet apart, the land being kept clean with a horse cultivator. Nine varieties of wheat were sown in this manner on sandy loam, which was manured in the spring of 1890,

with from 18 to 20 tons of stable manure per acre. Each variety occupied six rows, covering a space of one-twentieth of an acre. The following results were had:—

——	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Yield per Acre.	Weight per Bushel.
				Bush.	
Campbell's Triumph	May 2	Aug. 11	101	5¼	58½
Judket	do 2	do 12	102	7	59½
Ladoga	do 2	do 9	99	7¼	57¼
Red Fern	do 2	do 11	101	5⅓	59½
Rio Grande	do 2	do 13	103	7¾	60
Red Fife	do 2	do 12	102	5½	59½
Saxonka	do 2	do 11	101	5¼	58
White Delhi	do 2	do 7	97	8	60
White Russian	do 2	do 13	103	7¼	60¾

The samples of grain grown on these plots weighed well for this season, but so much of the land being unoccupied the crop was relatively small.

EXPERIMENTS WITH WINTER WHEAT.

A few varieties of winter wheat were sown in field plots, but most of them were much injured by winter, and some were so badly winter-killed that the yield per acre could not be ascertained. A similar experience was had last year, which leads to the opinion that the climate of Ottawa is not favourable to the growth of winter wheats.

Democrat.—On sandy clay loam, no manure; ⅔rds acre. Sown 6th September, 1889, 2 bushels per acre; ripe 1st August, 1890; straw bright; stands well; very little rust; height, 3½ to 4 feet; yield per acre not ascertained; weight per bushel, 59½ lbs.

Early Red Clawson.—On sandy loam; no manure. Sown 10th September, 1889, 2 bushels per acre; ripe 31st July, 1890; straw strong; very little rusted; height, 3 to 3½ feet, yield per acre not ascertained.

Golden Cross.—On sandy loam; no manure. Sown 10th September, 1889, 2 bushels per acre; ripe 30th July, 1890; straw rather dark, but strong; considerably rusted; height, 4 to 5 feet; yield per acre, 26¼ bushels; weight per bushel, 61¼ lbs.

Manchester.—On sandy clay loam; no manure; 1 acre. Sown 6th September, 1889, 2 bushels per acre; ripe 30th July, 1890; straw dark, and rusty; height 3½ to 4 feet; yield per acre, 25 bushels; weight per bushel, 61¼ lbs.

Martin's Amber.—On sandy loam; no manure. Sown 10th September, 1889, 2 bushels per acre; ripe 5th August, 1890; straw bright and strong; very little rust; height, 3½ to 4½ feet; yield per acre not ascertained.

Mediterranean—On sandy loam; no manure. Sown 10th September, 1889, 2 bushels per acre; ripe 31st July, 1890; straw rather dark; considerably rusted; height, 3½ to 4 feet; yield per acre not ascertained.

New Monarch.—On sandy loam; no manure. Sown 10th September, 1889, 2 bushels per acre; ripe 31st July, 1890; straw bright and strong, with very little rust; height, 3½ to 4½ feet; yield per acre not ascertained; weight per bushel, 58½ lbs.

Tasmania.—On sandy clay loam; no manure. Sown 5th September, 1889, 2 bushels per acre; ripe 1st August, 1890; straw bright; considerably rusted; height, 3 to 3½ feet; yield per acre not ascertained; weight per bushel, 61 lbs.

Volunteer.—On sandy loam; no manure. Sown 10th September, 1889, 2 bushels per acre; ripe 31st July, 1890; straw dark; much rusted; height, 3½ to 4 feet; yield per acre 26 bushels.

EXPERIMENTS WITH RYE.

WINTER VARIETIES.

Reading Giant.—On light sandy loam; no manure; 2½ acres. Sown 7th September, 1889, 1½ bushels per acre; ripe 30th July, 1890; straw strong and bright; very little rust; height, 5½ to 6 feet, of fine appearance, yield per acre, 14¾ bushels; weight per bushel, 55 lbs.

Finnish Wassa.—On light sandy loam; no manure; 2¼ acres. Sown 7th September, 1889, 1½ bushels per acre; ripe 29th July, 1890; straw rather soft, breaks down more than the other varieties, also more rusted; height, 5 to 5½ feet; yield per acre, 17¼ bushels; weight per bushel, 53 lbs.

Polar.—On light sandy loam; no manure; 2½ acres. Sown 7th September, 1889, 1½ bushels per acre; ripe 30th July, 1890; straw strong; 5½ to 6 feet high; considerably rusted; heads well filled; yield per acre, 16 bushels; weight per bushel, 51¾ lbs.

Common Fall Rye.—On light sandy loam; no manure; 1 acre. Sown 7th September, 1889, 1½ bushels per acre; ripe 30th July, 1890; straw strong, considerably rusted, yield per acre, 24¼ bushels; weight per bushel, 55¼ lbs.

SPRING VARIETY.

Spr'ng Rye.—On poor, light sandy soil; 18 to 20 tons manure per acre two acres. Sown 22nd April, 1½ bushels per acre; straw bright and strong; height, 4 to 4½ feet; heads well filled; yield per acre, 24⅓ bushels; weight per bushel, 58¼ lbs.

EXPERIMENTS WITH PEAS.

Blackeyed Marrowfat.—On sandy loam; on which was applied 18 to 20 tons of manure per acre in 1890, ½ acre. Sown 8th May, 4 bushels per acre; ripe 9th August; time to mature, 93 days; yield per acre, 39¼ bushels; weight per bushel, 61 lbs.

Daniel O'Rourke.—On light sandy loam; no manure; ¼ acre. Sown 8th May, 2¾ bushels per acre; ripe 25th July, time to mature, 78 days; yield per acre, 37¾ bushels; weight per bushel 58¾ lbs.

Golden Vine.—On sandy clay soil; no manure; 5 acres. Sown 28th April, 3 bushels per acre; ripe 4th August; time to mature, 98 days; yield per acre, 36¾ bushels; weight per bushel, 65½ lbs.

Multiplier.—On sandy clay loam; no manure; 5½ acres. Sown 28th April, 3 bushels per acre, ripe 12th August; time to mature, 106 days; yield per acre, 35¾ bushels, weight per bushel, 65½ lbs.

Pride.—On clay loam; no manure; ⅛ acre. Sown 19th May, 2 bushels per acre; ripe 8th August; time to mature, 81 days; yield per acre, 30½ bushels; weight per bushel, 65½ lbs.

EXPERIMENTS WITH TURNIPS.

Seventeen varieties of turnips were sown in rows 2 feet 4 inches apart, and the yields per acre given in the following list have been calculated from the produce of two rows in each case 66 feet long. Estimates based on small plots almost always show a relatively greater yield than when founded on the results of larger areas, but since all the varieties were treated alike and the soil very similar throughout these figures form a fair basis for the comparison of varieties. They were all sown on the 30th of May and pulled the 21st of October. The soil was a sandy loam, rather

light in character, which received a coating of from 18 to 20 tons of manure per acre in 1888, and a coating of unleached ashes, about 150 bushels to the acre late, in 1889.

——	Yield per Acre.		Yield per Acre.
	Tons.	Lbs.	Bush.
Lord Derby Swede (Carter)	46	1,060	1,551
Purple Top Swede (Rennie)	39	634	1,310 34/80
Skirving's Improved Purple Top Swede (Steele)	39	492	1,308 12/80
Selected Champion Purple Top Swede	39	210	1,303½
Highland Prize Purple Top Swede (Steele)	37	1,098	1,251 28/80
Elephant Swede (Carter)	35	1,280	1,188
Marquis of Lorne Purple Top Swede (Bruce)	35	1,280	1,188
Queen of the Swedes (Carter)	35	555	1,180 55/80
Purple Top Swede (Steele)	34	168	1,136 8/80
Skirving's Swede (Carter)	34	168	1,136 8/80
Skirving's King of Swedes (Steele)	33	1,744	1,129 4/80
Sutton's Champion (Rennie)	33	188	1,103 8/80
Hartley's Bronze (Pearce)	30	1,804	1,030 4/80
Bangholm (Carter)	29	1,824	997 8/80
Clyde Swede (Evans)	27	1,155	919½
White Swede (Steele)	26	1,601	893 71/80
Pearce's Invincible (Pearce)	21	570	709½

In a second trial with 22 varieties on a poorer soil, without manure, later sown, the following results were had. The yield per acre was calculated from the same sized plots. The seed was sown on the 2nd June and the roots pulled 24th October:—

——	Yield per Acre.		Yield per Acre.
	Tons.	Lbs.	Bush.
Improved Purple Top Mammoth (Simmers)	32	350	1,072½
Hartley's Bronze (Pearce)	27	1,722	928 32/80
Laidlaw's Swede (Pearce)	26	1,601	893 71/80
Skirving's Swede (Carter)	26	611	876 51/80
Bangholm Purple Top Swede (Rennie)	25	1,480	858
Highland Prize Purple Top Swede (Steele)	24	1,358	822 28/80
Hazard's Swede (Evans)	24	368	806 8/80
Purple Top Swede (Rennie)	24	227	803 47/80
East Lothian Purple Top Swede (Bruce)	24	085	801 25/80
Highland Prize Purple Top Swede (Simmers)	23	1,378	789 78/80
Selected Champion Purple Top Swede	21	1,418	723 73/80
Lord Derby Swede (Carter)	20	943	682 23/80
White Swede (Steele)	20	872	681 17/80
Skirving's Improved Purple Top Swede (Steele)	19	1,458	657 58/80
Royal Norfolk Purple Top Swede (Bruce)	18	1,620	627
Purple Top Swede (Bruce)	17	1,074	584 24/80
Sutton's Champion (Rennie)	17	508	575 8/80
Purple Top Yellow Aberdeen (Pearce)	17	084	568 4/80
Pearce's Invincible (Pearce)	16	1,942	565 44/80
Sutton's Champion Swede (Bruce)	16	1,165	552¾
Clyde Swede (Evans)	15	1,609	526 48/80
Skirving's King of Swedes (Steele)	15	690	511½

In this second series of 22 sorts it will be seen that the relative positions of the varieties, as to yield, are somewhat changed. The 13th in the first series becomes second in this, the 10th fourth, the 5th becomes sixth, the 2nd eighth, the 4th stands eleventh, and the 1st twelfth, with the 16th almost equal.

Larger plots were sown on soil similar in character and treatment to that on which the first series of experimental plots were grown, with the following results:—

Bangholm Swede (Carter's).—Size of plot, 300x15 feet; yield per acre, 31 tons 338 lbs., or 1,038$\frac{58}{60}$ bushels.

Lord Derby Swede (Carter's).—Size of plot, 300x15 feet; yield per acre, 27 tons 498 lbs., or 908$\frac{16}{60}$ bushels.

Skirving's Swede (Carter's).—Size of plot, 400x15 feet; yield per acre, 25 tons 348 lbs., or 839$\frac{8}{60}$ bushels.

EXPERIMENTS WITH MANGELS.

Twenty-one varieties of mangels were sown in rows 16 inches apart, and cultivated by hand with a Planet Junior cultivator. The land was a good sandy loam and well prepared. Part of it was manured in the spring of 1888 and part during the winter of 1890, from 18 to 20 tons of barnyard manure being used to the acre.

There were two series of plots. The first was sown on the 2nd of May and pulled 16th October, and the second was sown 14th May and pulled 23rd October. The yield per acre in the first series was calculated from the results from two rows in each case 140 feet long, and in the second from one row 132 feet long. The remarks made under turnips, regarding the estimated yields per acre from small plots, will also apply here.

——	Yield per Acre.		Yield per Acre.
First Series.	Tons.	Lbs.	Bush.
Pearce & Co.'s Giant (Pearce)	53	1,366	1,789$\frac{28}{60}$
Warden Prize Yellow Globe (Carter)	51	1,133	1,718$\frac{53}{60}$
Yellow Intermediate (Rennie)	49	696	1,644$\frac{50}{60}$
Giant Yellow Intermediate (Steele)	48	1,320	1,622
New Giant Yellow Intermediate (Bruce)	47	6	1,566$\frac{6}{60}$
Chirsk Castle (Buist)	42	1,905	1,431$\frac{45}{60}$
Giant Half-long Yellow (Rennie)	42	1,395	1,423$\frac{13}{60}$
Mammoth Red or Norberton Giant (Simmers)	41	279	1,371$\frac{12}{60}$
Giant Yellow Globe (Rennie)	39	1,553	1,325$\frac{23}{60}$
Mammoth Long Red (Steele)	35	282	1,171$\frac{22}{60}$
Golden Fleshed Tankard (Steele)	34	821	1,147$\frac{1}{60}$
Mammoth Red (Buist)	31	36	1,033$\frac{36}{60}$
Mammoth Long Red (Evans)	30	1,479	1,024$\frac{32}{60}$
Mammoth Long Red (Carter)	29	1,586	993$\frac{6}{60}$
Red Tankard (Steele)	29	1,479	991$\frac{14}{60}$
Golden Tankard (Evans)	28	1,490	958$\frac{12}{60}$
Golden Intermediate (Carter)	28	601	943$\frac{21}{60}$
Mammoth Long Red (Rennie)	27	1,889	931$\frac{32}{60}$
Golden Fleshed Tankard (Simmers)	27	1,417	923$\frac{37}{60}$
Mammoth Long Red (Bruce)	27	1,206	920$\frac{6}{60}$
Mammoth Long Yellow (Carter)	23	796	779$\frac{54}{60}$
Second Series.			
Golden Fleshed Tankard (Steele)	52	1,584	1,759$\frac{44}{60}$
Warden Prize Yellow Globe (Carter)	46	998	1,549$\frac{33}{60}$
Giant Yellow Globe (Rennie)	45	1,105	1,518$\frac{25}{60}$
Mammoth Long Red (Bruce)	41	1,699	1,394$\frac{32}{60}$
Golden Intermediate (Carter)	39	408	1,306$\frac{43}{60}$
Pearce & Co.'s Giant (Pearce)	38	626	1,277$\frac{6}{60}$
Mammoth Long Red (Carter)	37	1,735	1,262$\frac{15}{60}$
Mammoth Long Yellow (Carter)	31	370	1,039$\frac{54}{60}$
Red Tankard (Steele)	30	1,256	1,020$\frac{54}{60}$
Mammoth Long Red (Evans)	30	477	1,007$\frac{57}{60}$
Golden Fleshed Tankard (Simmers)	29	1,920	998$\frac{42}{60}$
Mammoth Long Red (Rennie)	29	1,474	991$\frac{14}{60}$
Golden Tankard (Evans)	28	669	944$\frac{52}{60}$
Mammoth Red or Norberton Giant (Simmers)	26	1,906	898$\frac{22}{60}$
Mammoth Long Red (Steele)	25	175	836$\frac{13}{60}$

EXPERIMENTS WITH SUGAR BEETS.

These were sown with a Planet Junior drill in rows 16 inches apart on land adjoining that on which the experimental plots of turnips were grown. The soil was of the same character, and had received a coating of manure, about 18 to 20 tons per acre, early in the spring of 1890. They were sown on the 13th of May and pulled on the 18th of October. The yield per acre of the several varieties has been calculated from the product of two rows 66 feet long, a method of estimation which is fairly reliable for the purpose of comparing varieties, but one which usually figures up a larger yield than can be got where such roots are grown by the acre. The proportion of sugar contained in each has been determined by the chemist of the Experimental Farms and the particulars will be found in his report appended. Seed of three of the varieties was kindly supplied by M. Musy, Esq., of the Beet Sugar Works at Farnham, Que., and one by Wilfred Skaife, Esq., of Montreal.

———	Yield per Acre.		Yield per Acre.
	Tons.	Lbs.	Bush.
Seed from M. Musy, Esq., Farnham	35	950	1,182½
Red Top (Rennie)	30	1,215	1,020¼
Seed I.B.I.O. from M. Musy, Esq	28	1,585	959¾
Prize Nursery (Carter)	28	1,585	959¾
Seed I.B.D. from M. Musy, Esq	27	1,440	924
White Sugar Beet (Buist)	25	1,398	856 38/80
Seed C.P. 2 P.A. from M. Musy, Esq	25	1,150	852½
White Silesian Green Top (Rennie)	21	158	702 38/80
Seed from Wilfred Skaife, Esq., Montreal	20	920	682
Silesian (Landreth)	19	1,270	654½
Imperial (Bruce)	17	1,970	599½
Vilmorin's Improved (Pearce)	14	1,865	497¾
White Silesian (Steele)	14	50	467½
Imperial (Landreth)	13	400	440

EXPERIMENTS WITH CARROTS.

Of carrots there were two sets of plots sown in rows 16 inches apart, adjoining the experimental plots of mangels, on soil of the same character and similarly treated. The yield per acre has been calculated in the first series from the results obtained from two rows, each 66 feet long, and in the second series from one row, 132 feet long. Such a calculation, as already explained under "Sugar Beets," is of value when comparing varieties, but is not always a reliable basis on which to found expectation where large quantities are grown. The first set of plots were sown on the 1st of May and pulled on the 16th of October; the second were sown on the 8th of May and pulled on the 23rd of October.

In these experiments as well as in those of the mangels and sugar beets, the yield per acre has, no doubt, been much influenced by the short distance (16 inches) between the rows, whereas last year, they were put 2 feet 6 inches apart. At 16 inches many of the larger sorts of mangels were somewhat crowded, and 18 inches would probably be a better distance for these. In either case the rows would be too close for horse cultivation, but if the land is clean they can be conveniently worked with a "Planet Junior" cultivator. Whether the extra yield will more than compensate for the additional cost of hand labor has not yet been determined. Great variations are seen in the results obtained from the duplicated plots, showing that such tests would require to be repeated many times, under varying conditions, before they could be accepted as a reliable guide in the choice of varieties.

The first series of 25 varieties yielded as follows, arranged in order of precedence:—

——	Yield per Acre.		Yield per Acre.
	Tons.	Lbs.	Bush.
Improved Short White (Steele)	34	706	1,145 6/60
Half Long White (Evans)	32	548	1,075 42/60
Orange Giant (Carter)	29	1,301	988 31/60
Large White Vosges (Rennie)	28	430	940½
Large White Belgian (Rennie)	27	1,539	925 39/60
Early Gem (Rennie)	27	252	904 17/60
Large Short Thick White Vosges (Simmers)	25	1,579	859 38/60
Danvers Orange Intermediate (Vaughn)	25	885	848 5/60
Half Long Scarlet Luc (Rennie)	25	95	834 33/60
Chantenay (Rennie)	24	1,005	816¾
Guerande or Ox Heart (Vaughn)	24	906	815 6/60
Danvers Half Long (Pearce)	23	1,322	788 44/60
Large White Vosges (Bruce)	23	629	777 9/60
Mitchell's Perfect Perfection (Mitchell)	23	629	777 9/60
Green Top Orthe (Pearce)	23	134	768 54/60
James Scarlet Intermediate (Vaughn)	22	253	737 33/60
James Intermediate (Pearce)	21	372	706 12/60
St. Valery (Evans)	20	1,679	694 38/60
Early Scarlet Short Horn (Vaughn)	20	1,283	688 3/60
Long Red St. Valery (Pearce)	20	986	683 6/60
Chantenay (Evans)	19	1,897	664 57/60
Half Long Scarlet Nantes (Vaughn)	19	1,204	653 24/60
Short Model (Pearce)	19	1,006	650
Long Scarlet Altringham (Vaughn)	19	16	633 33/60
Chantenay Half Long Scarlet (Vaughn)	17	1,244	587 24/60

The second series includes 24 varieties, and the yield is as follows:—

——	Yield per Acre.		Yield per Acre.
	Tons.	Lbs.	Bush.
Improved Short White (Steele)	34	1,498	1,158 18/60
Large White Vosges (Rennie)	29	1,697	994 27/60
Half Long Scarlet Luc (Rennie)	29	212	970 13/60
Early Gem (Rennie)	28	1,420	957
Half Long White (Evans)	28	1,222	953 13/60
Green Top Orthe (Pearce)	28	232	937 12/60
Guerande or Ox Heart (Vaughn)	26	1,262	887 42/60
Chantenay (Rennie)	26	1,262	887 42/60
Danver's Half Long (Pearce)	25	1,380	856 21/60
Large Short Thick White Vosges (Simmers)	25	292	838 12/60
Large White Belgian (Rennie)	24	1,112	818 32/60
James Scarlet Intermediate (Vaughn)	23	1,718	795 13/60
Chantenay (Evans)	23	613	776 53/60
Orange Giant (Carter)	21	1,981	733 1/60
Mitchell's Perfect Perfection (Mitchell)	21	1,362	722 42/60
Chantenay Half Long Scarlet (Vaughn)	21	1,164	719 33/60
Large White Vosges (Bruce)	21	996	716 6/60
Short Model (Pearce)	19	1,501	658 42/60
Danver's Orange Intermediate (Vaughn)	19	1,402	656 43/60
Long Red St. Valery (Pearce)	17	956	567 38/60
Early Scarlet Short Horn (Vaughn)	16	1,462	557 42/60
Long Scarlet Altringham do	16	472	541 13/60
Half Long Scarlet Nantes do	15	1,482	524 42/60
St. Valery (Evans)	15	294	504 53/60

Two larger plots were grown on adjoining land with rows the same distance apart. These were sown on the 8th May and pulled on the 23rd of October. The

varieties were Improved Short White (Steele's): size of plot, 420 x 23 feet; yield per acre, 35 tons 119 lbs., or 1,168$\frac{39}{60}$ bushels; and Orange Giant (Carter's): size of plot, 360 x 23 feet; yield per acre, 27 tons 976 lbs., or 916$\frac{16}{60}$ bushels.

EXPERIMENTS WITH POTATOES.

Ninety-four named varieties of potatoes have been tested side by side on a light sandy loam, which was in oats in 1889, and to which was applied a dressing of from 18 to 20 tons per acre of fresh manure in the spring of 1890.

The drills were ploughed out and the manure put into them, after which it was lightly covered with earth before the potatoes were planted.

The planting was done on the 16th of May. The size of the plots from which the yield per acre has been calculated varied. The measurements are given in a separate column. As the soil appeared to be very uniform and all the varieties were treated exactly alike, planted at the same time and given nothing more than ordinary field cultivation, the results are fairly comparable.

The Algoma Seedlings were obtained from Mr. Clifford, of Saulte Ste. Marie.

	Size of Plot.	Yield per Acre	
	Feet.	Bush.	Lbs.
Algoma Seedling No. 3	44 x 3	319	00
Thorburn	261 x 3	306	54
Lee's Favourite	60 x 9	291	4
Rosedale	15 x 3	282	20
Delaware	216 x 3	271	7
Early Albino	60 x 12	268	43
Pearl of Savoy	126 x 3	268	00
Crown Jewel	126 x 9	266	00
Algoma Seedling No. 1	99 x 3	265	13
Beauty of Hebron	60 x 3	264	11
Late Goodrich	126 x 3	262	10
White Star	126 x 3	259	37
Chicago Market	60 x 3	256	7
Sharpe's Seedling	60 x 6	253	5
Rosy Morn	126 x 18	247	00
Empire State	126 x 18	246	00
Wonder of the World	126 x 3	245	45
Richter's Improved	126 x 3	245	00
Early Puritan	180 x 3	244	1
May Queen Early	126 x 6	243	20
Flower of Eden	60 x 12	242	00
Compton's Surprise	126 x 3	240	4
Rose's Beauty of Beauties	225 x 3	238	14
State of Maine	216 x 3	238	3
Halton Seedling	126 x 12	237	40
Algoma Seedling No. 2	102 x 3	236	4
Carter's Delight	126 x. 6	232	52
Prairie Seedling	126 x 3	230	28
Ruby	60 x 3	229	54
Richter's Shneerose	60 x 12	229	54
Rural Blush	126 x 6	226	38
Vermont	126 x 3	225	40
Early Callao	126 x 3	225	40
London	279 x 3	224	39
Eye Carpenter	60 x 3	223	51
Rose's New Giant	126 x 18	223	45
Onion Early	126 x 3	223	43
Early Sunrise	60 x 39	223	10
Early Ohio	126 x 18	222	45
Clarke's No. 1	210 x 3	221	15
Vanguard	60 x 6	220	49
Ohio Gunner	60 x 6	220	49
Stray Beauty	126 x 12	219	12
Dakota Red	126 x 12	219	00

———	Size of Plot.	Yield per Acre	
	Feet.	Bush.	Lbs.
Early Rose	60 x 3	217	48
Holborn Abundance (Carter)	126 x 6	217	00
St. Patrick	126 x 3	211	16
King of the Russets (Carter)	126 x 6	210	18
White Star	126 x 3	209	20
Rose's New Invincible	192 x 3	204	11
Early Eating	60 x 12	204	11
Select Magnum Bonum (Carter)	126 x 9	194	56
Dumfries Early White	126 x 3	191	6
Early Maine	60 x 12	191	4
Corona Beauty	222 x 3	187	29
Alexander Prolific	126 x 6	187	15
Bliss' Triumph	60 x 12	187	2
Six weeks Round White	60 x 3	185	32
Charles Downing	234 x 3	184	5
Surprise (Carter)	126 x 3	181	30
Sukreta (Carter)	60 x 6	181	30
Gleason's Late	126 x 3	181	14
Sugar	60 x 6	180	29
Great Eastern	126 x 6	178	00
Mammoth Prolific	126 x 3	175	44
Schoolmaster	126 x 3	174	46
Adirondack	60 x 3	173	26
Member of Parliament	60 x 3	173	26
White Sprout	60 x 9	171	25
Pride of America	126 x 6	167	30
Brownell's Winner	225 x 3	167	14
Conqueror	126 x 3	164	12
Fidelia	60 x 3	163	21
Emperor William	126 x 3	158	30
Daisy	252 x 3	157	29
Thorburn's Paragon	60 x 6	154	16
August Kidney	126 x 3	152	41
Extra Ruper Crane	60 x 6	151	15
Scotch Champion	126 x 3	149	48
Prime Minister	60 x 3	147	13
Frame Early	60 x 3	147	13
Manhattan	60 x 3	147	13
Green Mountain	195 x 3	140	14
Cosmopolitan (Carter)	60 x 27	136	41
King of the Earlies	60 x 3	136	7
Telephone	60 x 6	136	7
Snowflake	60 x 3	133	6
Burpee's Superior	126 x 12	130	55
New Badger State	126 x 6	130	7
First Crop Ash Leaf (Carter)	126 x 6	96	00
Early Household	126 x 3	94	6
Alpha	60 x 3	66	33
English Kidney	60 x 6	66	33
Asparagus	60 x 6	3	1

INDIAN CORN.

In the report of the Experimental Farms for 1889 brief reference was made to seventy varieties of Indian corn which had been tested that year, and fuller details were promised in a special bulletin. After the information which had been gained was brought together it was thought best to continue this work another season before presenting the results. During the past year nearly eighty varieties were planted under similar conditions and in plots of uniform size, and the results of the two years' work on Indian corn will shortly be ready for publication.

SEED TESTING.

This useful branch of work has been actively carried on during the past season at the Central Experimental Farm, and the timely information afforded has saved many farmers much disappointment and loss. In 1889, 541 samples of wheat were

tested, the growth of 1888, giving an average of 83 per cent. of vitality; while the average of 343 samples, the growth of 1889, is 84·3 per cent. A similar comparison with barley gives 84 per cent. for 115 samples in 1888, and 84·9 per cent. for 279 samples in 1889, while the average for 174 sample of oats grown in 1888 was 79 per cent. and for 345 samples in 1889 it was 90·5 per cent. showing but very slight variations in the results obtained from the tests of the wheat and barley, but a remarkable increase in the average vitality of oats, and this, notwithstanding the fact that rust prevailed in 1889 to an unusual degree. The total number of tests completed was 1245 and in the following table the results are given.

RESULTS of Grain Tests, 1889–90.

Kind of Seed.	Number of Tests.	Highest Per centage.	Lowest Per centage.	Average Vitality
Wheat	343	100	30	84·3
Barley	279	100	2	84·9
Oats	345	100	12	90·5
Rye	2	77	70	73·5
Corn	92	100	0	68.4
Peas	24	100	25	81·2
Grass	13	100	0	68·6
Clover	16	91	43	69·6
Turnip	38	100	58	83·7
Mangel	28	90	14	43·6
Carrot	30	100	10	51·8
Buckwheat	6	98	16	67·1
Tares	2	94	91	92·5
Rape	2	98	81	89·5
Beans	4	100	34	72·0
Millet	5	100	65	86·8
Beet	9	90	14	49·5
Onion	2	70	34	52·0
Cauliflower	2	81	67	74·0
Cabbage	2	84	3	43·5
Pumpkin	4	68	16	30·0
Tobacco	9	77	0	23·7
Flax	2	91	26	58·5
Lettuce	1	.....	.....	18·0
Parsnip	1	.....	.....	40·0
Sunflower	1	.....	.....	92·0
Cotton Seed	1	.....	.....	64·0
Sorghum	1	.....	.....	56·0
Sugarcane	1	.....	.....	33·0
Total number of samples tested, highest and lowest percentage and average vitality	1245	100	0	81·8

The season of 1890 in most of the Provinces has been characterized by unusally wet weather, which has caused the grain in some districts to sprout; rust has also been very prevalent. Such influences always lower the vitality of cereals, and greater care is necessary in selecting grain for seed. All doubtful samples should be sent in good season to the Experimental Farm for test.

GOVERNMENT IMPORTATION OF TWO-ROWED BARLEY.

During the Session of the House of Commons in February last, on the recommendation of the Minister of Agriculture, the Government agreed to place in the Estimates the sum of $25,000 for the purchase in England and distribution in this country of two-rowed barley for seed. In this the House concurred, and shortly after 10,000 bushels of Carter's Prize Prolific barley was purchased for this purpose, for the reason that this variety had already been tested in different parts of the

Dominion, on the Experimental Farms and by individual farmers with good results. This was purchased from the well known seed firm of James Carter & Co., of London, England, and brought out in 5,000 bags of 112 lbs. each—two English bushels. Arrangements were made for its disposal by the Director of Experimental Farms, and on its arrival in Montreal a number of bags were opened, the grain carefully examined and its germinating power tested. The bariey proved to be fairly uniform and plump, and weighed about 54 lbs. to the busbel, but many of the bags were found to contain a small percentage of foreign grain and seeds. To separate these and insure uniformity in tbe sample the wbole of the 5,000 bags were opened and the grain passed twice through the cleaning machinery belonging to the Montreal Warehouse Co., when the bags were re-filled, weighed and prepared for shipment. This work necessarily caused some delay and entailed expense and loss, towards which Messrs. Carter & Co. subsequently contributed £50 sterling.

In the meantime, orders had been received from 2,606 farmers in different parts of the Dominion for 3,200 bags and these were forwarded as rapidly as possible; but notwithstanding that tbe utmost efforts were used to ensure prompt despatch, the grain in many instances did not reach its destination early enough to produce the best results.

Tbe season proved unfavourable for barley in Ontario, Quebec and the Eastern Provinces, but this crop has been grown with fair success in Manitoba, the North-West Territories and British Columbia. In the central and eastern Provinces the six-rowed barley of the crop of 1890 is much lighter than usual, the Ontario crop being estimated at about 2 lbs lighter than the average of past years, and it may be fairly presumed that the two-rowed barley has suffered in a like degree. After harvest, circulars were sent to all those who had been purcbasers of the imported barley, asking information concerning dates of sowing and harvesting, description of of soil, the preceding crop, manure used, yield per acre and total yield, leaving a larger space on the sheet for general remarks. A small cotton bag with an addressed tag was enclosed with each circular, and the parties were requested to forward a sample by mail of about 1 lb. in weight of the barley grown from the seed purchased. The number of reports and samples received up to the 30tb of January is as follows: Ontario, 872; Quebec, 48; Nova Scotia, 13; New Brunswick, 23; Prince Edward Island, 11; Manitoba, 62; North-West Territories; 22; British Columbia, 1.

The following table shows the results in the yield per acre and total yield, the average weight of the samples as received and tbeir weight after cleaning, by wbich from 12 to 18 per cent. of the lighter grain was separated. This cleaning was necessary, for the reason tbat many of the samples were forwarded just as they came from the thresher and hence were not in a marketable condition.

Table showing results of tests of Two-rowed Barley (Prize Prolific), imported by the Government of Canada for seed.

——	Number of Reports with Samples.	Yield per Acre.	Total Yield from 112 Pounds.	Weight per Bushel as Received.	Weight per Bushel after Cleaning.
		Bushels.	Bushels.	Lbs.	Lbs.
Ontario	872	25½	28¼	50¼	51½
Quebec	48	20¾	22¾	48¼	50⅛
Nova Scotia	13	26½	26½	47 1/10	48
New Brunswick	23	22¼	24 1/10	47⅓	49¾
Prince Edward Island	11	26½	27½	48	49
Manitoba	62	39	43¾	48	50¾
North-West Territories	22	27½	32 1/10	46½	50⅛
British Columbia	1	45¾	45¾	50½	53

In Bulletin No. 35 of the Bureau of Industries, issued by the Ontario Department of Agriculture, the statistics of crops in Ontario for 1890 are given. These are compiled from returns made by 1,015 correspondents and the average yield of six-rowed barley is there given as $22\frac{2}{10}$ bushels. The average yield in Ontario of the two-rowed, based on the returns made by 872 farmers, is $25\frac{1}{2}$ bushels, showing that the yield of the two-rowed has been superior to that of the six-rowed by $3\frac{3}{10}$ bushels. With such an increase on the whole barley crop of Ontario, taking barley at 50 cents a bushel, there would be a total gain of $1,157,187.

With reference to a market for this barley, there is every prospect of its finding a ready sale in Great Britain at remunerative prices, provided it can be produced to weigh 52 lbs. and upwards per bushel. As a rule, the plumper and heavier the sample the higher the price. It has been shown that 872 samples grown during the past unfavourable season in all parts of Ontario have weighed on an average when properly cleaned, $51\frac{1}{2}$ lbs. per bushel, and there seems no reason in doubting that in an average year two-rowed barley could be grown at least 1 or 2 lbs. heavier than this, particularly in the better barley districts of the Province. In the report of the judges at the Brewers Exhibition held last October in the Royal Agricultural Hall, London, England on the twelve samples of Canadian two-rowed barley shown there weighing from $51\frac{1}{2}$ to 55 lbs. per bushel, these experts say: "These samples compare very favourably with French, Saale, Danish or other European barleys, and if sent in good condition could be consumed in this country with great satisfaction to the brewers and to the consumers of beer." And further in their closing remarks. "The judges agree in speaking in high terms of many of the samples submitted and in very high terms indeed of some two or three of the best." Two of the samples specially commended by them were the Chevalier, which weighed $52\frac{1}{2}$ lbs.. and the Golden Melon, which weighed 52 lbs. A shipment of 50 quarters—400 English bushels—of Prize Prolific barley of this year's growth, weighing about 52 lbs. to the bushel, has been forwarded to London, England, to be malted and brewed by one of the leading brewers in England, so that correct conclusions may be reached as to its commercial value there. It is altogether probable that the brewers of the United States will continue to purchase a part of the Canadian barley crop notwithstanding the high duty imposed; and if so, are they not likely to prefer a barley which gives a larger proportion of extract, and hence, from a given quantity, makes more beer. With regard to the home market, many of our Canadian brewers would prefer the two-rowed if it could be had in sufficient quantity for separate malting; and if our farmers will use a portion of their barley crop for feeding purposes, as I believe they should do, in place of selling so much grain off their farms, then the two-rowed is to be preferred to the six-rowed, for the reason that it yields a larger number of bushels to the acre and the grain has a smaller proportion of husk to kernel. Further information connected with this important subject will be found in Bulletin 9 of the Central Experimental Farm, in which the individual opinions and experiences of a large number of farmers living in different parts of the country are given.

FORESTRY.

The plantations of belts of forest trees on the Central Experimental Farm have during the past season been extended. A large number of both trees and shrubs have also been planted in ornamental clumps along the sides and at the intersecting points of roadways and in other locations where needed. In a very short time these groups will add much to the beauty and attractiveness of the Farm. Nearly all the trees and shrubs hitherto planted have made thrifty growth and are already beginning to attract much attention from visitors. Within a very few years these clumps will be very useful for determining the annual growth of timber trees and the hardiness and adaptability of the many sorts under test for this district.

In the report of the Horticulturist some particulars are given regarding the distribution of about 1,000 packages of forest-tree seedlings, which were sent chiefly to farmers on the North-West plains for test. So widespread was the interest manifested in this subject last season that the supply was not half enough to meet

the demand, and, under instruction of the Minister, a further and larger supply has been obtained, more than sufficient to supply all those who were disappointed last year. By this means it is expected that small plantations will be established at a large number of different points where, within a few years, the trees will be large enough to produce a liberal supply of seed wherewith to extend the planting.

The following paper, containing a summary of the work which has been done in this direction and notes on the trees which have been most successfully grown, was read at the meeting of the American Forestry Association, held in Quebec, on the 3rd of September, 1890:—

"FORESTRY ON THE WESTERN PLAINS OF CANADA.

"*By Wm. Saunders,*

"Director Experimental Farms, Ottawa.

"The experimental farms which have been established by the Government of Canada are five in number, located at the following points: Nappan, Nova Scotia; Ottawa, Ontario; Brandon, Manitoba; Indian Head, North-West Territories, and Agassiz, British Columbia. Experiments in tree planting were begun at all these farms as soon as possible after the selection of the sites, but on the farms on the western plains in Manitoba and the North-West Territories this work has been conducted on a more extensive scale than on the other sites, for the reason that the need of forest shelter is more keenly felt in the prairie districts. Work was begun on the farm at Indian Head during the summer of 1887, and the first trees were planted in the spring of 1888, about 20,000 in all, consisting of a large number of varieties. This farm is a section of bare prairie land of 680 acres, without any shelter whatever. In the spring of 1889, another consignment of about 12,000 trees was forwarded, and during the present season a few thousand more have been sent. A considerable quantity of seed of the box elder, with a smaller proportion of white ash and American elm has been sown each year, and thus more than 50,000 seedlings have been added to the stock. A portion of these seedlings have been distributed among the settlers in the neighbourhood but the larger part has been planted in shelter belts and forest clumps on the farm.

"The Brandon farm was selected during the summer of 1888, and tree planting was begun there in the spring of 1889. About 20,000 trees were sent that year and ten or twelve thousand more during the present year. A large number of seedlings of box elder, ash and elm have also been grown on this farm during both seasons referred to. The Brandon farm is situated partly in the valley of the Assiniboine River and partly on the bluffs which form the northern boundary of that valley. This farm is mostly prairie, but in the ravines in the bluffs, and also on the face of the bluffs, there are large patches of scrub, consisting of small poplars, scrub oak, hazel, elcagnus and other low bushes, while near the river bank there is a small grove of elm, ash, and box elder trees, with undergrowth of willow, rose, &c. From this brief description it will be seen that the land on these two farms is varied as to exposure, while the soil and the climatic conditions by which they are surrounded are such as to include within their area most of the difficulties which stand in the way of tree growing in the better farming districts in the Canadian North-West.

"During the spring of 1889 a considerable number of packages of trees were sent by mail and express to different parts of the North-West plains for test, and this work has been continued on a larger scale during the past season. The distribution outside of the Experimental Farms in 1890 consisted of over 100,000 seedling trees of one and two years' growth, which were sent by mail in about 1,000 packages of 100 each to as many different points, while larger bundles were forwarded by express to twenty-five of the experimental gardens on the line of the Canadian Pacific Railway from Moose Jaw to Calgary, to most of the agencies on the Indian Reserves, and the chief stations of the Mounted Police. By these several methods trees have been distributed for test over the whole area from the eastern part of Manitoba to the western extremity of the great plains of the Territories and along the foot hills of the Rocky

Mountains. On the Indian Head farm trees have had the test of two winters and three summers; on the Brandon Farm and at a few other points, including about twenty stations on the Canadian Pacific Railway, we have the results of one winter and two summers; while at a very large number of other points the summer drought and heat is the only test the trees have yet been subject to. This latter, however, is no mean test, for dry weather will often cause the death of more trees than will the cold weather of winter.

"The results of the tests on the experimental farms have been carefully noted each year, but the experience gained is too limited as yet to admit of very positive statements regarding many varieties of trees under trial. The following notes are submitted, with the hope that they may be of some interest to the American Forestry Association.

"Box Elder, (*Negundo aceroides*).—This tree promises to be the most valuable of all forest trees for the western plains, adapting itself to all conditions of climate and situation, and making thrifty growth under trying circumstances. No tree is so universally successful; but to get the best results the seedlings should be grown from seed collected from trees growing on the river banks and ravines in Manitoba or the Territories. If grown from eastern seed the young trees are often partly winter-killed. In three or four years from the time of sowing the seed this tree will usually attain a height of from 5 to 7 feet, with a nice bushy head, and after that the growth is quite rapid.

"Among the trees which promise to rank next in value are the American elm and green and white ash, when grown from Manitoba seed, but these often prove more or less tender when grown from seed produced in Ontario or the western States. The native poplars and some of the willows also make fine growth, and aid materially in the formation of shelter belts; some of the Russian poplars have also succeeded very well, notably *Populus Petrovska*, *certinensis*, *bertolinus* and *bolleana*; *Salix laurifolia* is also valuable. The American mountain ash, European mountain ash, yellow birch, European white birch and the variety of white birch, known as the *cut-leaved*, have also proved hardy, as far as they have been tried. Of the maples, the only ones which have succeeded thus far are the silver-leaved *Acer dasycarpum*, and the Norway maple, *Acer platanoides*, and these are only partially successful. The Siberian maple, *Acer ginnala*, has proven hardy at the Indian Head Farm, but this will rank rather as a shrub than a tree.

"Among the evergreens, the white spruce, transplanted from the sandy plains near Carberry, Manitoba, or the spruce from the foot-hills of the Rocky Mountains, succeed best. The Scotch fir and the European mountain pine are also hardy in many places, enduring the low temperatures of the winter better than the drying winds and hot weather of the summer months. The white spruce of the East, Norway spruce, arbor vitæ, Austrian pine, red cedar and European larches have failed in most localities in the Territories, but many of them have survived and made a little growth in some places in Manitoba. The same may be said of the basswood, European ash and Russian mulberry. The attempts to grow the sugar and red maples, sycamore, black locust, butternut, black walnut and western catalpa have so far been unsuccessful.

"Among the most valuable shrubs useful for ornamental purposes and as undergrowth are the several native willows, the wolf willow, *Eleagnus argentea*, the native wild cherry, Saskatoon and hazel, to which may be added the Siberian pea, *Caragana arborescens*, Russian olive, *Eleagnus*, and the several varieties of lilac. The wild rose also serves a similar purpose, and the Rosa rugosa from Japan, which has proved hardy and valuable at Indian Head.

By the free use of the trees and shrubs named effective shelter belts and forest clumps can in a few years be produced on the North-West plains, which will help to break the force of the winds and give a home-like beauty to the bare prairie. When sufficient time has elapsed to allow of more extended testing many valuable additions will no doubt be made to the list now given."

During my journey through Manitoba and the North-West Territories last summer it was fonnd that the native forest trees were producing seed in great abnndance. As this was an opportunity not often to be had for a most useful work, prompt arrangements were made for the collecting of a large qnantity. Both the snperintendents of the north-western Experimental Farms, Mr. A. Mackay and Mr. S. A. Bedford, entered heartily into the work, visited the districts where seeds were most plentifnl and, with the help of settlers, Indians and half-breeds snccceeded in securing between two and three tons of tree seeds. They consist chiefly of Manitoba maple, ash, oak and wild cherry. Abont seven acres have been sown on the Experimental Farm at Brandon, Man., and enongh has been reserved at Indian Head, N.W.T., to cover a similar area. A few sacks have also been kept at each farm to supply any settlers in the neighbourhood who may apply for them. The remainder (about a ton and a-half) has been forwarded to the Experimental Farm for general distribntion. Already more than 500 packages have been sent out by mail and the stock on hand will probably be sufficient for two or three thousand more, leaving sufficient to plant some large plots on the Central Farm. As each of the packages sent ont will contain enongh seeds to produce many hnndreds of trees while the large areas sown at the several Experimental Farms will, if successful, be likely to prodnce several millions, the results of this years work in the collecting of tree seeds will in a short time do much to further tree planting on the western plains of Canada.

ANNUAL INSPECTION OF BRANCH EXPERIMENTAL FARMS.

NAPPAN.

During the summer the nsnal annnal visits were made to the several Experimental Farms. The farm for the Maritime Provinces at Nappan was inspected during the latter part of July. Among other features of interest there was a large and instructive series of grain plots of many different varieties, illustrating the variations in individuals sorts, the effects of special fertilizers on their growth, also the inflnence of draining, which, by prompt removal of superabundant water, admits of early sowing and thus gives greater vigour to the plants. Useful facts were also being demonstrated regarding the growth of field roots, Indian corn, fruits and garden vegetables. This farm has had many visitors from the adjacent districts who have expressed surprise and gratification at the progress which has been made.

VISIT TO SOUTHERN MANITOBA.

The jonrney westward was undertaken early in August, when the grain was approaching maturity. Some parts of southern Manitoba were visited when in company with the Dairy Commissioner, Prof. J. W. Robertson, I had the pleasure of attending several meetings of farmers, especially at Pilot Mound and Glenboro, and also of driving through a very fertile range of country for abont 100 miles through an almost constant succession of wheat fields laden with grain, almost ready for the reaper. At Glenboro' the opportunity was afforded of visiting the adjacent Icelandic settlement where pleasing evidences of thrift, comfort and prosperity were observable on every hand. The mixed farming carried on by these worthy settlers is evidently the best style of farming for that conntry and when generally adopted will result in greater prosperity. Praises of the useful work being carried on at the Brandon Experimental Farm met me here, and I found that many of these people had cheerfully driven the forty miles which separates them from this farm in order to take in some of the useful lessons taught there by the experiments conducted, especially those with varieties of grain and useful fodder plants.

BRANDON.

Arriving at Brandon on the 15th of August, the Experimental Farm there was found to possess many interesting features. The new buildings had made fair progress. These have since been completed. The avenue trees and belts of forest growth had made rapid advancement and will soon become a prominent feature. The fields of grain were most promising and the acre plots of different varieties of oats were the heaviest in crop I had ever seen. The crop of Indian Corn and other fodder plants was unexpectedly heavy. The plots of native grasses and some of the foreign sorts had made thrifty growth, and the plantations of small and large fruits which had been put out in clearings on the bluffs, amid the surrounding shelter of thick scrub were most promising. Much of the hay crop on the meadow lands had been cut and stacked. Heavy winds had partly lodged a few of the earlier sown plots of grain in the valley, but these were now ready for the reaper. The harvest promised to be an abundant one.

INDIAN HEAD.

Passing on to Indian Head on the 18th, the grain crops were truly magnificent and never more full of promise. Miles of waving golden-headed wheat greeted the eye at almost every point of view. Most of the Ladoga wheat was cut and stacked, but a portion, now over ripe, had been left for my inspection—this was cut on the day of arrival. In the fields the scene was a busy one; two binders, with their quota of men, were in constant use from early to late, cutting the early-ripening sorts of oats, barley and wheat, and good progress was being made. On the afternoon of the 20th a cold wind set in from the north, the temperature fell rapidly, and before night the possibilities of frost began to be discussed. At the time of the last observation at night the thermometer still stood above 40, and hopes were entertained of escape from impending danger, but the morning revealed the fact that there had been five degrees of frost. Many of the garden vegetables were more or less injured, the tomatoes were gone, the potato vines partially blackened and the foliage of the corn, which looked so thrifty and vigorous on the previous day, was now rapidly drooping, and it was feared that serious injury had been done to the standing crops of grain. The harvesting was pushed on with increased vigour; while the two binders felled and bound the golden grain willing hands cut and stacked the corn ere its leaves should wither and dry, and experiments were devised to make the most of the opportunity given by cutting plots of standing grain, which had been purposely sown late, at different periods, so that information might be had as to the best time to cut frozen grain in case such frosts should occur again. The conclusions reached will be found in the report of the Superintendent of the Indian Head Farm. Many differences of opinion were expressed as to the probable result of this severe visitation, some of the hopeful ones claiming that no harm was done; but subsequent experience has shown that the injury to all the late wheat, which was then in a soft condition, was serious, and that the effects on that which was well advanced, but still standing, was such as to lessen its value. There was no frost at Brandon that night, but it came soon after. The unfavourable harvest weather which followed, and which prevailed all over Manitoba and most of the eastern part of the Territories, attended with a most unusual fall of rain, caused further injury, and the bright outlook was darkened, and much of the grain, although in general a heavy crop, has brought very low prices. The necessity of early sowing, the selection of some early ripening varieties, so that the harvesting may begin earlier, and not come on all at once, and of devoting a larger proportion of the land to other crops than wheat, is forcing itself upon the minds of all thoughtful farmers, and it is believed that this visitation severe as it was will be followed by compensating advantages. These wonderful plains so marvellous in their fertility despite occasional drawbacks are being gradually occupied, and when once the farmers can be brought to fully realize the great importance of adopting mixed farming, its general practice will do much to lessen the injury caused by early frosts where wheat is the mainstay of the country.

VISIT TO SOUTHERN ALBERTA.

Leaving Indian Head on the 22nd, Dunmore was reached the following day, and *en route* opportunities were given for inspecting some of the experimental gardens of the Canadian Pacific Railwaw which had been supplied with bundles of forest trees from the Central Experimental Farm. The season had been very dry and unfavourable for growth ; still, the results in some localities were very promising. At Dunmore, a tour through a portion of Southern Alberta was planned, and leaving by a night train for the south, Lethbridge was reached the following morning. This town is very prettily situated on an elevated plain 300 feet above the Belly River, a rapid stream of considerable volume, its waters being clear and cold. The output of coal, the mining of which is the chief industry here, was then about 500 tons per day from the Galt coal mines. New shafts were being sunk in anticipation of increased demands as soon as the railway then building to Montana, should be opened. By the courtesy of the Managing Director, Mr. Wainwright, I was privileged to inspect the working of all the different departments and to enter one of the side shafts where the coal was being mined. The seam is about 4 feet in thickness, and has been traced for so many miles that the deposit seems to be practically inexhaustible. Through the kindness of the Commissioner, Col. L. W. Herchemer, instructions had been given to place one of the teams of the Mounted Police at my disposal. The officers commanding at Lethbridge and Fort Macleod, Capt. R. B. Deane and Major S. B. Steele, were exceedingly courteous, gave me much information and aided me in my investigations in every way in their power. Journeys were undertaken to Fort Macleod, a thriving town on the Old Man River; from thence to the reserve of the Blood Indians, where an opportunity was given, under the guidance of the obliging agent, Mr. W. Pocklington, to inspect the agency buildings, examine the fields and gardens under cultivation and to visit some of the Indian camps. A further drive of from twenty to thirty miles across the reserve brought me to the Mormon settlement at Lee's Creek, within 14 miles of the Montana boundary. I found the Mormon settlement to be a very prosperous one numbering from 400 to 500 souls. The energy and industry of the people are very marked. Late and early, busy hands were at work bringing in the harvest—which on account of drought, was rather light this year—cutting hay in the neighboring sloughs or in the valley of the creek or caring for the numerous bands of cattle and horses which roam the plains in the vicinity of the settlement. It is said that no liquor is used in this community and very little tobacco. I saw no evidence of the use of either. Frugality and industry seemed to go hand in hand; the settlement has made rapid progress, and, as far as could be ascertained from those in the neighbourhood who are not Mormons the laws of the country are being respected. A general store well supplied with goods is one of the main features in the settlement, and under their system of co-operation it seems to be well supported. The people have gained an excellent reputation for their butter, and have built a cheese factory, which will be equipped and in running order next spring. After enjoying for a day the kind hospitality of some of the people in the settlement the return journey to Fort Macleod and from thence to Lethbridge was safely accomplished after a ride of about 200 miles in all. Most of the district passed through is well adapted for ranching and many thousands of cattle and horses may be seen in bands on the plains, which stretch to the base of the Rocky Mountains, which are always in full view. Pleasant weather, an invigorating atmosphere and the uniform kindness of many new found friends, aided in making this journey a most agreeable experience.

A brief stay was made at Medicine Hat where the Experimental Garden of the Canadian Pacific Railway was inspected and notes taken on the growth and relative hardiness of many varieties of trees and shrubs. This garden is a most attractive one, and is gay with flowers from an early period in the summer until the time of frost. Its success is mainly due to the warm interest taken in it by J. Niblock, Esq., Superintendent of the Western Division, who is an enthusiastic lover of trees, shrubs and flowers. The remaining journey to Agassiz was made without a break.

AGASSIZ.

Quite a change had taken place in the appearance of the Experimental Farm at Agassiz within the year. About 50 acres of land had been cleared and brought under cultivation, and about as much more underbrushed. A vast amount of labour has been expended in removing immense trees and stumps. The clearing of land here and getting it into condition for crop is a very laborious undertaking, but under the energetic management of the Superintendent, Mr. Thos. A. Sharpe, rapid progress has been made. Several orchards have been planted and a number of blocks of small fruits set out. Fruit and forest trees have also been planted on the bench land and on the slopes of the mountain. The usefulness of large experimental orchards in a country so eminently adapted for fruit culture can scarcely be over estimated, as these will furnish in a short time reliable sources of information to the settler concerning the most suitable and profitable sorts for him to plant. The varieties already brought together there may be summarized as follows:—

			No. of Varieties.
Apples	No. of trees	938	118
Crab apples	do	[illegible]	6
Pears	do	212	55
Plums	do	132	51
Cherries	do	149	42
Peaches	do	284	86
Nectarines	do	25	12
Apricots	do	42	18
Quinces	do	16	7
Figs	do	4	2
Grapes	No. of vines	297	79
Gooseberries	No. of Bushes	107	9
Currants, red and white	do	235	8
Black currants	do	112	15
Blackberries	do	1,007	27
Raspberries	do	879	26
Strawberries	No. of Plants	8,520	47

Summing these all together we have over 600 varieties of fruit, to which must be added 414 different sorts of ornamental trees and shrubs, inculding 16 kinds of edible nuts. Such a collection will shortly make this farm one of the most attractive places on the continent. Experiments with different varieties of grain, Indian corn, field roots and potatoes have also been conducted during the past season, the details of which will be found in Mr. Sharpe's report.

DRAINING, GRADING, &c.

Further progress has been made in these important departments of work during the past season, 1¼ miles of tile drains have been laid, making 17 miles in all since the farm was purchased. Much heavy grading has been required around the new dairy building and piggery, and in bringing to a proper grade some portions of the ground adjacent to the dwellings.

BUILDINGS.

A building for carrying on experimental work in dairying has been erected, and is now being fitted with the necessary appliances. A piggery has also been built, 100 by 20, and stocked, and under the superintendence of Prof. J. W. Robertson, Agriculturist and Dairy Commissioner, experimental work is now in progress to determine some important points in pig feeding, further particulars on these subjects will be found in his report. An engine house has been erected and the engine placed in connection with shafting which runs the whole length of the barn by which means power for the various machines required for carrying on the farm work can be conveniently supplied. An extension to the poultry building has been planned and the work begun. This it is hoped will be completed early in the spring. A suitable structure will also be required for carrying on experimental work with sheep.

CHANGES AND ADDITIONS TO THE STAFF.

Since the last report was published the vacancy caused by the resignation of Mr. W. W. Hilborn as Horticulturist at the Central Experimental Farm has been filled by the appointment of Mr. John Craig, who has by a long course of training in Quebec with the late lamented Chas. Gibb, and subsequently with Prof. J. L. Budd, of the Agricultural College in Iowa, become specially fitted for this work. By the appointment of Prof. J. W. Robertson as Dairy Commissioner for the Dominion and Agriculturist at the Central Experimental Farm, and Mr. J. C. Chapais, as an assistant Dairy Commissioner to labour among the French-speaking communities in Quebec and the other Provinces, the general agricultural interests of the country will be promoted and the facilities afforded by the Experimental Farm for experimental work in dairying can be fully utilized and information gained which will lead to the advancement of these great commercial departments, which now profitably occupy the attention of so many in the farming community in Canada.

EXHIBITIONS ATTENDED.

Exhibits of the products of the Central and other Experimental Farms, have been made at several points during the past season. Much as we should like to accede to the wishes of the many friends who extend invitations to make a display of farm productions at their fairs, it is quite impracticable at that busy season of the year, when the summing up of the details of all the work of the season begins, to prepare for more than two or three exhibitions. A satisfactory exhibit was made at the Central Fair in Kingston, an excellent display was got up for the Industrial Exhibition in Toronto, which, supplemented by other late-maturing products, was subsequently shown at the Western Fair in London. A good exhibit was also made at the Canada Central Exhibition in Ottawa.

The branch experimental farms have also undertaken similar work in the respective Provinces in which they are located, and in each case as many of the more important fairs as could be reached have been attended. Such opportunities bring many practical farmers in direct contact with the progressive work of the farms, and by the display of many useful and interesting products a general feeling of appreciation is awakened and facilities offered for giving information to many enquirers.

CORRESPONDENCE.

Probably no better evidence could be given of the increasing interest taken by the farmers of Canada in the work of the Experimental Farms than a comparison of the letters received during 1890 as compared with 1889. These letters have come chiefly from farmers sending requests for reports, bulletins or seed grain, or seeking information in reference to some branch of their calling, and the number and variety of the questions asked have involved much time and labour in answering them. There is no work more useful than that of stimulating enquiry, and information never benefits a man at any time so much as just when he feels the need of it. Farmers have been invited to correspond freely with the Experimental Farms, and it is hoped that they will continue to do so, and provision will, I trust, be made for the additional office assistance which will be required to overtake such rapidly increasing work.

—	Letters Received.	Letters Sent.	Letters Received.	Letters Sent.
	1889.	1889.	1890.	1890.
Director	3,653	.....	11,739	11,460
Entomologist and Botanist	1,700	.....	1,547	1,394
Chemist	359	.....	569	551
Horticulturist	247	.....	750	3,064
Poultry Manager	195	.....	312	205
Accountant	710	.....	958	1,625
Agriculturist and Dairy Commissioner	.....	.....	1,664	1,507
	6,864	.....	17,539.	19,806

To this must be added :—

No. of grain circulars sent with grain distributed	12,360
do 3-lb. bags of grain distributed	12,360
do packages of seedling forest trees and small fruits	1,316
do bags of tree seeds	563

There have also been received 2,152 samples of grain for inspection and report.

In 1889 the number of bulletins and reports sent out was 41,584; in 1890, 218,129.

The total number sent out of letters, reports, bulletins, grain, seeds, trees, &c., was 262,267.

The number of farmers who have by request been placed on the mailing list to receive the reports and bulletins of the Farm is 20,600, in addition to which there is a special dairy mailing list of 4,009.

FINANCIAL STATEMENT OF EXPENDITURE ON THE DOMINION EPERIMENTAL FARMS.

In submitting the following classification of expenditures on the several experimental farms established in Canada from the 1st of July, 1889, to the 30th of June, 1890, the object has been to make everything as clear as possible, and where a grouping of the items seemed necessary, to bring together those of a similar character.

CENTRAL EXPERIMENTAL FARM.

Expenditures, 1st July, 1889, to 30th June, 1890.

	$ cts.
Horses, harness	386 43
Cattle	6,922 20
Implements, tools, hardware, &c.	1,519 51
Draining and drain tiles	1,727 40
Grading, road-making, &c.	1,266 00
Cattle and horse feed	693 79
Blacksmithing and repairs	281 70
Seed grain, trees, shrubs, &c.	1,333 19
Stable manure, ashes and fertilizers	857 30
Exhibition expenses	247 77
Books, periodicals and newspapers	161 96
Printing and stationery	2,790 43
Telegrams and telephones	152 88
Travelling expenses	551 41
Chemical department	475 77
Poultry department	308 92
Seed testing and care of propagating houses	659 81
Grain distribution	1,637 61
Tree distribution	968 63
Salaries	11,238 14
Wages, farm work, including experimental work with grain and other farm crops	4,573 95
do care of stock	1,104 03
do horticultural department	1,223 36
do botanical department	386 78
do care of grounds, shrubbery and ornamental trees	414 86
do office help with correspondence, distributing reports and bulletins and messenger service	1,659 05
Water account, including excavations	386 71
Contingencies	937 67
	44,801 95

EXPERIMENTAL FARM, MARITIME PROVINCES.

Expenditures, 1st July, 1889, to 30th June, 1890.

	$ cts.
Harness	5 15
Cattle	780 00
Implements, tools, hardware, &c	710 68
Draining and drain tiles	1,086 47
Grading, road-making, clearing	402 26
Land account	230 78
Cattle and horse feed	65 03
Blacksmithing and repairs	117 78
Seed grain, trees, shrubs, &c	37 54
Stable manure and fertilizers	254 84
Exhibition expenses	31 61
Travelling expenses	153 96
Salaries	1,200 00
Farm wages, including experimental work with farm crops, fruit trees, vines, &c	1,256 50
Care of stock	484 50
Office help	120 00
Contingencies	56 84
	6,993 94

EXPERIMENTAL FARM, MANITOBA.

Expenditures, 1st July, 1889, to 30th June, 1890.

	$ cts.
Horses, harness	658 95
Cattle	35 00
Implements, tools, hardware, &c	1,438 17
Draining and drain tiles	297 35
Grading, road-making, clearing	954 72
Land account surveys	18 65
Horse and cattle feed	735 24
Blacksmithing and repairs	273 89
Seed grain, trees, shrubs, &c	390 12
Stable manure and fertilizers	198 50
Exhibition expenses	103 18
Travelling expenses	340 00
Forestry	684 35
Salaries	1,200 00
Farm wages, including experimental work with farm crops, fruit trees, vines, &c	2,982 57
Contingencies, including rent of dwelling	168 24
	10,478 93

EXPERIMENTAL FARM, NORTH-WEST TERRITORIES.

Expenditures, 1st July, 1889, to 30th June, 1890.

	$ cts.
Horses, harness	651 70
Implements, tools, hardware, &c	869 93
Grading, road-making	144 07
Land account legal expenses	25 00
Horse and cattle feed	164 97
Blacksmithing and repairs	182 05
Seed grain, trees, shrubs, &c	281 87
Stable manure and fertilizers	166 75
Exhibition expenses	111 30
Travelling expenses	168 05
Forestry	278 37
Salaries	1,200 00
Farm wages, including experimental work with farm crops, fruit trees, vines, &c	3,376 94
Office help	90 00
Contingencies, including rent of stables, $100; sinking wells, $133.45	362 07
	8,072 07
By seed grain furnished for grain distribution and charged to that account in Central Experimental Farm	407 00
	7,666 07

EXPERIMENTAL FARM, BRITISH COLUMBIA.

Expenditures, 1st July, 1889, to 30th June, 1890.

	$ cts.
Horses, harness	1,829 65
Cattle	235 50
Implements, tools. hardware, &c	1,116 62
Clearing, grading, &c	1,340 89
Cattle and horse feed	557 80
Blacksmithing and repairs	35 80
Seed grain, trees, shrubs, &c	756 10
Travelling expenses	656 80
Salaries	1,200 00
Farm wages, including experimental work with farm crops, planting orchards, &c	1,200 21
Office help	20 00
Contingencies, including house rent, $140	258 10
	9,207 47

SUMMARY.

Total Expenditure for Experimental Farms, 1889–1890.

Dr.		$ cts.
Central Experimental Farm, Ottawa		44,801 95
Experimental Farm for Maritime Provinces—Nappan, N. S		6,993 94
do do Manitoba—Brandon		10,478 93
do do North-West Territories—Indian Head		7,666 07
do do British Columbia—Agassiz		9,207 47
		79,148 36

Cr.	$ cts.
By Experimental Farm Vote	70,000 00
Governor-General's Warrant	9,148 36
	79,148 36

In the estimates for the experimental farms for 1888–89 no provision was made for the purchase of stock, and the work which it was desird to accomplish could not be carried on without some expenditure in that direction. Notwithstanding that the purchases were limited as far as was practicable, the sum required for this purpose was $7,972.70. In consequence of the very large demand for bulletins and reports the printing account amounted to more than the sum provided, and the correspondence having increased more than three-fold, some additional office help was necessary. The outlay needed to meet these exigencies was $1,175.66, making in all $9,148.36 which was covered by a Governor-General's Warrant at the close of the year.

While the sum of $44,801.95 stands charged against the Central Experimental Farm as its cost for the year ending 30th June, 1890 for the reason that the money has been spent there, it should not be forgotten that a large portion of this sum is expended on items relating to the work in general or the requirements of the four branch farms. In the matter of salaries, there are six of the officers of the Central Farm whose work is of a general character and whose time is devoted about as much to the branch farms and to the interests of the farmers in the Provinces where those farms are located as it is to the work of the Central. Their salaries amount in all to $8,800, one-half of which would be fairly chargeable to the branch farms. The expenditures on each of the following accounts might very properly be divided between the Central and the other farms, for the reason that the benefits arising from the outlay incurred on work and material are shared by all. The purchases of seed grain, trees, shrubs and seeds are for the advantage of the whole Dominion. The distribution of samples of grain for test, of young forest trees, tree seeds and fruits as well as much of the regular horticultural work on the Central Farm, is of this same general character. So also are the outlays connected with the chemical laboratory, the special experiments on grasses and grain, the testing the vitality of agricultural seeds, the sum charged for stationery, which includes supplies for all the farms, the printing of reports and bulletins and their distribution and the office help needed for the large correspondence kept up with the farmers of the Dominion. The sum expended for stock, which is included in the amount referred to, properly belongs to capital account and has been purchased with the view of laying the foundation for good and useful strains of animals, the increase of which will be available for stocking the branch farms. By deducting the amount paid for stock and one-half of the sums charged to the Central Experimental Farm for the items enumerated, the expenditures on this farm would be reduced to a little more than half of the sum which is now placed against it.

ACKNOWLEDGEMENTS.

I gladly avail myself of this opportunity to acknowledge my obligations to all the officers of the Central and Branch Experimental Farms for the devotion they have manifested in their work and the efficiency they have shown in the discharge of their respective duties. To their faithfulness in this respect the reports submitted bear ample testimony. To the foremen and employees my thanks are also due for the interest they have taken in those branches of the work devolving upon them. To the farm foreman, Mr. John Fixter, and to Mr. W. T. Macoun, who have both assisted me in the experimental work, I take pleasure in again acknowledging my indebtedness. Their constant vigilance and reliability in recording observations has relieved me from the necessity of close attention to many details which in less careful hands would have required more frequent inspection, and entailed an additional tax on time already fully occupied. To Mr. Wm. Ellis, who has had charge of the seed-testing department, my thanks are also due for the trustworthy manner in which he has carried on the work of determining the vitality and germinating power of a large number of samples of grain which have been received from all parts of the Dominion.

WM. SAUNDERS,
Director, Experimental Farms.

REPORT OF THE AGRICULTURIST.

(JAS. W. ROBERTSON.)

To WM. SAUNDERS, Esq.,
Director, Dominion Experimental Farms,
Ottawa.

DEAR SIR,—The Order in Council by which I was appointed Dairy Commissioner for the Dominion of Canada, also designated me as "Agriculturist" of the Central Experimental Farm.

The time intervening between the date of my appointment, 1st February, 1890, and the middle of October, was given almost entirely to the discharge of the duties arising from and pertaining to my position as Dairy Commissioner. By your courtesy I was relieved from much of the superintendence of the farm work, in order to enable me to carry out the instructions of the Honourable the Minister of Agriculture, to the effect that I should visit the several Provinces of the Dominion for the purpose of delivering a series of lectures in each on "Dairy Farming" and kindred topics. My journeys enabled me at the same time to inform the farmers in the various localities where the meetings were held, of the nature, variety and extent of the service which it is the object of the Dominion Experimental Farms to render. The very full and generally correct reports of the meetings which the local newspapers inserted, gave a wide publicity to the facts which were mentioned in relation to them and that through channels that could not be used as fully by the issue of bulletins and correspondence.

The visits to the several Provinces were times of reaping for me as Agriculturist as well as times of sowing as Dairy Commissioner. In all the sections where I met the farmers and had opportunity for examining into their condition and the methods of agriculture which they followed, no chance was missed where suggestions could be gained or observations made that could assist further in the effort to make the work of the Agriculturist as practically helpful to as many of the farmers as possible, and that as speedily as is practicable. A brief yet fairly complete record of these journeys, lectures, etc., will be found in the report of the Dairy Commissioner, a copy of which will be furnished to farmers or others who are interested in agriculture upon their application to me at the Central Experimental Farm.

EXPERIMENTAL DAIRY BUILDING.

To enable investigations to be carried on to completeness into the economical methods for the production of milk, butter and cheese, an experimental dairy building was erected on the farm It was planned to be suitable in size and convenie nce for the carrying on of such researches as may be undertaken. The nature and direction of these may be outlined as follows:—

I. Investigations will be carried on in the feeding of milking cows, to discover what differences, in the marketable quantities and the commercial value per pound of milk and butter, result from differences in (*a*) "breeds," (*b*) "feeds," (*c*) "care and treatment of the animals." In this branch of work it is expected that service will be given to the farmers, through illustrations of the best practices that may be followed on any farm, rather than through the origination of new theories.

II. The care and handling of milk, from the time it is drawn until the finished product is ready for the market, will receive attention, in order to reveal and demonstrate the losses or the gains that result from treatments of milk, cream, butter, skim-milk and butter-milk.

III. A curing room for cheese has been provided, wherein lots of cheese, to be made under the direction of the Dairy Commissioner, will be kept and cured, in order to obtain further information on the most profitable practices and treatments in the manufacture and ripening of that article of food.

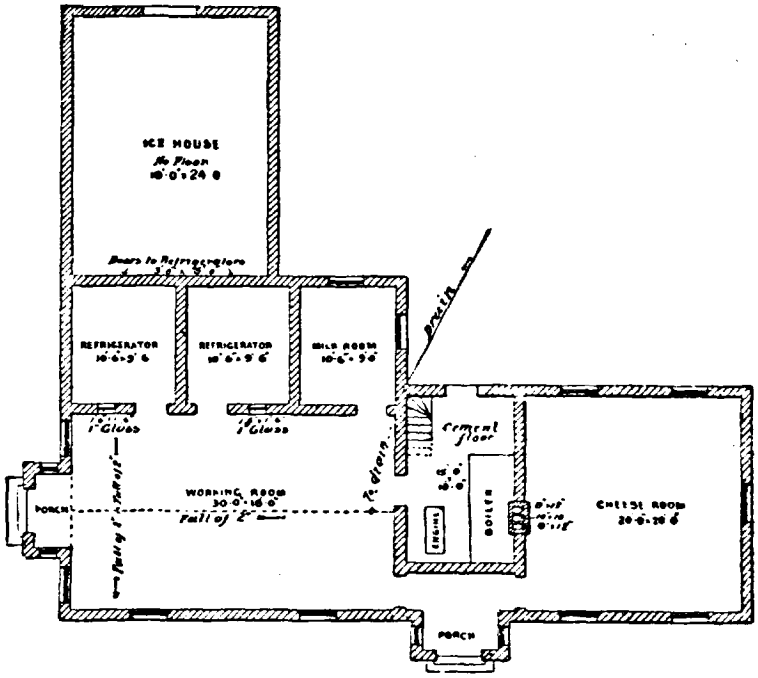
IV. The keeping properties of butter as affected by different treatments during the process of making will be tested; and examinations will be commenced and continued regarding the suitability of certain packages for the preservation of butter for the foreign markets.

V. The use of dairy salt of Canadian manufacture will be continued, and its adaptation for the preservation of butter will be compared with other brands.

VI. Dairy appliances and apparatus of different sorts will be used and reported on, as far as time will permit, and the needs and interests of the public seem to require.

The following figures illustrate the plan and construction of the building:—

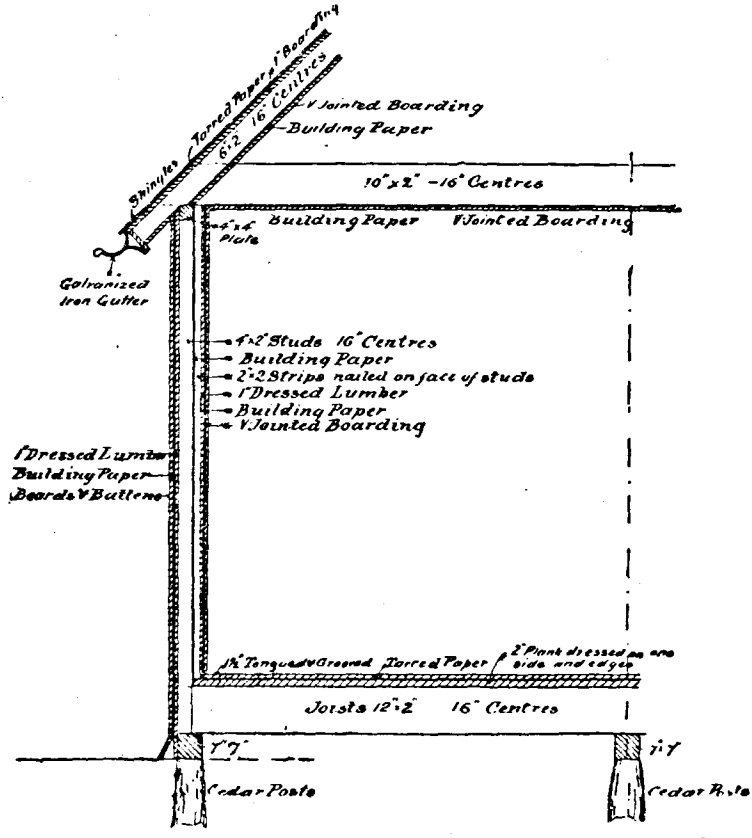
Fig. I; *Experimental Dairy Building.*



NOTE.—The *floor* of the working room is inclined to the middle and end where the drain is, as shewn on the plan, but there is no gutter. The floor is finished with two coats of oil applied hot.

The *ceilings* of the refrigerators are 7′ 6″ high and the ice is put over them direct from the ice house; they are constructed with galvanised iron troughs between the ceiling joists.

Fig. II; *Experimental Dairy Building.*



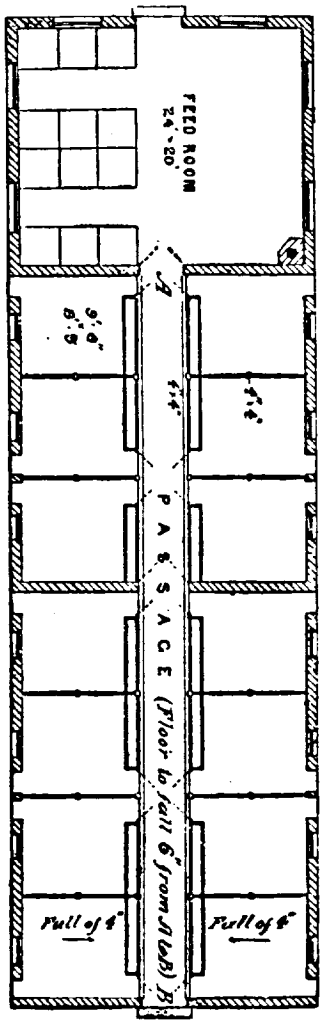
NOTE.—All the outside walls of the building are constructed according to the details shown; the refrigerators and the ice boxes over them are finished in a similar manner, except that plain dressed lumber has been used instead of boards and battens.

PIGGERY.

The swine-feeding industry of the Dominion is capable of indefinite extension, with advantage to the farmers. To provide for the accommodation of this class of live stock on the farm, a piggery was erected during the summer. In the details of its construction an effort was made to embody those points in the building and arrangement of the pens which could be copied with advantage by farmers, and also by those who feed the by-products of dairies upon a large scale in connection with cheese factories and creameries.

The following figures illustrate the plan of the pens:—

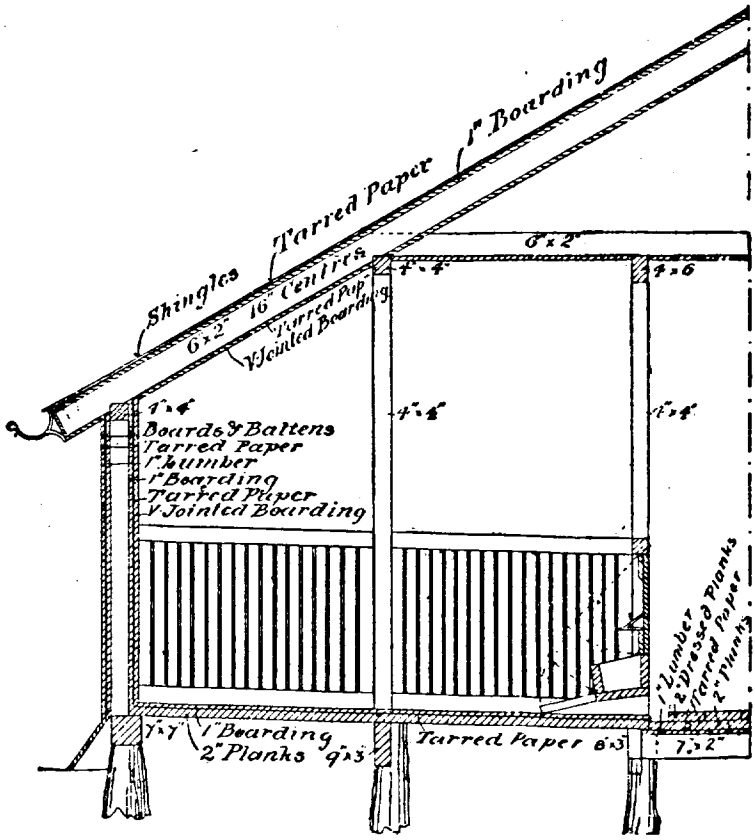
Fig. III; *Piggery.*



NOTES.—The feed room contains 12 bins; the flue in the corner accomodates the steam-heater. There are three large ventilators up through the roof.

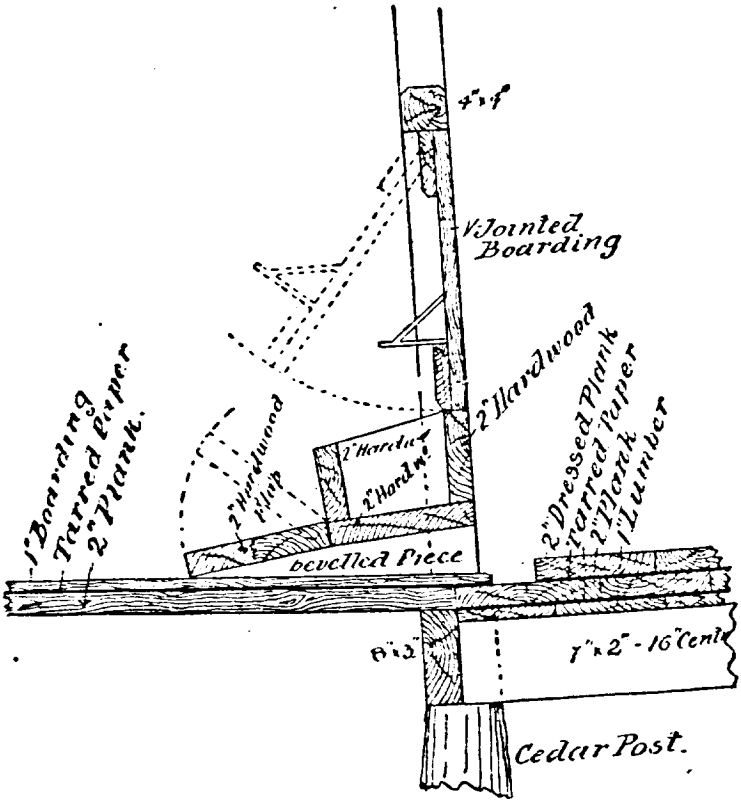
The floors of the Pens are all finished with two coats of oil applied hot; they have a fall of 2 inches towards the gutters on both sides of the passage. There will be a small yard outside for each Pen.

Fig. IV; *Piggery.*



NOTES.—Both the 1" boarding and the 2" planks of the floor run from the outside of each Pen towards the passage. The figure shews a section of one side of the piggery only.

Fig. V; *Piggery.*



NOTES.—This figure shews the details of the placing of the feeding-trough, the hinged foot-board in front of the trough, the swinging feeding-door over the trough, and the gutter which receives all the liquid from each Pen. The fall in the floor towards the feeding-trough permits the swine to lie on a dry bed at the back of each Pen.

The line of experimental work to be taken up may be indicated by a statement of what is being done:

Swine purchased:—

Berkshires—

One sow, from Mr. J. H. Davis, Woodstock, Ont.
One sow, from Mr. George Green, Fairview, Ont.
One sow, from Messrs. J. G. Snell & Bro., Edmonton, Ont.

Large Improved Yorkshires—

One boar, from Mr. E. M. Jarvis, Clarkson, Ont.
One sow, from Mr. Wm. Davies, Markham, Ont.
One sow, from Mr. J. Y. Ormsby, Springfield-on-the-Credit, Ont.

Essex—

One boar, from Mr. Jas. Main, Boyne, Ont.
One sow, from Mr. Jas. Main, Boyne, Ont.

Other breeds will be represented in the pens during the year.

Besides these, twenty-four young grade pigs were bought. They are now in six pens, under feeding tests. To some of them the feed is given warm, after being steamed by the use of a small "Royal Steam-heater."

Four pigs are in each of the six Pens.

—	Description of Pigs.	Feed.
Pen 1	White—3 barrows and 1 sow	A mixture of equal quantities of ground barley, peas and rye, *steamed and fed warm.*
Pen 2	White—4 barrows	A mixture of equal quantities of ground barley, peas and rye, *mixed with cold water and fed raw and cold.*
Pen 3	Black—4 sows	A mixture of equal quantities of ground barley, peas and rye and *pease ensilage.*
Pen 4	Black—2 barrows and 2 sows	*Pease ensilage only.*
Pen 5	Black—1 barrow and 3 sows	A mixture of equal quantities of ground barley, peas and rye, *steamed and fed warm and sugar beets.*
Pen 6	Black—4 barrows	A mixture of equal quantities of ground barley, peas and rye, *mixed with cold water and fed raw and cold, and sugar beets.*

The four pigs in Pen 1 are of equal age and of similar breeding to those in Pen 2; the pigs in Pen 3 to those in Pen 4; and the pigs in Pen 5 to those in Pen 6.

At this writing it would be imprudent to draw any conclusions from the comparative rates of increase in live weight. A Bulletin setting forth the results will be issued as soon as enough information is gained to warrant that its contents will not mislead any farmer. Conclusions regarding feeding experiments which are reached and published too hastily are not boons to the farmers, though they may boom for a time the name of the publisher.

CATTLE.

To our herd of cattle several new animals and breeds have been added. The stables are now filled to their utmost capacity. Experiments are in progress, and others are being prepared for and commenced, which will add to our knowledge of the comparative values of different feeds and treatments in the production of milk and beef. For much of the most valuable of the work, years of patient investigation will be required to amass sufficient information upon which to found conclusions

which will be correct in principle. The *individuality* of each animal is such a potent factor, and a definite perception and recognition of the nature of the *individuality* is so elusive of even the most careful and painstaking study, that the results of comparisons between breeds must depend very much upon the capacity, constitution and tendency of the particular animals which are chosen to represent them. The qualities of each animal are not directly the expression of the sum of all the antecedent qualities of the ancestors on both sides, because the inherited capabilities may be much modified in every case by care, management and feeding during the period of growth.

Thus, while the feed consumed by every animal every day is duly weighed and recorded, also the weights of the milk from the milking cows every day, the live weights of the animals which are under particular feeding tests once a week, and the live weights of the other animals once a month, it is felt that the premature publication of records would lead to no real service for the farmers and might intensify the rivalries between the advocates of the different breeds without any compensating advantage. Every one of the breeds has particular adaptation for rendering peculiarly valuable service when it is used in the line of production for which it has been developed. Nobody who has given the meaning of "breeds" any discriminating attention would claim that they are all equal in their power and capacity for the economical production of milk, butter, cheese, beef or veal, under one similar and rigid system of keeping; neither could one assert assuredly that any one of the recognised breeds is behind the others in profit-making talent when the particular requirements of its peculiar characteristics have been provided for in the best way. Hence, from our experimental investigations, farmers may look for guidance as to the ways whereby the animals of the different breeds can be made to yield the best returns, rather than for competitive comparisons between the breeds.

The breeds of cattle which are now represented on the farm are:—"Shorthorns," "Polled Angus," "Galloways," "Holsteins," "Ayrshires," "Devons," "Quebec Jerseys" or "Canadian" and "Jerseys." These are named in the order in which they stand in our stable, and not with any reference to meritorious rank. There are also a number of steers and milch cows, mostly grades of Shorthorn. During the year there were purchased:—

Shorthorns.

From Mr. Thos. Guy, Oshawa, Ont:

One cow, Rose of Sydenham =16031=; red; calved 6th February, 1886; bred by Thos. Guy, Oshawa, Ont.; got by Samson=8787=;—dam, Red Rose,=4450=; by Enterprise 2nd =1769=;—Sally =4728=.

From Mr. J. N. Hortop, Kinsale, Ont:

One cow, Fashion Book=15918=; red; calved 12th January, 1887; bred by D. Birrell, Greenwood, Ont.; got by Eclipse (Imp.) [1251] (49526);—dam, Fashion 7th=6091=; by Lancaster=752=; —Fashion of Maple Hall 2nd=6102=.

From Mr. George Johnston, Ashburn, Ont.:

One bull Nappan=14042=; red; calved 14th May, 1890; bred by George Johnston, Ashburn, Ont.; got by Warfare (Imp.)=6452=(56712);—dam, Fashion 7th=6091=; by Lancaster=752=;—Fashion of Maple Hall 2nd=6102=.

Galloways.

From Mr. Thomas McCrae, Guelph, Ont.:

One cow, Violet III of Tarbreoch.

One heifer, Hannah B. of Guelph, No. 11080, S.H.B.; calved 23rd February, 1888; bred by Thomas McCrae, Guelph, Ont.; got by Stanley II, O.E.F., No. 2837,

A.G.H.B., No. 4473, S.H.B. ;—dam, Hannah III of Castlemilk, No. 7699, S.H.B. ; by Beaconsfield, No. 1344, S.H.B. ;—dam Hannah V., No. 1421, S.H.B.

One bull calf.

Holsteins.

From Messrs. A. C. Hallman & Co., New Dundee, Ont. :

One cow, Mina Rooker, No. 9893, H.H.B. ; calved 3rd April, 1884; bred by K. Schagen, Medwoud, North Holland; got by Pieter, No. 209, N.H.B. ;—dam, Mina.

Ayrshires.

From Mr. James McCormick, Rockton, Ont. :

One cow, Maggie [1783] ; red and white ; calved 29th March, 1883 ; bred by Mr. James McCormick, Rockton, Ont. ; got by Frank [1330] ;—dam, Primrose 4th [1305] ; by Indian Chief [1174] ;—g.d. Primrose 3rd [400].

From Mr. Thomas Guy, Oshawa, Ont. :

One cow, Ida [1837] ; white and red ; calved 10th March, 1884; bred by Mr. John Lawrie, Malvern, Ont. ; got by Lord Lorne [1406] ;—dam, Mary [1554] ; by Carluke [744] ; g.d. Martha [546].

Devons.

From Mr. W. J. Rudd, Eden Mills, Ont. :

One bull, Hero [982] ; calved 10th March, 1889 ; bred by Mr. W. J. Rudd, Eden Mills, Ont. ; got by Rose's Duke (929), (Imp.) ;—dam, Beauty [800] by Kempenfelt [719] ;—Cherry Pie, [578].

One heifer, Ethel [961] ; calved 20th May, 1888 ; bred by Mr. W. J. Rudd, Eden Mills, Ont. ; got by Lord Lansdowne [933] ;—dam, Rose [953] ; by John A. [852] ; —Beauty [713].

From Mr. Samuel Harper, Cobourg, Ont. :

One heifer, Fanny B. [960] ; calved 9th March, 1888 ; bred by Mr. Samuel Harper, Cobourg, Ont. ; got by Mike [920] ;—dam, Rose of Cobourg [897] ; by Garibaldi 2nd [717] ;—Cherry [691].

Jersey.

From Mrs. E. M. Jones, Brockville, Ont. :

One cow, Barberry of Dorval, No. 44,816 ; solid light fawn ; calved 13th January, 1887 ; got by Leonard of Dorval, No. 14,393 ;—dam, Mulberry (imported).

Canadians or Quebec Jerseys.

I take the following from the report which Mr. J. C. Chapais, Assistant Dairy Commissioner, St. Denis, Que., made upon the purchase of these.

"I have bought, according to instructions, 4 cows registered in the Herd Book of Canadian cattle opened by the Government of the Province of Quebec, 4 cows of the same breed not registered at the moment of the purchase, and 1 bull registered in the above mentioned Herd Book.

"Here are the notes respecting each of the registered cows :—

"Charlotte Noir," probable age 15 years ; registered under No. 348, L.G.R.B.C. ; bought from Cyprien Herriault, farmer, of the Parish of St. Jean Port-Joli, L'Islet County, P.Q. I have bought that cow, old as it is, on account of its individual value as a milch-cow, but chiefly because of the character of prepotency with which it transmits milking qualities to its offspring. It has given, itself, 30 lbs. of milk a day in a pasture of moderate quality, in the time of full growth of grass, towards the end of June, without any extra food. But its first merit is that it has transmitted its milking qualities to every heifer descendant. That cow has competed in the agricultural exhibitions with the best Ayrshires of the place, and has taken the first prizes. It can easily give yet 2 or 3 calves, which will, without any doubt, prove to be valuable stock for the experiments of the Farm, if the cow be bred to the bull I have bought, which will be mentioned later. Those are the reasons why I bought that cow.

"Alice," aged 6 years; registered under No. 358, L.G.R.B.C.; bought from Louis Blanchet, farmer, of the same parish as Cyprien Therriault. It is one of the best cows of the place, giving 30 lbs. of milk a day in a pasture of moderate quality, in the time of full growth of grass, towards the end of June, without any extra food. It has the great quality, common, moreover, to all Canadian cows well kept, of giving a good quantity of very rich milk during eleven months of the year, if well fed.

"Anna," aged 7 years; registered under No. 359, L.G.R.B.C.; bought from Louis Blanchet, above mentioned, and having the same character as its sister "Alice."

"La Lebrun," aged 9 years; registered under No. 196, L.G.R.B.C.; bought from François Gagnon, farmer, of the parish of St. Denis, Kamouraska County, P.Q. Mr. Gagnon has one of the best herds of Canadian cattle in the Proviuce, and that cow was the best of his herd. It shows all the points of an excellent milch cow, and has given 32 lbs. of milk a day in a pasture of moderate quality, in the time of full growth of grass, towards the end of June, without any extra food. With special care that cow is apt to give from 38 to 40 lbs. of milk a day. It keeps in milk too, from calf to calf, if fed for that. It is in calf now, and has been served by Kamouraska, No. 27, L.G.R.B.C., one of the best bulls of the breed. The calf, male or female, cannot fail, then, to be an animal of good value.

For the four cows above mentioned were paid $50 each.

I come now to the cows not registered when they were bought. They have all been purchased from François Gagnon, above mentioned. According to your instructions, I had to choose these cows from amongst the ordinary cattle of French farmers, of good quality.

"Anquetille," aged 6 years. In my opinion that cow is equal, in all respects, to "La Lebrun" above mentioned. It is remarkable for the richness of its milk in cream.

"Velléda," aged 4 years. It is an excellent specimen of Canadian cattle, showing prominent points of Jersey.

"La Basque," aged 3 years. That small cow has been reared in the woods, and is one of the most hardy specimens of the breed. Before it had been bought by Mr. Gagnon it lived at its owner's, fed on straw in winter and pasturing in the woods in summer. It proved, however, a good milker, notwithstanding that absence of good care.

"Belle-du-Lac," aged 4 years. Has much of the character of the last mentioned, but is a little better as a milch cow, judging from the information given to me.

For these last four cows were paid $25 each.

They were all eligible for registration in the Herd Book of Canadian Cattle and are all registered now as follows:—

"Anquetille,"	6	years;	registered	L.G.R.B.C.,	under No.	373.
"Velléda,"	4	do	do	do	do	374.
"La Basque,"	3	do	do	do	do	375.
"Belle-du-Lac,"	4	do	do	do	do	376.

I will now give you the details respecting the bull:—

"Quintal," aged 18 months; registered under No. 30, L.G.R.B.C.; bought from Odilon Robichaud, farmer, of the Parish of St. Denis, Kamouraska County, P.Q. I consider that young bull as one of the best of the breed hitherto registered. Its father, "Kamouraska," No. 27, L.G.R.B.C., is the finest bull of the eastern part of the Province of Quebec, out of a most remarkable milch-cow. Its mother, "Ventre-Blanc," No. 171, L.G.R.B.C., was also one of the best milch-cows of the district. Though rather small, it is very well formed, and shows all the points of a good bull. For it has been paid $30.

I have to make the remark, before closing the report, that I had to buy that herd in that season of the year which is the most disadvantageous for such a purchase. It was impossible to ascertain by myself, otherwise than by the external points and the assertions of the owners, the milking qualities of the cows purchased. I had to rely as much as possible on my own judgment in making my choice.

Grades of Shorthorn.

From Mr. Wm. Hinde, Harriston, Ont.:

Six steers for feeding purposes.

Eight milch cows, for experimental dairy work.

These cows were all expected to calve in December and January, and were purchased to commence a series of investigations into some of the problems of winter butter-making, combined with the rearing of stock for feeding and fattening purposes.

The following are the rations which are fed to most of the cattle:—

Ration No. 1.

For Dry Cows:

	Lb.
Corn Ensilage	25
Turnips	25
Straw	12
Chopped Grain (barley and peas)	4

Ration No. 2.

Milking Cows:

	Lb.
Corn Ensilage	25
Carrots	25
Straw	12
Chopped grain (barley and peas)	6
Wheat bran	3

Ration No. 3.

First Lot Steers:

	Lb.
Hay	20
Turnips	40
Straw	5
Chopped barley	2
Chopped peas	2
Ground oilcake	1
Cotton seed meal	1

Ration No. 4.

Second Lot Steers:

	Lb.
Corn ensilage	50
Straw	5
Chopped barley	2
Chopped peas	2
Ground oilcake	1
Cotton seed meal	1

Ration No. 5.

Third lot Steers:

	Lb.
Corn ensilage	20
Turnips	20
Hay	10
Straw	5
Chopped barley	2
Chopped peas	2
Ground oilcake	1
Cotton-seed meal	1

These rations are not made up quite in accordance with the usually accepted feeding standards, which have been devised from and based upon feeding experiments and analyses of feeds that have been conducted mostly in Germany. The following table sets forth the quantities of "digestible protein," "digestible carbo-hydrates" and "digestible fat," which have been found on the average, in 1 pound each of the several feeding materials named, as calculated from the average analyses of these feeding substances, and the percentage of the several nutritive constituents which have been found by several experiments to be digestible by ruminants :—

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
Peas	do	·87	·201	·534	·029
Oilcake	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

By applying this table to the several rations, Nos. 1, 2, 3, 4 and 5, it will be found that they contain the quantity of nutrients mentioned under the several headings:

——		Total Dry Organic Matter.	Digestible Protein.	Digestible Carbo-hydrates.	Digestible Fat.	Nutritive Ratio.
Ration No. 1.	Lb.	Lb.	Lb.	Lb.	Lb.	
Corn ensilage	25	6·250	·400	5·750	·150	
Turnips	25	2·125	·250	1·875	·025	
Straw	12	10·200	·420	3·960	·048	
Chopped grain, (barley and peas)	4	3·520	·590	2·268	·110	
		22·095	1·660	13·853	·333	1:8·8
Ration No. 2.	Lb.					
Corn ensilage	25	6·250	·400	5·750	·150	
Carrots	25	3·525	·325	2·875	·050	
Straw	12	10·200	·420	3·960	·048	
Chopped grain, (barley and peas)	6	5·280	·885	3·402	·165	
Wheat bran	3	2·610	·351	1·359	·081	
		27·865	2·381	17·346	·494	1:7·8
Ration No. 3.	Lb					
Hay	20	17·20	1·020	8·600	·240	
Turnips	40	3·40	·460	3·000	·040	
Straw	5	4·25	·175	1·650	·020	
Chopped barley	2	1·78	·188	1·200	·052	
Chopped peas	2	1·74	·402	1·068	·058	
Oilcake	1	·92	·283	·368	·050	
Cotton-seed meal	1	·92	·336	·264	·070	
		30·21	2·804	16·150	·530	1:6·1
Ration No. 4.	Lb.					
Corn ensilage	50	12·50	·800	11·500	·300	
Straw	5	4·25	·175	1·650	·020	
Chopped barley	2	1·78	·188	1·200	·052	
Chopped peas	2	1·74	·402	1·068	·058	
Oilcake	1	·92	·283	·368	·050	
Cotton-seed meal	1	·92	·336	·264	·070	
		22·11	2·184	16·050	·550	1:7·8
Ration No. 5.	Lb.					
Corn ensilage	20	5·00	·320	4·600	·120	
Turnips	20	1·70	·200	1·500	·020	
Hay	10	8·60	·510	4·300	·120	
Straw	5	4·25	·175	1·650	·020	
Chopped barley	2	1·78	·188	1·200	·052	
Chopped peas	2	1·74	·402	1·068	·058	
Oilcake	1	·92	·283	·368	·050	
Cotton-seed meal	1	·92	·336	·264	·070	
		24·91	2·414	14·950	·510	1:6·6

The term "nutritive ratio" is one which is employed to designate the proportion which the *digestible protein* (called also the nitrogenous substances, or "flesh-formers") bears to the *digestible carbo-hydrates* and *fat*. The carbo-hydrates are the

starch, sugars, gums, crude fibre and like substances; they are sometimes referred to as "heat-producers." To give to the fat an equitable starch value, the quantity of it is multiplied 2½ times before it is added to the carbo-hydrates proper, for the calculation of the nutritive ratio.

The dry cows on Ration No. 1 are fed twice a day, and are allowed as much of the mixture as they will eat up clean. The quantity varies from 40 pounds to 60 pounds per day for different animals.

The milking cows on Ration No. 2 are fed twice a day, with the exception of the Shorthorns and Polled Angus, which are fed three times. The cows consume from 40 pounds to 80 pounds each per day. To fresh-calved cows and those which respond to it, 1 pound of ground oilcake and 1 pound of cotton-seed meal per day are given in addition.

The two steers, Nos. 1 and 2, on Ration No. 3, have been consuming about 50 pounds each per day of the mixture which composes their ration; that is equal to 21·2 pounds of dry organic matter per head daily.

The two steers, Nos. 3 and 4, on Ration No. 4, have been consuming about 46 pounds each per day of the mixture which composes their ration; that is equal to 16·6 pounds of dry organic matter per head daily.

The two steers, Nos. 5 and 6, on Ration No. 5, have been consuming about 50 pounds each per day of the mixture which composes their ration; that is equal to 20·4 pounds of dry organic matter per head daily.

As has been mentioned already, it would be unwise to draw any conclusions or make any further reference to investigations which are only in progress; but this may be added with safety, the economic value of ensilage for cattle feeding is surprisingly high, and it is not yet appreciated by the masses of Canadian farmers.

For the current year, new investigations along lines for the practical service and guidance of the farmers are being commenced. Among others, it is considered expedient to illustrate, by the growth of crops suitable for soiling and the making of ensilage, how many cattle may be sustained under ordinary farming conditions, on the product from 20 or 40 acres of land. The needs of the farmers for the successful and profitable prosecution of cattle-raising, stock-feeding and dairying, appear to be in the direction of larger numbers of cattle per 100 acres, rather than for more acres of land.

Abortions.

During the year, what is commonly known as the disease of *epidemic abortion* prevailed in the herd. The unnatural and premature births usually occurred at from the fifth to the seventh month. Little reliable knowledge of the antecedent or even immediate causes of the disease or losses is yet in our possession. Ignorance of the nature of the disease has been hidden by draping the mention of it with the astutenesss of medical mystery, under the guise of an announcement that it owed its existence to "a germ."

The treatments which were adopted, might be termed empirical.

I. The stables were thoroughly fumigated by the burning of sulphur, saturated with alcohol, with the doors and windows closed for three hours. Of course all the cattle were out.

II. A wash was made up of 1 part of bichloride of mercury to 4,000 parts of water, into which solution were put 8 ounces of common salt; once a day the bare skin around the vulva, the anûs and the root of the tail of the cows in calf, and also of those which had aborted, were sponged with the solution.

III. After several weeks of that treatment the following was adopted as being preferable: 2½ drachms of bichloride of mercury were dissolved in 3¼ ounces of glycerine and 3¼ ounces of alcohol; after these had united, 4¼ gallons of rain water were added. (The mixture should be kept in a wooden vessel, out of the reach of irresponsible persons, and animals). The bare skin under the tail and around that part was moistened once a day with the solution.

IV. The cows, which formerly has been turned out into a large yard every day for water, were watered from troughs in front of their stalls.

V. When a pregnant cow showed any symptoms of approaching abortion,—and these are, slight relaxation of the muscles surrounding the vulva, restlessness and a continuous slight elevation of the tail,—she was at once put into a box-stall, where she was free from disturbance or causes of excitement. One-ounce doses of tincture of opium were given in the feed—even three times a day for one or two days—until a quiet and slightly sluggish condition prevailed. Drenching with medicine was avoided.

The result is—and it is mentioned with hesitation and fear, lest the dread abortions should occur again—that since the system of treatment has been adopted, 13 cows have given safe delivery to calves at the natural time, and only one case of abortion has occurred, and that could be accounted for satisfactorily. That covers a period of three and-a-half months. During the preceding ten months there were 13 births at the natural time, and 14 prematurely, at from four and-a-half to eight months.

NEW BUILDINGS.

A sheep building is needed for the accommodation of that class of stock. After it is erected, the three important departments of live stock for experimental farm work—cattle, swine and sheep—will be in full operation, without the hindering limitations which are entailed on investigations by the erection of buildings and preliminary work.

Permit me to refer farmers and others who may be seeking information on grain-growing tests and other agricultural work to your own report, as my connection with the Central Experimental Farm, with the exception of live stock management, has been as yet to a large extent advisory rather than executive.

I have the honour to be,

Your obedient servant,

JAS. W. ROBERTSON,
Agriculturist.

REPORT OF THE HORTICULTURIST.

(JOHN CRAIG.)

WM. SAUNDERS, F.R.S.C., F.L.S., F.C.S.,

Director Dominion Experimental Farms,

SIR,—I have the honour to submit herewith a report on the work carried on in the Department of Horticulture since my appointment, 15th January, 1890. The characteristics of the past season were an unusually late spring—delaying somewhat outdoor operations—and a remarkably favourable summer for plant growth; this closed with an equally favourable autumn for the thorough and essential ripening of wood made during the season, leaving trees and shrubs in good condition to withstand the severity of winter.

I have endeavoured to bring together, as briefly and clearly as possible, in the following pages, information drawn from the experience of the year in most instances, and often corroborated by the experience of previous years. For the sake of clearness, the work has been divided and placed under the following heads:—

I. LARGE FRUITS.—Bearing upon the number and condition of varieties in orchard; touching specially upon the Russian and hardier classes best adapted to the needs of northern planters, with cultural notes.

II. SMALL FRUITS.—Touching especially upon grapes and strawberries, making the early varieties a feature of the former, the most reliable and productive of the latter; also summing up the records on other small fruits for three years, with hints on varieties.

III. VEGETABLES.—Outlining proposed work and that in hand; giving the names of the most successful varieties of those tested.

IV. FORESTRY—TREE DISTRIBUTION—FRUIT DISTRIBUTION.—Touching on the importance of the question in Manitoba and the Territories. Giving an outline of the work of distributing forest-tree seedlings and possible results; also bearing upon the distribution of large and small fruits.

V. FUNGICIDES.—Giving formulæ for their preparation and results of experiments on the apple scab.

VI. REPORT ON SEEDLING SMALL FRUITS.—Giving opinions of a visiting committee of experts on seedling raspberries, fruiting at the Experimental Farm—with descriptions of varieties.

I beg gratefully to acknowledge the following donations:—

Peter Henderson & Co., New York; a large collection of vegetable seeds.
Mr. S. H. Mitchell, St. Mary's, Ont.; corn and tomato seed.
Mr. M. Crawford, Cuyahoga Falls, Ohio; strawberry plants.
Mr. Julius Schnadelbach, Grand Bay, Ala.; strawberry plants.
Mr. David Greig, Cainesville, Ont.; strawberry plants.
Mr. P. E. Bucke, Ottawa; Northern Light grape.
Mr. N. C. Fisk, Abbotsford, Que.; grape cuttings.
Wm. Craig & Son, Abbotsford, Que.; scions of crabs and Russian apples.
Mr. Geo. Mitchell, Abbotsford, Que., scions of seedling apples
Mr. Abel Bresso, Abbotsford, Que.; scions of seedling apples.
Mr. C. R. H. Starr, Wolfville; apple scions.
Dr. T. H. Hoskins, Newport, Vt.; apple scions.
Mr. P. C. Dempsey, Trenton, Ont., apple trees and scio s
Mr. R. W. Shepherd, jr., Como, Que.; apple scions.
Mr. J. J. Gibb, Como, Que.; apple scions.

Mr. Chas. Hardisty, Clarence, Ont.; seedling apple scions and fruits.
Rev. Robt. Hamilton, Grenville, Que.; apple scions, and trees of Populus nigra.
Mr. R. B. White, Ottawa; collection of seedling plums.
Prof. J. L. Budd, Iowa Agricultural College, Ames.; hardy fruits and shrubs, and many favours.

It was my privilege, during the year, to attend various meetings in agricultural circles—among them the meeting of the American Forestry Association, held in the city of Quebec the first week in September last. In a paper read before the Association I attempted to give an outline of the experimental work in forestry, in progress at the Dominion Experimental Farms. The system and policy of the Department was highly commended, and seemed to meet with the hearty approval of the many delegates present.

At the September meeting of the Montreal Horticultural Society a magnificent display of fruits—notably apples—was shown. Nowhere in the Dominion can a finer exhibit of seedlings be seen than at the exhibitions of this Association, many of which, it is to be hoped, will receive extended trial before long. This society is also paying careful attention to the merits of the Russian apples, now beginning to fruit in many localities about Montreal.

The summer meeting of the Ontario Fruit Growers' Association was held during July at Niagara on the Lake, where an opportunity was afforded of studying one of the most favourable peach-growing districts of Ontario. A lively interest was taken by all present in horticultural advancement, by means of Government experimental work.

I have the honour to be, Sir,

Your obedient servant,

JOHN CRAIG,

Horticulturist.

I.—LARGE FRUITS.

APPLES.

Nearly all varieties came through the winter without injury and have made a satisfactory growth the past season. A few have been replaced and several additions made.

Cultivation.—The trees have been banked up with earth to the height of 12 inches each autumn, which protects them from being girdled by mice, and prevents the swaying action of the wind. The orchard received a dressing of barnyard manure last spring, which was ploughed under, and the soil prepared for a crop of roots. A space of 4 feet was left clear on each side next the trees, which was carefully cultivated till the middle of July, or the end of the growing season, afterwards, care was taken to keep down the weeds, thus preventing any from seeding. Under the favourable conditions prevailing last autumn, the trees ripened up well and went into winter quarters in good shape.

As a preventive to scale and other bark insects, the stems and main branches were washed, early in June, with soft soap, to which was added a sufficient quantity of a strong solution of washing soda, which had first been dissolved, to reduce it to the consistence of a thick paint. This wash has the effect of keeping the bark green and healthy. It is a practice that should be followed generally by fruit-growers.

From careful notes taken the past two seasons varieties in the following list do not appear to be hardy enough for this latitude, and cannot be recommended for general planting: *Brewington, Gravenstein, Nonpareil, Peck's Pleasant, Warner's King, Yellow, Belle-fleur.*

The following may be assumed as a doubtful list, having been injured each winter in a greater or less degree: *Baldwin, Bottle Greening, Cooper's Market, Cranberry Pippin, Chenango Strawberry, Fall Jennetting, Fallawater, Lady Henniker, Maiden's Blush, Northern Spy, Ribston Pippin, Roxbury Russet, Shannon, Spitzenberg, Swayzie Pomme Grise, Wagner, Grimes' Golden.* There is no doubt that individual trees of varieties named in this list, and even in the first one, can be found doing fairly well in this locality; but they are exceptional cases, and probably under unusually favourable conditions. It is also doubtless true that we, in the colder sections, can obtain by *top-working on hardy stocks* a sufficient quantity of fruit for home use of many of these choice old varieties. Experiments in this line using different stocks will be inaugurated as soon as practicable.

RUSSIAN APPLES.

Most of the varieties, as given by Mr. Hilborn in the annual report of 1888 have made very satisfactory progress up to date. Thirty-five of the later importations of the Iowa Agricultural College were received from Prof. Budd last spring, and were added to the original planting, making in all 215 Russian varieties on trial. This orchard was the first to fruit on the Experimental grounds, a number of trees giving specimen apples this year. Some of them are large, and of fair quality, but further experience is needed before a true estimate can be made of their value. In this connection it may be added that the large and interesting collection of Russian fruit on the farm of the late Charles Gibb, of Abbotsford, Que. (now owned by Wm. Craig & Son) has been, by your instructions, under my observation during the fruiting season of this year. The planting of Russian fruits was begun by Mr. Gibb about ten years ago. Many varieties are now coming into bearing, and it is hoped that by careful observation of the success of the different varieties in that district, a reliable opinion will be arrived at in regard to their possible success and usefulness in the colder parts of the Dominion. The fruit-growers of the Province of Quebec, especially, had for years been watching with much interest the self-imposed task of fruit testing—"for the cold north"—undertaken by Mr. Gibb, and it will be a source of satisfaction to them, to know that the results which he came so near attaining, will not be lost to the people in whose interest he laboured. It is hoped that, with the added experience of another year, sufficient information will be acquired to enable such facts to be published in bulletin form, as will serve as a guide to planters along the northern limits of present apple culture; for this is the region where the Russian apple will be of greatest service. Another purpose which this race will serve, and which will be developed later, is that of giving us hardy stocks for top-grafting. Many varieties already fruited, judging from their poor quality, should be condemned, but will be retained, for the purpose just indicated, on account of their great vigour and hardiness. They will also undoubtedly be the progenitors of a hardier race of apples than we now have, by crossing with our American sorts, or by seedling production.

The following list is based upon the observation of four years on the grounds of the Iowa Agricultural College, and the experience of last summer at Abbotsford. The varieties mentioned are commended to the careful attention of fruit growers.

Zolotoreff.—Large, conical, rich carmine with light dots and stripes on the shady side. Calyx open, basin, wrinkled, stem short, cavity, deep, narrow. Flesh yellowish white, tinged with pink when over-ripe, rather coarse in texture, quality medium. Season early September. A fine handsome apple. The tree is a vigorous upright grower with large glossy leaves. Hardy as Duchess. Closely resembling this in tree and fruit, are Basil the Great, and Titovka.

Golden White.—Large, oblong, ribbed, yellow ground covered with bright red towards cavity, calyx open, basin slightly wrinkled, somewhat ribbed, stem short, thick, cavity small, in some almost closed. Flesh white, crisp, tender, juicy. Sub-acid sprightly, very good season, August to September. Keeps better than Duchess. Claimed by some to keep till mid-winter. Tree a good grower of upright habit. Very hardy.

Arabka (Imported by Ellwanger & Barry).—Large, oblong, irregularly ribbed, dull red on sunny side, shading to dark green. Calyx closed, basin shallow, deeply wrinkled. Stem short, thick set, in closed cavity. Flesh greenish, white, rather coarse, mildly acid. Season November to March. In the west the tree has been somewhat subject to blight, but it has not been affected this way in the east. In hardiness it may be graded with Wealthy. This will undoubtedly be valuable in the colder districts. Trees planted ten years ago at Abbottsford have been bearing heavily and regularly the last four years. The Arabka imported by the United States' Department of Agriculture is quite different—an early fall apple of the Duchess type, very vigorous and hardy.

Gipsy Girl.—One of the hardiest and most vigorous of all the Russians. Specimens were taken this season from trees planted two years ago on the Experimental Farm. The fruit is large, highly coloured, of fair quality, and keeps till February. Wherever this tree has come under my notice, it has been doing well.

Royal Table.—This apple is of North German origin, a later importation by Prof. Budd. The trees at Abbotsford, are compact growers, with round topped heads, slender twigs and medium sized leaves; they have made vigorous growth, and seem perfectly hardy. Fruit medium to large, conical, ribbed, greenish with dull red stripes on the sunny side, calyx open, basin wide, wrinkled, stem short thick, cavity wide shallow, flesh greenish white, inclined to be tough, quality fair. Season; at this date (January 25) specimens in my cellar are firm and in good eating condition. It should keep through February. As already stated notes were taken on a considerable number of varieties which fruited at the Experimental Farm and at Abbotsford the past year, but it is thought better to reserve such information for future publication.

IMPORTATION AND PROPAGATION.

Arrangements were made last winter by the Fruit-Growers Association of Ontario, through the Secretary, Mr. Woolverton, for the importation of a large collection of scions of Russian apples, pears and plums. By arrangement with Mr. Woolverton this consignment was placed in my hands to be propagated, for trial on this and the branch Farms, and for distribution to the members of the association. Owing to the length of time in transit, the scions were not in good condition when received in March. They were root grafted at once, and set out at the proper time in spring. Last fall it was found, that 44 out of 45 varieties of apples had grown, giving in round numbers 1,350 trees. Specimen trees of 6 out of 7 varieties of the pears were obtained—in all 78 trees ; 15 trees of one variety of plum also made a satisfactory growth. It is proposed to increase these as rapidly as practicable for dissemination, and trial at different points in the Dominion. A number will be top grafted next spring, with a view to obtaining specimens of the fruit at as early a date as possible. This work of distribution of rare plants and new fruits, which the Ontario Fruit-Grower's Association has practiced among its members during a number of years past, is one highly to be commended, and is productive of valuable results.

SEEDLINGS, NATIVE AND RUSSIAN.

Of the seedling apples raised from seed imported under your direction from Russia, about three thousand have been planted in a special "seedling orchard." They have been set 5 feet apart each way and will remain there until some idea of their probable value can be formed, when the more promising will be transplanted to permanent positions for more extended trial. Smaller assortments of these have been sent to the branch Farms for testing in a similar manner.

Efforts have also been directed towards gathering in, all the native seedlings which have been reported as worthy of propagation, or have come under my notice, as possessing good points.

Thus far, thirty seedlings have been collected, principally from the older apple growing districts of the Eastern Townships, from Montreal and Northern Ontario. Those received in spring were crown grafted, most of which made satisfactory

growth; others received during the summer were budded. The whole collection with additions as received, will constitute an instructive group when contrasted with the seedlings of Russian origin.

PEARS.

Very few of the cultivated varieties of American and West European pears prove hardy in this section. Nearly all belonging to this class have been more or less severely injured by winter since planting in the trial orchard. This injury has mainly consisted in the loss of part or the whole of the growth of the preceding year. Others, however, have been killed outright. The orchard has been treated in the same manner as the apple orchard, and the soil is well suited to pear culture.

The following varieties have shown least injury from the cold of winter thus far, indicating that, under favourable circumstances, they might be grown to a limited extent in this and similar latitudes: *Flemish Beauty, Bartlett, Beurré Hardy, Beurre d'Anjou, Doyenné, Boussock, Goodale, Josephine de Malines, Seckel, Vicar of Winkfield.* It is probable that other varieties will be noted later, as developing hardiness in an unexpected degree, as the work of testing goes on. Pears have been almost wholly untested in this vicinity up to the time of planting them on the Experimental Farm.

In this connection, it may be added that interesting results are looked for, when the work now in hand—that of top-grafting the hardiest Russian sorts with the best varieties of the present cultivated pears—has been brought to au issue. This is a line of experiment that has not yet been entered upon in America, and from which it is hoped the colder sections will reap much benefit.

RUSSIAN PEARS.

Nearly all varieties of this class have come through the last two winters uninjured, and strong hopes are entertained for their future usefulness. Through the kindness of Prof. Budd, I have been able to make a considerable addition to the collection already in orchard, and expect to be able to extend the work in this line next spring.

The following notes are made on trees planted eight years ago at Abbotsford, all of which have grown vigorously, and give every indication of perfect hardiness:

Beesemianka (No. 508 and 3 M).—Tree a strong upright grower, with remarkably bright green healthy foliage. It has shown no sign of blighting in the east, but has been affected to a limited extent by this disease in the west. A few specimens of fruit were borne this year, but dropped before an idea of the quality could be ascertained.

Sapieganka.—This is even a stronger grower than the last and more spreading in habit. The twigs are thick, bark a bright olive in colour. This would appear to be a grade less hardy than the last. It has not come into bearing yet.

Gakovka.—This seems to be the hardiest of the class. From close observation of its habits in widely separated localities I believe it will succeed wherever the Duchess apple can be grown. It is a rapid grower of upright habit and strictly determinate in regard to ripening its wood in the fall. I cannot speak of the fruit. Prof. Budd says: "The fruit is large and handsome, but is mainly valuable for culinary use, for which it is not excelled. Though pleasant in flavour the flesh is too firm for desert use until over ripe."

Lemon.—The characteristic of this tree is the fact of its having almost invariably a central leader from which the side branches are thrown. This forms an ideal head. Annual growth has been strong. Shoots large. It is said to be a cooking pear. Not fruited yet.

Limber Twig.—Prof. Budd says this succeeds best on dry, upland soil. It has done well at Abbotsford on gravelly soil. The bark is light green, buds peculiarly long and sharply pointed. Not fruited.

Kurskaya.—This is said to have been first introduced by the Mennonites of Minnesota. In general appearance and habit of growth it much resembles Bessemianka. The fruit has not come under my notice.

Autumn Bergamot (No. 122).—This has been very satisfactory in point of hardiness and vigour at Abbotsford. The fruit is said to be small and highly flavoured.

SEEDLING PEARS.

As a product from the pear seed imported from the region of the Volga in Russia—a district in which the pear is found growing wild—one hundred and twenty-five of the most vigorous seedlings were transplanted in the same manner, and adjacent to the apple seedlings already mentioned. A number of seedlings from other sources have also been added and the whole will make a very interesting and, it is hoped a useful collection. The late Chas. Gibb, advocated frequently the wisdom of growing seedlings from the wild pear of the Volga region, for the purpose of introducing a hardier fruit stock than we now have in the French pear seedlings. Owing to the difficulty of obtaining seed in quantity, this line of work has not been attempted by fruit growers, outside of a few pear specialists.

PLUMS.

The majority of the older and finer varieties of this fruit first planted have not succeeded as well as was expected. The partial failure of this class in the first planting was no doubt very much increased by the planting as an experiment a number of varieties in the fall. A severe winter followed, resulting in the death of a considerable number. These failures have, however, in most cases, been replanted and all will receive a fair trial. While many may not make long lived trees, yet they will be useful in furnishing pollen which may be used in the work of crossing with hardier varieties.

The following list contains those kinds which thus far have stood the test of winters in this vicinity with least injury. They have all originated from the European plum, *Prunus domestica* and have been in cultivation for a number of years in the fruit growing districts of Ontario and the Eastern States: *Reine Claude, Magnum bonum, Yellow Egg, Richland, Glass Seedling, Washington, Nota Bene, Bryanston's Gage, Newman, Pond's Seedling, Lombard, Bradshaw.*

Another class of plums which are more promising in point of hardiness, though they have not fruited to any extent thus far, belong to the same species as the last, but are derived mostly from East Europe. The following have come through uninjured by winter killing and give promise of vigour and longevity; *Early red, Late red, White Nicholas, White Otschakoff, Trabische, Voronesh, Hungarian, Moldavka.* Most of these have fruited in the Western States, in many cases the fruit will be found very useful, and in some instances of high quality.

For a number of years past, a few experimenters in the Western States, have been developing selected varieties of the native plum of that region—a fruit which has too long been neglected—*Prunus Americana.* A number of promising varieties are now on the market and will be of much service along the northern limits of plum culture. *De Soto,* which has so rapidly sprung into popularity of late, is a notable representative of this class. An effort has been made to secure as large a collection of these as possible. Among them are the following, which appear to be the most valuable: *Hawkeye, Speer, Wolf, Wyant, Rollingston, Forest Garden, Forest Rose, Jas. Vick,* and *Garfield.*

Prunus Chicasa.—This is native to the south-west, is less hardy than the preceding, and sometimes fails from imperfect fertilization. As a cooking plum it is unsurpassed. Among the prominent representatives on trial, may be mentioned *Mariana, Milton, Weaver, Maquoketa, Moreman* and *Pottawattamie.* The last three, are late introductions.

Japanese plums.—These have not succeeded here, and while their usefulness for the colder sections is doubtful, yet for the milder portions they are at least worthy of trial in a limited way.

Seedlings.—A seedling plantation has been started wherein tests in this line are being conducted, and to which constant additions will be made.

Selected seed and plants of the Americana and Chicasa types have been secured from the west, both north and south.

Some very interesting seedlings have been collected through Mr. Aug. Dupuis, Village des Aulnaies, north of the city of Quebec. These are grown from pits of the Blue Damson and Orleans plums. They have been cultivated in that rigorous climate by seedling production for years. Judging by samples of fruit received last fall they are well worthy of propagation.

Through the courtesy of Mr. R. B. White, of Ottawa, who has for a number of years made a specialty of collecting hardy and promising plum seedlings, I have obtained a considerable number of specimen trees, which have succeeded well with, and are thought favourably of, by that gentleman.

CHERRIES.

It was not expected that varieties derived from the Mazzard stock would succeed in this locality, but in order to arrive at definite conclusions, a collection of the principal members of this class as well as those belonging to the Dukes and Morellos was planted in orchard. Experience thus far has justified the above opinion in regard to the Mazzards, and indeed many of the Dukes might be included in the same division as far as hardiness is concerned.

Of the Duke and Morello varieties the following catalogued varieties have come through the winters with comparatively little injury thus far:

Dyehouse, Belle Magnifique, Large Montmorency, Royal Duke, Early Richmond, Late Morello.

It is being generally admitted that as profitable market cherries—except in the extreme south—the Morello varieties are, on account of their hardiness and productiveness, growing in popularity. For this and similar sections we will have to depend mainly on them for our supply of this much appreciated fruit. There appears at present no other line in the culture of large fruit so promising in immediate and beneficial results, as will be attained by the propagation and dissemination of members of the Morello class, which have been imported by the Iowa Agricultural College. A considerable collection of these varieties were obtained, and have been on trial since 1888. With one or two exceptions they have shown every evidence of hardiness, growing uniformily with thrift and vigor. Specimens of fruit were had from 12 varieties last season giving indications of early bearing habits. The fruit in all instances was very good; in a few cases really excellent. These varieties are also included in the collection at Abbotsford, where they have fruited the past two or three years. The following list, with short descriptive notes, includes those which bore fruit on the Farm last season. The dates of ripening are given as occurring this year:—

Wragg.—This tree, which is now being distributed from the west, is an only survivor of a lot of cherry trees sent out there, which were selected from an importation made by Ellwanger & Barry from Germany some 18 or 20 years ago. The tree is of the Morello type, round-headed and vigorous. Fruit ripe this year 5th August. Large, round flattened, colour dark red, stem long, rather acid, slightly astringent, very juicy. A promising late variety.

Ostheim (of Minnesota).—Size of Kentish, dark-red, roundish obtuse, highly coloured juice, good quality; about a week earlier than Wragg; differs from the next in season and quality. Tree is open topped; a free grower.

Ostheim (of Morris).—This is a small dark-coloured cherry, round, compressed, fair quality, pit large, somewhat lacking in juciness; ripens with Wragg, about 6th August. Is not as free a grower as the last.

Lithaur Weichsel.—Small dark-red, when fully ripe almost black, roundish obtuse, flesh firm, pleasant sub-acid, pit rather large, ripe 31st July; tree close, round topped, quite hardy. Were this a little larger, on account of its earliness, it would be very valuable.

Voronesh 27.—A promising variety imported under this number from Voronesh, Russia. Fruit very large, bright red, round, flattish, flesh juicy, sub-acid, pit small, ripe 4th August; tree hardy, vigorous.

Gruner Glas.—In appearance of tree and fruit resembling the last, but later. Fruit large, bright-red, slightly more acid than last, ripe 8th August; very productive.

Bessarabian (or Russian 62).—Tree a spreading grower, twigs slender, with prominent buds; very hardy; fruit large, about same size as Wragg, round, depressed, stem long, colour, dark-red when fully ripe, good quality, ripe 5th August.

Russian 207.—Medium to large, round, flattened above, bright-red, long stem, fair quality, juicy; tree upright, one of the most vigorous growers; ripe 6th August, resembles Voronesh 27.

Vladimir.—Here again as in the case of Ostheim there seems to be two varieties under the same name. This one, imported by Prof. Budd, is a very early cherry, the earliest of all here, ripe 28th July. Fruit medium size, nearly black when ripe, roundish oblate, mild sub-acid, very pleasant, tree vigorous and hardy.

Vladimir. (Imported by Mr. Gibb from Moscow).—Is distinguished by its slender twigs, and more conservative habit of growth; shows every sign of perfect hardiness. I cannot speak of the fruit. Still another Vladimir is on trial here. This was introduced by a later importation of the Abbotsford Fruit-Growers' Association. It differs entirely from the two foregoing, resembling the Mazzard family in leaf and habit of growth much more than the Morello. This one has not yet fruited.

Montmorency Ordinaire.—This is of the Morello type, but is not a late importation. It is one of the hardiest of the catalogued sorts and is worthy of more extended cultivation than it now receives. Fruit about the size of Early Richmond, dark-red, mildly sub-acid, very pleasant. Ripe, 2nd August.

Observations on the behaviour of the above selections and a number of others growing at Abbotsford on gravelly soil for several years, were made this season. They had made a most satisfactory growth and, as already stated, with one or two exceptions, had not suffered from the cold of winter. Fuller information will be published later. Due attention is being given to seedling production in this as well as the other lines of fruit culture.

RUSSIAN APRICOTS.

In answer to a letter from the editor of *American Garden* last August, asking for my experience and opinion on the behaviour and value of these fruits, the following note was written, which so nearly covers the ground that it is not considered necessary to add anything further at present:

"The Russian Apricots, as a class—and they do not appear to differ much in variety as far as tested here—seem to rank in hardiness with the Lombard plum. The trees lost several inches of young wood last winter, and also show evidence of injury to the stems. Alexis and Catherine appear to be most promising. They have good foliage and are vigorous growers. The soil and treatment depend somewhat on the stocks upon which these apricots are worked. They are doing well in many places on sandy loam, which tends to hasten maturing of the wood in the autumn.

In advance of more extended tests, it would not be safe to call them "a valuable acquisition." I do not think they will be grown to any extent in peach-growing districts, and it is questionable if they are sufficiently hardy to do well north of the peach line. They bud and graft readily on the myrobolan and American plum (*P. Americana.*) The latter, on account of its hardiness, I consider the most desirable stock. Crown grafts on this have made a growth of from two to three feet since spring, when they were set out."

II.—SMALL FRUITS.

GRAPES.

The importance of grape-growing in the Province of Ontario can hardly be over-estimated. From small stations in the Niagara district there have been shipped the past season, in many instances, as much as four or five hundred tons of this delicious fruit. The season has been a profitable one in the older grape-growing districts. In Eastern Ontario and Quebec however, the reverse has been the case, many varieties failing to ripen owing to the unusually late spring, followed by the cool weather of summer and autumn.

In the Ottawa Valley it has been one of the most unfavourable seasons yet experienced, the wet and cold weather being very productiveof mildew and fungous diseases.

The vineyard of the Experimental Farm was planted in greatest part during the seasons of 1887 and 1888. Annual additions have since been made till, at the present time, there are on trial 165 varieties. The soil in which these are planted is a light sandy loam sloping, with a southern aspect. It has received yearly dressings of wood ashes till last spring, when a coat of barnyard manure was applied. Rains during the blossoming period prevented the thorough fertilization of a few varieties. Soon after the fruit began to develop downy mildew appeared, and would, doubtless, have destroyed the greater part of the crop had not preventive measures been promptly instituted. On its appearance the vines were sprayed with the fungicide known as ammoniacal copper carbonate. This was prepared by dissolving 2 ounces of copper carbonate in a quart of ammonia (20 per cent.), and diluting with water to 25 gallons. By two applications of this fungicide, and care being taken to remove and destroy all affected berries, the spread of this disease was finally checked.

In this section as well as in all portions of Quebec, Eastern and Northern Ontario, it is necessary to lay down the vines and cover with earth after pruning in the fall. I think it would be profitable for growers in districts where vines are not winter killed, but are often weakened by exposure to the vicissitudes of winter, to at least pin the canes to the ground covering with sufficient earth to hold them in this position, as well as to protect the crowns from the frost. A vine, though not actually winter killed, may be so enfeebled by a long and trying exposure, as to make but little growth the following season and mature a lessened quantity of fruit of inferior quality. This priuciple should always be borne in mind.

Part of the vineyard has been planted after what is known as the "French system." This is practically a renewal system, having the vines set four feet apart each way, and trained to stakes. Near cities where land is valuable, and high culture is given, this method can be practised with success. Results here the past season show that varieties grown in this way, were from five to eight days later in ripening, than the same varieties grown eight by ten feet apart, and trained to the trellis on the fan system.

As already stated there are now on trial 165 varieties. Of these 94 fruited last season; many, however, did not ripen. The weather on the whole being so unfavourable, the season can fairly be considered as a test one, in regard to the important points in grape culture—of early ripening and immunity from disease.

The following varieties ripened in the order given, beginning 2nd September and closing 29th September: *Florence*, *Champion*, *Cottage*, *Moore's Early*, *Brant*, *Green Mountain*, *Early Victor*, *Peabody*, *Lady*, *Janesville*, *Delaware*, *Berckman's*, *Gaertner*, *Norwood*, *El Dorado*, *Wilder*, *F. B. Hayes*, *Barry*, *Herbert*, *Worden*, *Lindley*, *Potter*, *Roger's* 36, *Northern Muscadine*, *Mary*, *Vergennes*, *Dracut Amber*. *Marion* was the first to colour, but the summer heat seemed insufficient to ripen it fully. This list contains the most promising varieties for northern growers.

In advance of more extended trial it would not be wise to speak positively as to the merits and desirability of many of the newer sorts.

The following did not ripen thoroughly, but are commended for trial in the more favorable grape growing districts of Ontario:—*Alma*, large white, ripens with

Concord. *Amber*, white, medium size, a few days later than Concord. *August Giant*, large red, late. *Challenge*, red, fair quality, late. *Etta*, white, medium size, season of Diana. *Grein's Golden*, large white, good quality, later than Concord, *Grein's No.* 4, large white, fine quality, later than Concord. *Imperial*, pinkish white, fine quality, season of Isabella. *Oriental*, resembles Catawba. *Roger's No.* 2, very large black, season of Concord. *Roger's No.* 30, red, large, fine quality, later than Concord. *Transparent*, large white, juicy, late. *Wilding*, later than Concord.

Cuttings were taken from those giving evidence of probable future value, which will be planted next spring with a view to testing them in various parts of the Dominion—should such a course be deemed advisable.

STRAWBERRIES.

The winter of 1889–'90, was unusually severe on small fruits, strawberries especially, owing to the repeated freezing and thawing and consequent accumulation of ice in low places, which characterized the winter. On examination after the disappearance of the snow in the spring, it was found that roughly estimated an average loss of 50 per cent. of plants, in the strawberry plantation had been sustained. The relative loss of the different varieties varied widely, as will be hereafter noted, and in this respect the experience of the season is very instructive. The injury, too, appeared to be in proportion to the vigor of the plant when it went into winter quarters as indicated by the number of runners made the preceding autumn. Again, the older plants with weakened vitality, suffered more than the younger plants possessing better roots and greater vigor. This is an important argument in favour of the frequent renewal of strawberry beds. With good cultivation, not more than two full crops should be taken from the same plantation, and many growers advocate a change after each full crop has been picked. This rule, however, is not generally practised outside of specialists in the line.

The following selection based upon the experience of the past season, has been made from those varieties reported on by Mr. Hilborn in Bulletin 5, and have been planted in a new trial plot. The planting was done in August, and will give interesting data as to the relative advantages of fall and spring planting :—

Bubach,
Black Defiance,
Black Giant,
Belmont,
Crescent,
Capt. Jack,
Cohansick,
Crimson Cluster,
Daisy,
Early Canada,
Eureka,
Garibaldi,
Green Prolific,
Gandy,
Haverland,
Hoffman Seedling,
Itasca,
Jersey Queen,
Jas. Vick,
John Little,
King of the North,
Logan,
Manchester,
Mrs. Cleveland,
Miller's Seedling, No. 2,
Miller's Seedling, H. 11,
New Dominion,
Norman,
No. 1001,
Nicanor,
Old Ironclad,
Osceola, (Mitchell's early)
Photo,
Parker Earle,
Prince of Berries,
Pine Apple,
Pearl,
Ruby,
Royal Hautbois,
Sharpless,
Seneca Queen,
Stayman No. 1,
Shirts,
Surprise,
Turner's Beauty,
Woodruff,
Windsor Chief,
Wonderful,
Warfield, No. 2,
Woodhouse.

The following varieties, most of them not yet introduced, were received and planted last August:—

Alabama,	Muskingum,
Beder Wood,	Nunan Charlston,
Bessie,	Parker Earle,
Ivanhoe,	Regina,
Martha,	Viola,
Middlefield,	Woolverton,
Williams,	Yale.

Showing per cent. of injury by the winter to the different varieties:—

Under 10 *per cent.*

New Dominion, Downer's Prolific ,Crystal City, Excelsior, Pearl, Cohansick, War Field No. 2, No. 1001, Haverland.

10 *to* 20 *per cent.*

Grand Duke, Crawford, Miller's Seedling No. 2, John Little, Mrs. Cleveland, Bordelaise, Crimson Cluster, Logan.

20 *to* 30 *per cent.*

Seneca Queen, Nicanor, Legal Tender, Bubach.

30 *to* 40 *per cent.*

Gandy, Hampden, Mammoth.

40 *to* 50 *per cent.*

Crescent, Capt. Jack, Covill, Jessie, Jas. Vick, Amateur, Garretson, Golden Defiance, Windsor Chief, Fairy, Snowflake, Daisy, Itasca, Monmouth.

50 *to* 60 *per cent.*

Old Ironclad, Early Canada, Mount Vernon, Photo, Jewell, Ontario, Royal Hautbois, Ruby, King of the North.

60 *to* 70 *per cent.*

Daniel Boone, Jumbo, Woodruff, Cumberland, Kentucky, Summit, Pine Apple, Bancroft, Champion.

70 *to* 80 *per cent.*

May King, Emerald, Chas. Downing, Norman, Sterling, Belmont, Wilson (selected), Ohio, Shirts, Jersey Queen, Green Prolific, Lida,Eureka, Turner's Beauty, Surprise.

80 *to* 90 *per cent.*

Wilson, Sharpless, Manchester, Mary Fletcher, Mrs. Garfield, Black Giant, Parry, Hoffman's Seedling, Garibaldi, Bright Ida, Henderson, Miller's Seedling H. 11, Moore's Prolific, Black Defiance.

90 *to* 100 *per cent.*

Maggie, Cornelia, Prince of Berries, Atlantic, Sunapee, Triomphe de Gand, Boyden's No. 30, Anna Forest, Montreuil, Connecticut Queen.

Among the older varieties the following are the most reliable for general planting in this locality, given in order of ripening:—*Crescent* (P), *Wilson* (B), *Capt. Jack* (B), *Daniel Boone* (P), *Sharpless* (B), *Manchester* (P) and on heavy soil, *New Dominion* (B).

Of the newer varieties which can be safely recommended for trial in order of ripening are:—*Michel's Early* (B) (*Osceola*), *Haverland* (P), *Miami* (P), *Bubach* (P), *Crawford* (P), *Logan* (B), *Pearl* (B), *Cloud* (P), *Seneca Queen* (B) *Enhance* (B), *Eureka* (P), *Gandy* (B).

The following varieties do not seem worthy of extended cultivation and can be profitably omitted except possibly in such localities as they seem specially adapted:—*Pocahontas, Cohansic, Pine Apple, Surprise, Crimson Cluster, Legal Tender, Bordelaise, Royal Hautbois, Sunapee, Early Canada, Hathaway, No. 5; Bancroft, Cornelia, Ray's Prolific, Prince of Berries and Nicanor.*

SEEDLING STRAWBERRIES.

While with our already extended list of varieties it hardly seems wise to add to it by seedling production, yet as time goes on the standard of excellence will be constantly rising and there will be always room for a berry with well marked characteristics. We cannot expect to find in a single berry all the desirable points of excellence. It is, therefore our aim in this work to develop strong growing varieties having one or more distinguishing qualities, which shall be superlative in these particulars, whether this be in point of earliness, lateness, hardiness, vigor, productiveness, size or quality. This should be the aim of every grower. Our strawberry lists are already crowded with varieties, many of which are almost indistinguishable, and without any prominent characteristics.

Prof. Green, Horticulturist of Ohio Experiment Station, says in a recent bulletin:—"It will be found that varieties which have failed to become favorites, either have no pronounced characteristics, or have been wanting in qualities required to fit them for general cultivation. It is commonly believed that a variety may do well in one locality and yet fail in another, and *vice versa*. There is some truth in this and also much error. It is true that varieties vary more or less on different soils, but it is also true that the most variable sorts are the least valuable. In fact if a variety varies greatly on different soils, it may be set down as unreliable, sooner or later it will fail even where it seems most at home. To believe that because a variety exhibits a defect in one locality it may not in another, is almost always a fatal error. If a variety lacks vigor, is susceptible to disease, is tender when in bloom, or is unproductive, there is no ground for hope that even under favourable conditions it will become generally popular, and remain so. Some such have been favorites in certain localities for a time, but sooner or later have been discarded. To hope to find varieties suited to certain sections only is a delusion. The only varieties that stand the test in particular sections are those that succeed over wide areas."

Out of 650 seedlings fruited the past season 40 were selected and replanted for further trial. The seed from which these plants were grown was selected from vigorous individuals exhibiting marked characteristics in one or more particulars, such as earliness or lateness, firmness and fine quality. Others were grown from the earliest berries of the season's crop and still others from the latest, of the same variety. It cannot be said that there was a corresponding general or marked disposition on the part of the offspring of either of these classes to imitate the peculiarities of their parents, although in a few cases the variations were striking. All such were carefully preserved, for the purpose of carrying on the work of selection. Many were of good size and fine quality but some lacked firmness, or were defective in foliage.

RASPBERRIES.

Comparatively few varieties came through the winter entirely uninjured, and all the tender sorts suffered more or less severely. With a view to test the advantage as well as cost of protecting during winter by laying down and covering with sufficient earth to hold them in position, half of the plants of each variety were pruned and treated in this manner. The remaining half were unpruned and allowed to stand without further protection. The relative returns from the two sections will be carefully noted next year. For convenience raspberries may be readily divided

into two classes according to their methods of propagation. 1st, Upright varieties, increasing by suckers from the roots. This includes mainly our red and yellow sorts. 2nd. Drooping canes, rooting from the tips, commonly called "tip varieties." These with one or two exceptions are all black or purple in colour. Of the first class considering the red ones only; 21 varieties fruited the past season.

The following are the most reliable, for market purposes, of the older kinds in order of ripening: *Hansel, Turner, Marlboro, Cuthbert.* For home use, with winter protection and good culture, the following is a desirable list: *Turner, Herstine, Clark, Cuthbert.*

Among the yellow caps, *Brinckle's Orange* is unsurpassed in quality, but is not a profitable market berry and needs protection, except in the milder portions of the country.

Golden Queen. A beautiful yellow berry, is earlier than Cuthbert; like it a strong grower, equal to it in quality and a good bearer. This should be a profitable market berry, and is also well adapted for home use.

Among the later introductions, the following seem specially worthy of mention:—

Herstine. Large, bright red, quality good, rather soft, productive, season late, needs winter protection.

Heebner. Large, dark red, high flavoured; has the same fault as the last, lacking firmness, a good bearer, fairly vigorous, might be valuable for near market.

Thompson's Early Prolific.—Ripened with Hansel last season. The fruit is larger and finer and gives promise of a longer picking season. Plant fairly vigorous and productive.

Royal Church.—This has not been sufficiently tested here to speak positively, but from past behaviour it would seem to be a promising medium early variety, of good size and quality, but not firm enough for distant shipment.

CLASS II—TIP VARIETIES.

Few additions have been made to the general list of black caps, most of which are under cultivation for a number of years. From the twenty varieties which fruited last year the following are noted as the most reliable:

Souhegan, Tyler and *Doolittle* are practically identical, and are the earliest to ripen. One of these should be included in each planter's list, to connect the strawberry and raspberry season.

Hilborn.—A medium early sort, of good quality and a heavy bearer. This is an excellent berry for near market, but is specially valuable for amateur growers; it is also valued for canning.

Shaffer.—Sometimes known as Shaffer's Colossal. Is a fine strong grower, an immense bearer of large purple berries, which are rich and juicy, putting it at the head of the list as a canning berry. Its dull colour and lack of firmness prevent it taking a high place as a market variety, but where well known it is highly appreciated.

Gregg.—Completes the season. It is also vigorous, productive, and ships well. It does not, however, rank as high in quality as Hilborn, but is indispensable in the list of the market gardener.

Among those not fully tested here may be mentioned *Palmer.* If it succeeds, according to present indications, it will supersede Tyler or Sonhegan, which is its season of ripening.

Muskingum.—Is of the Shaffer type, but does not seem to be any improvement; perhaps a trifle firmer. With present experience positive statements cannot be made.

Earhart.—Will be of value in the milder portions of Ontario where the season will admit of a second crop, which, under favourable conditions, is usually borne before growth is checked by frost.

Attention is called to the report (inserted at the close of mine) of a visiting committee on a collection of seedling raspberries, black and red—as the notes have been made by experienced growers of small fruit.

BLACKBERRIES.

The cultivation of the blackberry in Canada has not received the attention which the quality and excellence of this fruit demands. Again the varieties which were first introduced, from lack of hardiness and without winter protection have not succeeded outside of peach-growing districts. This, coupled with the great abundance in some districts of the native species (*Rubus Canadensis*) has hindered the introduction and cultivation of varieties of more recent origin and greater hardiness. They should be planted in deep, rich soil, and liberally mulched in dry seasons; with a careful selection of varieties and good cultivation, paying crops will be obtained. In the colder fruit-growing districts the practice of laying down the canes in the fall is generally adopted with profitable results. The canes should be pinched back occasionally during the growing season to induce a stocky growth and aid the process of ripening the wood.

Of the 20 sorts on trial—unprotected last winter—the following were badly injured: *Gainor, Tecumseh, Bonanza, Early Cluster, Wilson, Jr., Early Harvest, Crystal White*, Kittatiny.

The following suffered, but in a less degree than the last named:—*Dorchester, Taylor's Prolific, Wachusett, Wilson's Early, Minnewaski, Erie, Lucretia Dewberry.*

The following came through with slight injury: *Snyder, Agawam, Stone's Hardy, Western Triumph.*

For the colder sections this last selection will be generally found most reliable, ripening in the order named. It is difficult to give a list of the hardier varieties covering the whole season, as these nearly all ripen early. Agawam and Snyder, are close competitors in point of earliness, hardiness and productiveness, but the former has the advantage of greater size and better quality. A good succession for the milder districts is *Early Harvest, Agawam, Wilson, Minnewaski.*

The *Lucretia Dewberry*, a trailing form of the blackberry. has not been productive on light soil, nor has it sustained its reputation for hardiness. From present experience it cannot be recommended for other than garden culture.

CURRANTS.

Twenty-two varieties are on trial, made up of black, red and white sorts. The season was a favorable one, and a fair crop was gathered from all varieties, although they have not been planted long enough to give full returns yet.

The currant worm (*Nematus ventricosus*) was very troublesome, three broods appearing. The first was treated effectually with Paris green, the second and third when the fruit was larger were destroyed with white hellebore. This was applied very quickly with the ordinary orchard barrel pump. As a rule the grower does not apply the insecticide soon enough to save the foliage, and growers forget, too, that defoliation this year means a short crop next; hence the importance of prompt action as soon as the presence of the larvæ is detected.

Nearly all varieties of the Red and White Currant suffered from loss of foliage in August, probably due to fungous troubles: *White Dutch, Victoria, Raby Castle* and *Prince Albert* were partially free from injury of this kind.

The following of the red varieties have been most satisfactory in point of vigor and productiveness, and ripen in the order given, though there is very little difference between the earliest and latest:—*Victoria, Fay, Red Dutch, Versaillaise, Prince Albert.* Among the newer introductions, *Wilder*, and *Moore's Ruby*, seem promising. The former is large and of good quality; the latter is of good quality, but somewhat lacking in vigor.

There has been practically no change in the list of White Currants, *White Grape* being rather larger and more productive than *White Dutch* which is better suited for market purposes. *White Dutch* is the richest and finest flavored of all the currants.

BLACK CURRANTS.

Lee, though rather small in bunch, was most satisfactory of those tried this season. It is also the earliest to ripen.

There appears to be little difference between *Black Naples* and *Champion*. *Prince of Wales*, a later introduction, seems worthy of extended trial, though its foliage has been somewhat defective.

Black English resembles Black Naples in habit of growth, quality and size of fruit, but is later.

Crandall is a variation of the Missouri flowering currant (*Ribes aureum*) which has been extensively advertised and disseminated. Its strong points seem to be vigor of plant and productiveness; its weak points, unevenness in size and time of ripening of fruit, and poor quality. As a crossing stock, it will probably be of value.

SEEDLING CURRANTS.

The large collection of seedlings brought here by Prof. Saunders from London, made a fine show of fruit and attracted much attention while in bearing. There are about 150 seedlings in the collection. A selection of 25 of the most promising was made, based upon the notes collected by Mr. Hilborn, supplemented by the experience of last year. Cuttings were taken from those specially noted, and were set out early in August. They were well rooted before cold weather, and will make suitable plants for starting trial plantations on the branch Farms next spring. It may be added that some of these thought well of by Mr. Hilborn were propagated last year, and have already been distributed.

GOOSEBERRIES.

Owing to the first planting of gooseberries having to be removed from their original location, on account of unsuitable soil, sufficient time has not elapsed since in which to arrive at any definite opinions regarding the value of the different varieties in this section. Last season was a favorable one, all varieties making a fair growth, though very little fruit was borne. As noted previously the currant worm was specially active; this fruit receiving the same attention with Paris green and white hellebore very little injury was sustained.

A large number of the European varieties are on trial, but owing to unsuitable soil, unfavorable seasons and their natural tendency to be affected with leaf mildew, they have not yet given evidence of future usefulness. They will hardly prove useful except in favored locations, and with special treatment.

Among the newer varieties which have fruited here and elsewhere are *Pearl*, a seedling originated by Prof. Saunders, specially to be commended as an immense bearer and comparatively free from mildew. *Smith's Improved*, with high culture and careful pruning, will be generally satisfactory; it bears well, the fruit is large and of good quality.

III.—VEGETABLES.

The constantly and rapidly increasing number of varieties in all classes of vegetables, including many worthless new ones and many old ones re-named, renders the task of making a satisfactory selection for home use quite a formidable one. Very often a satisfactory selection is not arrived at till after considerable expenditure of time and money has taken place in testing the many "best" kinds.

It will be a feature of the work of this branch to make each year in certain lines such tests of varieties (1) as will tend to eliminate duplicates; (2) give experience upon which to recommend those sorts which have succeeded best here; (3) adding such hints on the methods of cultivation as will be deemed useful to the gardening public It is beyond all question true that farmers, as a rule, do not grow in sufficient quantity and variety these healthful products.

On account of press of other work consequent upon the inaugural duties of a new position, the experiments with vegetables were not as full and complete as I hope they will be in future.

The soil in which the following varieties were grown was not the ideal soil in the market gardener's opinion, being a light sandy loam, thought by many to be of too light a character to give good results in testing vegetables. A moderate dressing of barn-yard manure ploughed in, and a subsequent top dressing of ashes, gave most satisfactory results with all the vegetables on trial.

CABBAGE.

Of this vegetable there were fifty varieties on trial last season. As the test was a comparative, one the seed of all the varieties was sown in boxes in the propagating house on the same date, 14th March; after being twice transplanted they were set out 19th May. Observations were made on the following points, besides records of seed-sowing, appearance above ground, transplanting, and setting out, viz.: Date of heading: lighest head (in lbs.); heaviest head; average weight of head; number of immatured heads; also notes on form and solidity.

The subjoined tabulated statement gives the period of heading, and average weight of those varieties, which have been most satisfactory last season. Set out 19th May.

Variety.	Heading July.	Heading August.	Average Weight.		Remarks.
Very Early.			Lbs.	Ozs.	
Early Jersey Wakefield	20	.....	2	14	The standard early sort.
Express	22	.....	3	2	Is usually earlier than Wakefield.
Large Jersey Wakefield	22	.....	3	13	An improvement on E. J. Wakefield.
Early French Oxheart	22	.....	4	5	One of the best old varieties.
Early Dwarf York	22	.....	2	9	Heads small; firm, sure header.
Early York	29	.....	3	4	Heads evenly and well.
Medium Early.					
Chases Excelsior	29	.....	8	8	Good sized solid, flat heads.
Early Summer	.....	1	7	12	Good market variety.
Early Sugar-loaf	.....	1	6	2	Tall-growing, conical.
Fottler's Improved Brunswick	.....	1	8	14	Large, flat; good market variety.
Filderkraut	.....	8	8	0	Tall, pyramidal, solid.
Cannon Ball	.....	12	8	10	Sure header; round, good variety.
Market Gardeners	.....	12	8	8	Large, firm; bursts soon after maturing.
Succession	.....	14	7	10	A new variety; not well selected.
P. W. & Co. Excl. Flat Dutch	.....	14	12	0	One of the best market sorts.
Marble Head Drumhead	.....	14	10	9	Rots when planted early.
Late Varieties.					
Luxemburg	.....	18	6	7	One of the best late varieties.
Large Early Schweinfurt	.....	22	14	7	Uniformly large, firm, market.
Bridgeport Drumhead	.....	25	7	6	Much resembles next one.
Sel. Large Flat Dutch	.....	26	8	10	One of the standards.
Quintal Drumhead	.....	26	6	11	Head flat, rather soft.
Premium Flat Dutch	.....	28	5	12	A selected strain of the old flat Dutch.

The following varieties will make a satisfactory succession for home use:—

Early: Express, Large Jersey Wakefield. *Medium Early:* Fottler's Improved Brunswick, Cannon Ball. *Late:* Large Early Schweinfurt, Select Large Flat Dutch.

It is not thought advisable at this time, to give a list for market gardening purposes, though it might not differ materially from the above.

CELERY.

It is a matter of regret that this wholesome vegetable is not more generally cultivated by farmers. Indeed, it is difficult in many districts in the Province of Quebec to find it in gardens, except in or near the larger towns. The fact of the seed germinating slowly, and the extended period of time between seed-sowing and setting out the plants, probably deters many from growing it—causing them to look upon it as a lengthy operation. The usefulness of the product, however, far outweighs any trouble incurred in raising it. Sow the seed early, in rich ground. Set out in July, choosing moist, rich soil (trenching is not necessary). Bank up part of those set out for early use about middle of September, being careful that the soil is kept from between the leaves: the remainder towards the end of the month.

The following selection of the thirty varieties tested the past season were most satisfactory. Field notes are appended:—

Paris Golden Yellow (Steele Bros.)—A dwarf variety, though resembling Golden Self-Blanching was earlier. Heart large for an early sort; very crisp and fine flavored.

White Walnut (Henderson.)—One of the larger-growing kinds; medium early; crisp; very fine flavour. A good market variety.

Half Dwarf (Henderson.)—Was fit for table soon after White Walnut. Large hearts; blanches well; crisp; good flavour. As a medium early variety it was not excelled.

White Plume.—Introduced by the late Peter Henderson in 1884. It has become exceedingly popular, and is now more widely grown than any other variety. It is advocated occasionally by seedsmen that with this as well as other partial self-blanching kinds earthing up is unnecessary; but the improvement in quality will always repay the grower for the extra labour.

Sandringham.—Was one of the most satisfactory among the later kinds. It should be profitable for market. The Dwarf variety of this does not seem to be as yet well selected.

Giant Golden Heart (Vaughan.)—Very large; late, but somewhat lacking in flavor.

Red Giant Solid.—Probably the best red celery for market purposes; flavour good; a little inclined to be stringy.

CORN—SWEET.

Like other plants of this class the early-ripening varieties of corn were much retarded by the cool weather of late spring and early summer. Thirty-three sorts were tested, planted 26th May in small plots containing twenty-four hills of each kind. Notes were taken on the following points, viz.:—Date of planting; time of blossoming; ready for table; size of ear; productiveness; smuttiness; height of stalk; when ripe.

Early Varieties.

Northern Pedigree (Steele Bros.)—Planted 26th May; ready for table use 10th August, 75 days from planting; sweet; ear medium to small; well filled; eight-rowed; a dwarf variety, about 4 feet high; productive, and free from smut.

Mitchell's Extra Early (Pearce).—As grown here, a small white ten-rowed flint; quite sweet, and pleasant in flavor; cob small; planted 26th May; ready for table 11th August.

Burbank's Early Maine (Vaughan).—An eight-rowed sweet corn, with roundish kernel; very small cob; ready for table 10th August.

Early Cory and *Early Adams.*—Old and well tried sorts; were ready for pulling 14th August. Where one is grown the other may be omitted.

Second Early.

Among these may be mentioned—

Early Minnesota.—Ear medium in size; usually well filled; ready for table 24th August; sweet; good flavor.

Perry's Hybrid (Henderson).—Ear medium to large; with us twelve-rowed; well filled; large, sweet kernel; grows to a height of 6 feet; fit for use 24th August.

Late Varieties.

Roslyn Hybrid (Henderson).—Ear large; well filled; in flavor one of the best tall-growing and productive; ready for use 1st September.

Evergreen (Livingston.)—Sweet; ear large; well filled; one of the most productive sorts tried here; table 4th September.

Stowell's Evergreen (Henderson).—Sweet, medium to large; one of the standard sorts of the West, probably one of the best for late market. Ready for use 10th September.

Black Mexican.—Another old and generally satisfactory variety; ear medium; always well filled; sweet; good.

Mammoth Sugar.—For very late use; this has some value, but the ears and kernels are generally not well filled.

LETTUCE.

The collection of this vegetable consisted of forty-four kinds. It was intended to make a comparative test of varieties; also to compare the effect of transplanting and sowing, as shown by the size and duration of the heads. To determine these points two sowings of each kind were made on the 2nd of May. Lot No. 1 was sown in a cold frame, and when of proper size, 18 plants were transplanted to the field plots. Those of lot No. 2 were sown directly in drills, where they were to remain without further removal, after being thinned out. The experiment promised interesting results, but was invalidated by the persistent attacks of cut-worms, chiefly on those sown in drills.

The main points noted were date of maturity; size of head; quality; length of period of maturity—in other words, the period during which the variety was fit for table use before the seed stalks appeared. No experiments were made in forcing lettuce, so that the remarks following on the varieties apply particularly to out door culture:—

Early Curled Simpson (Henderson).—This was very satisfactory in regard to size of head and quality; retained its crispness well; early.

Tomhannock (Vaughan).—Was ready for use a few days after the above; equally satisfactory in other respects.

Toronto Gem (Steele Bros.)—Follows the last very closely in time of maturing. Fair size; crisp; and remarkably free from bitterness.

New York (Henderson).—One of the very largest summer varieties of the solid heading kind; good flavor, remaining a long time in condition for table use.

The *Cos Lettuce* is quite a striking variation from the ordinary form, heads elongated, conical and large; often completely blanched. This is a favourite among European gardeners, but it is said to have a tendency to run to seed.

Paris White Cos—Showed no greater inclination to run to seed than varieties of the common form; very strong grower. To obtain the best results the outer leaves should be drawn in and the whole tied up to ensure blanching.

Among others which showed many points of excellence may be mentioned *Black-seeded Simpson, Boston Curled, Oak-leaved* and *Deacon.*

PEAS.

In the test of peas, was included 56 varieties. They were planted on the 2nd of May in double rows, 3 inches apart and 32 feet long. They germinated evenly; in no case was there observed a difference of more than two days; neither trellises nor

stakes were used, which probably had the effect of diminishing the yield of the taller growing varieties. Careful record was taken of the time of blooming, podding; first picking; last picking; total yield; character; quality of peas and height of vine. These tests will be repeated next year as with other vegetables tested, when it is hoped more complete and accurate information can be published. With the experience of the season, the following are among the most reliable :—

Early.

Laxton's Earliest of All (Vaughan).—Half dwarf; smooth; about 2 feet in height, bearing short, thick pods, well filled; gave the highest yield of the very early kinds; picked 30th June.

Carter's Lightning (Pearce).—Same season as above; half dwarf; is not a heavy bearer, but gives nearly the whole crop at one picking.

Dan'l O'Rourke (Henderson).—Tall-growing; 36 inches and over; one of the earliest of this class; picked 1st July.

Philadelphia Extra Early.—Tall-growing; 36 inches; smooth. This may be omitted when the last is in cultivation.

Alaska (Pearce).—An old variety, too well and favourably known to need comment; very productive.

American Wonder (Henderson).—One of the best dwarf early-wrinkled sorts; unequalled in its class for home use; pods very large; not very productive; picked 3rd July.

First of All (Henderson).—Half dwarf; smooth; gave the largest yield of any of the early varieties on trial the past season; picking beginning 4th July; pods medium size; well filled.

Second Early.

Those giving most satisfactory results of this season were *Market Garden*, *Stratagem*, *Advancer* and *Blue Mohawk*.

Among *late* varieties may be mentioned *American Champion*, very tall-growing and productive; *Sanders' Marrow*, and *Hairs Dwarf Mammoth*.

RADISHES.

The great number of varieties of this vegetable now offered by the trade is quite puzzling to the amateur grower when selecting his supply of seed for spring planting. Again, the number of duplicates add to the confusion.

The value of a radish very largely depends: 1. On its earliness; 2. Its quality, as denoted by juice, crispness, and freedom from pungency; and 3. The length of time it retains this pleasant crispness.

Forty-four varieties were tested last season, particular attention being given to the points above noted.

The presence in great numbers of what is known as the radish maggot, was no doubt due in a large measure to a heavy coat of manure with which the soil was treated, and which was ploughed under previous to sowing.

Early Varieties.

Sutton's Rosy Gem (Pearce & Co.)—As noted by Mr. Hilborn in the report of last year, this was again the best early turnip shaped radish of its class, and remained in eating condition longer than any of the early varieties. Owing to the unfavourable weather for rapid growth in spring, vegetables of all kinds were much slower in maturing than is the case generally. This radish was ready for the table 38 days after sowing the seed and 4 days ahead of any other variety.

Early Fireball (Livingston).—A little later than the above, round; firm, crisp and tender.

Long Scarlet Short Top (Vaughan).—Proved to be one of the most satisfactory varieties of this class; ready for table in 43 days from sowing seed.

French Breakfast (Henderson).—One of the oldest, and still one of the best for forcing or early gardens; oblong scarlet; meduim in size, with white tips; flesh mild, white and firm.

Red Rocket (Henderson).—Olive-shaped, scarlet; with small root; firm and mild, but soon becomes spongy. One of the best for forcing.

Late Varieties.

Long White Winter (Vaughan).—Large, crisp, juicy; one of the best white.

Long White Vienna, or Lady Finger (Pearce).—A summer radish, vigorous grower; roots long; flesh pure white; crisp; firm, but is liable soon to become tough and pungent.

Rose China (Pearce).—Skin pinkish; flesh white; is probably the best winter variety.

Long Black Spanish.—An old and well tried sort; still gives good satisfaction.

Among other varieties which appear to possess desirable qualities, the following may be mentioned: *Wood's Early Frame, Olive-shape Scarlet, Early White Turnip* and *Long Purple.*

TOMATOES.

There is a common impression existing in the minds of many truck gardeners that to get the best results tomatoes should be planted in poor soil. This may be partially true where earliness alone is desired. Numerous carefully conducted experiments, notably those on the Experimental grounds of Cornell University, clearly disprove the fallacy of the above as a general statement. In summing up conclusions at the close of the season, Prof. Bailey says: "Liberal and even heavy manuring during the present season gave great increase in yield over no fertilizing, although the common notion is to the contrary. Heavy manuring does not appear, therefore, to produce vine at the expense of fruit."

Among the important points to be remembered in successful tomato culture, the following are noted: 1. Select seed from the best fruits of the most vigorous plants; 2. Sow early, eight to ten weeks before planting; 3. "Handle" frequently —transplant two or three times before setting out—by which means strong, stocky plants are obtained; 4. Transplant to the open as early as possible, into warm, rich well drained soil.

A test of forty varieties has been made here during the past season, and it is intended that the work shall be carried on each year, especially those lines bearing on the selection and production of new varieties. Notes on varieties on trial this year have been made on the date of blossoming; first ripe fruit; quality and character of fruit; and average yield per plant in pounds.

The following varieties, from experience of the past season, appear to be the most profitable for general cultivation, given in order of ripening:—

Chemin Market.—A new variety, introduced by Vaughan, of Chicago. Medium sized; round; somewhat cornered and elongated; deep red; cells well filled; and walls thick; a good shipper; one of the best early sorts

Ingnotum.—Originated with Prof. Bailey at the Michigan Experimental Station. Large; round; regular; bright red, with a large solid core; one of the best table varieties, though it has not kept as well after picking as some other kinds.

Favorite (Livingston).—One of the oldest, most generally cultivated and one of the best. Coming in early, it continues fruiting for a long season; a good market variety.

Potato Leaf.—Of the same type as Mikado and Table Queen. Large; smooth; somewhat irregular; dull pink in colour; very solid, consequently a good shipper; very productive.

Mikado.—Introduced by Henderson, of New York, in 1886. Has rapidly come to the front as a market variety. Large to very large; smooth and almost regular; purplish pink; the color somewhat detracts from its appearance; very desirable.

Optimus (Henderson).—Medium in size; smooth; regular; dark red; productive; a good late variety.

Golden Queen (Livingston).—This, as its name indicates, is yellow, and very attractive. Large, even, and regular in form; very productive. This gave the best results among the yellow varieties tested.

Many of the newer varieties give evidence of possessing points of merit which will place them on a par with most of those named above, but in advance of further tests, and considering that the present list is a very satisfactory one, descriptions are in the meantime withheld.

IV.—FORESTRY—FREE DISTRIBUTION.

The importance of this branch of horticulture is becoming more appreciated each year by the settlers of Manitoba and the North-West. This is being emphasized in a striking manner in those localities in which fruit-growing has been attempted, no matter on how limited a scale the beginning may be. The first requirement in the prairie region of the North-West is a shelter belt, whether a small fruit or vegetable garden is desired. It is the settler only, who can fully appreciate the benefit of wind-breaks for the protection of his home and his stock yards.

With a view to encourage tree planting on the plains, and gain information in regard to the adaptability of different varieties of forest trees to the requirements of the North-West, under direction of the Honourable Minister of Agriculture a distribution of 100,000 seedling forest trees from 10 to 15 inches in height, was made through the mails. During April of last year 1,000 packages, containing 100 seedlings each, made up in varying numbers of 17 varieties, were sent to applicants who had received notification of the intended distribution through their local journals. About 1,600 applications were received in excess of the number provided for, showing that to this line of experiment was accorded the hearty approval of the settlers of Manitoba and the North-West.

In sending out these trees due care has been taken to distribute them over as wide an area as possible, so that no part of the North-West might be overlooked.

In Manitoba 98 post offices received 591 packages of trees; North-West Territories, 92 post offices received 389 packages of trees. Total—190 post offices; 980 packages sent out.

A few varieties running out towards the end of the distribution, the remaining parcels were completed with small fruits, and are noted in that connection.

The following list gives the names of varieties and the number of each sent out, and was adhered to as closely as practicable, but in a few cases changes were necessarily made:—

10	White ash.	5	Russian mulberry.
10	Green ash.	5	Cottonwood.
25	Box elder.	3	Linden.
5	Soft maple.	1	Black wild cherry.
2	Hard maple.	1	Ky. coffee tree.
20	White elm.	1	Red cedar.
2	Honey locust.	1	Russian olive.
5	Black walnut.	2	Butternut.
2	Black locust.		

To each variety was attached a wooden label, with the name plainly printed upon it. The packing was done in a careful and expeditious manner, using sphagnum moss to preserve the necessary moisture, and covering with two sheets of paper—one oiled and the other the common manilla wrapping material. The trees arrived in good condition, though many were on the road from ten to fourteen days. Two parcels were returned after an absence of seven weeks, the parties to whom they were addressed having removed. These trees were then placed in the most favourable condition for

growth, with the object of finding out how many still lived after such hard usage. In one instance 53 per cent. recovered and made some growth; in the other 58 per cent. gave evidence of life, by throwing out new shoots and rootlets.

With each consignment the following circular of instructions was mailed:

DOMINION OF CANADA,
DEPARTMENT OF AGRICULTURE,
CENTRAL EXPERIMENTAL FARM,
OTTAWA, April, 1890.

DEAR SIR,—A package containing one hundred *forest tree seedlings* has been mailed to you this day, and your attention is specially called to the following instructions:—

When the trees are received, unpack at once and wet the roots. If unable to plant immediately, store them in a cool cellar, or heel them in out of doors, covering them completely with moist earth. *Situation.*—When selecting a site for planting, if possible choose a loamy and friable soil on a northern slope. A piece that has been summer-fallowed is preferable. Avoid southern exposures, as trees in such situations are liable to be injured by alternate freezing and thawing in the spring and by the hot winds in summer. *Preparation of soil.*—Work the ground from 12 to 15 inches deep and pulverise thoroughly; mark out rows 4 feet apart, running north and south. *Planting.*—Cut back to the living wood any tops that may be withered or otherwise injured. Do not expose the roots to the sun or wind for a minute, as the tender seedlings are quickly injured by such exposure. A good plan is to carry the seedlings to the field in a pail of water, from which they are planted. Set deep, 4 feet apart each way, putting the *box elders* and *cottonwoods* in the outside rows. If the soil is dry, pour water in the holes when half filled. Press the earth firmly about the roots in all cases, and leave the tree in a slight basin, with the top soil loosely laid on; it shoul d be kept in this loosecondition by frequent stirrings during the growing season. Where practicable plant corn in the interspaces of the north and south rows, and leave the stalks standing over winter. The corn will serve as a summer shade and assist in collecting snow through the winter. Cultivate at least once a week during the growing season; afterwards, sufficiently often to keep the weeds down. This treatment should be continued annually until the trees are large enough to shade the ground. Mulch heavily each year in the fall with straw, manure or prairie hay, which is removed in spring when cultivation begins.

You will be expected to take such notes during the growing period as will unable you to make a report at the close of the season on the behaviour of each variety, giving soil and exposure. Reports will be expected, whether favourable or unfavourable.

Yours truly,
JOHN CRAIG,
Horticulturist.

WM. SAUNDERS, *Director.*

This line of experimental work has been so well received and has met with such hearty support from those most concerned, that instructions have been given by the Minister of Agriculture to make another distribution next spring, sending out double the number distributed last year, and making such changes in regard to varieties as experience may warrant.

The work of testing larger sized forest trees on the North-Western plains was also continued. There was sent to twenty-five of the experimental gardens belonging to Canadian Pacific Railway a bundle of 125 trees of the hardiest sorts from 4 to 6 feet in height. These were distributed along the line from Moose Jaw to the Rocky Mountains. Among the Indian agencies there were also distributed about 3,000

trees of the same sizes and varieties. The following are the agencies to which trees were sent:—

Assiniboine,	Battleford,
Battle River,	Birtle,
Blackfoot,	Blood Reservation,
Piegan,	Crooked Lakes,
Edmonton,	Fort Pelly,
File Hills,	Moose Mountain,
Muscowpetung Reservation,	Onion Lake,
Touchwood Hills,	Sarcee Reservation,
Stony Reservation,	Saddle Lake,
Duck Lake,	Carlton.

By request of Fred. White, Esq., Comptroller of the North-West Mounted Police, about 3,500 trees of the same size as those sent to the Indian agencies and Canadian Pacific Railway gardens were distributed to the officers commanding at the following posts: Regina, Maple Creek, Medicine Hat, Lethbridge, Macleod, Calgary, Fort Saskatchewan, Battleford and Prince Albert. The results, showing the relative success of these trees as compared with seedlings raised *in the districts surrounding the above named places*, and those planted as yearlings cannot fail to prove instructive and useful. The subjoined list gives the varieties used in this distribution.

Deciduous Trees.

White ash.	Fraxinus viridis.
Green ash.	Fraxinus Americana.
European white ash.	Fraxinus excelsior.
American elm.	Ulmus Americana.
White birch.	Betula alba.
Canoe birch.	Betula papyracea.
American mountain ash.	Pyrus Americana.
European mountain ash.	Pyrus aucuparia.
Norway maple.	Acer platanoides.
Soft maple.	Acer dasycarpum.
Butternut.	Juglans cinerea.
Wild black cherry.	Prunus serotina.
European alder.	Alnus glutinosa.
European linden.	Tilia Europea.
Russian mulberry.	Morus hybrida.
European larch.	Larix Europea.

Shrubs.

Barberry.	Berbris vulgaris.
Artemesia.	Artemesia abrotans var?
Spiræa.	Spiraæ opulifolia.

Evergreen Trees.

Norway spruce.	Abies excelsa.
White spruce.	Abies alba.
Scotch pine.	Pinus sylvestris.
Austrian pine.	Pinus austriaca.
White pine.	Pinus strobus.
Arbor vitæ.	Thuja occidentalis.

DISTRIBUTION OF TREE SEEDS.

Considerable quantities of native tree seeds have been collected by the superintendents of the Brandon and Indian Head Farms, Messrs. Bedford and MacKay.

These seeds were forwarded to the Central Experimental Farm as early as practicable last fall, to be distributed from there in small sacks to Manitoba and North-West farmers, as a means of arriving at the relative advantages of growing trees from seed where wanted, and planting seedlings grown elsewhere. Experimental work in forestry at the above Branch Farms has already demonstrated the advisability of beginning with the hardiest native trees, and when with these shelter has been obtained the work will progress more satisfactorily.

The greater propotion of the seed arrived too late for the report of the distribution to be given this year. A part of the seed was sent out through the mails in small cotton bags. The Burr oak, and Black cherry were put up in packets containing about 400 seeds of each. The ash were sent out in sacks holding about 5,000 seeds. The seeds of the cherry being small were enclosed with those of the ash.

The distribution up to 1st January, 1891, was as follows:—

Species.	No. of Packages. Man.	N. W. T.
Manitoba burr oak (Quercus macrocarpa)	60	85
do Green ash (Fraxinus viridis)	219	201
do Black cherry (Prunus demissa) ?	219	201

The subjoined circulars of instructions were mailed to each recipient of the tree seeds:—

DOMINION OF CANADA,
CENTRAL EXPERIMENTAL FARM,
OTTAWA, December, 1890.

DEAR SIR,—A small sack, containing seeds of Manitoba burr oak (*Quercus macrocarpa*) has been mailed to your address this day.

Mix the acorns with damp sand and store in a cool cellar during the winter, being careful to guard from mice and rats. Sow after danger of heavy spring frosts is over, in well-drained mellow loam, sheltered if possible from strong sunshine and prevalent winds. Sow 2 inches apart, in drills which may be run 15 to 20 inches from each other. Cover to a depth of 2 inches, firmly pressing the soil over the seed. Keep the surface loose and free from weeds during the growing season. Protect the seedlings the first winter with a mulch of straw or hay. They may be allowed to remain in the seed bed 2 years, or they may be transplanted as yearlings to premanent positions.

Yours truly,
JOHN CRAIG,
Horticulturist.

WILLIAM SAUNDERS, *Director.*

DOMINION OF CANADA,
CENTRAL EXPERIMENTAL FARM,
OTTAWA, December, 1890.

DEAR SIR,—A small sack containing seeds of *Manitoba black cherry* and *ash* has been mailed to your address this day.

Mix the the seeds of each with damp sand or soil, and store in a cool cellar during winter, being careful to guard from mice and rats. Sow after danger of heavy spring frosts is over, in well-drained, mellow loam; shelter if possible from strong sunshine and prevalent winds. Sow 1 to 2 inches apart in drills, which may be run from 15 to 20 inches apart. Cover the cherry-pits to a depth of 1½ inches. The ash seed should have a covering of from ¾ to 1 inch. Press the soil firmly over the seed in both cases. Keep the surface loose and free from weeds during the growing season. Protect the seedlings the first winter with a mulch of straw or

hay. They may be allowed to remain in the seed-bed two years, or they may be transplanted as yearlings to permanent positions.

Yours truly,

JOHN CRAIG,
Horticulturist.

WILLIAM SAUNDERS, *Director.*

A quantity of the seed of each variety received, was either planted last fall or is in course of preparation for planting next spring on the Central Farm. The seedlings raised will be available for future tests here and elsewhere.

EVERGREEN SEEDLINGS.

The year has been a very favourable one for transplanting these plants—so sensitive when young to change of position and strong sunshine. About 130,000 two year seedling Riga pines were removed from the shaded seed beds and re-set in nursery rows, also several thousands each of Scotch pine, Norway spruce and a smaller number of Austrian pine, White pine, Arbor vitæ, Blue spruce and Douglas spruce. By setting in rows 15 inches apart and stirring the soil frequently with a Planet Junior cultivator very slight losses were sustained. These seedlings will be of suitable size, and available for distributing after another year.

The beds from which these seedlings were removed, were immediately re-sown with the following varieties, the seed having been obtained from the north-western Rocky Mountain region, with the exception of Pinus cembra, received from B. E. Fernow, Esq., Chief of the Forestry Division, Department of Agriculture, Washington, D.C.

Douglas fir.	Pseudotsuga Douglasii.
White fir.	Abies concolor.
Colorado blue spruce.	Picea pungens.
Bull or yellow pine.	Pinus ponderosa.
Stone pine.	Pinus cembra.

Douglas fir, White fir, and Colorado blue spruce germinated rapidly and well. Bull pine germinated more slowly and irregularly, but on the whole made satisfactory growth. The seeds of Stone pine have not yet germinated, probably due to the fact that they were not planted the same year as collected. Some difficulty was experienced and loss sustained from what is known to nursery men and florists as the "damping off" of the young plants. No specific remedy has yet been discovered against this malady. It seems to be encouraged by excessive moisture or by sudden dryness. The best results in growing evergreen seedlings are generally attained by keeping a partial shade and preserving a moderate but *even* degree of moisture

DISTRIBUTION OF FRUITS.

In reponse to a large number of requests by farmers in districts remote from fruit-growers, a number of packages were put up, containing as a rule, the following varieties—though in some cases it was found necessary to substitute other sorts, and sometimes vary the number of plants sent:

1 Apple tree, either Duchess or Whitney crab.
1 Cherry tree, either Vladimir or Bessarabian.
2 White grape currants.
2 Red Dutch currants.
2 Houghton gooseberry.
2 Shaffer raspberry.

2 Mammoth Cluster raspberry.		Black.
2 Gregg	do	
2 Hansell	do	Red.
2 Turner	do	
2 Cuthbert	do	

This selection was sent to 250 applicants. Many reports which have come in give very satisfactory accounts of the relative success of the different varieties Those coming from Manitoba and the North-West—which sections received the larger share of the distribution—are of special interest. Nearly all the varieties started well, except the black cap raspberries, of which "tip" plants only, were available at the time of sending them out. It is much safer and surer in shipping these varieties long distances to use yearling plants well rooted.

The following circular of instructions accompanied each parcel :—

DOMINION OF CANADA,
DEPARTMENT OF AGRICULTURE,
CENTRAL EXPERIMENTAL FARM,
OTTAWA, April, 1890.

DEAR SIR,—A package containing plants of small and large *fruits* has been mailed you this day, and your attention is specially called to the following instructions:—

When plants are received unpack at once and wet the roots. If unable to plant immediately, store them in a cool cellar or heel them out of doors, covering them completely with moist earth. *Situation.*—When selecting a site for planting, if possible choose a loamy and friable soil on a northern slope. A piece that that has been summer fallowed is preferable; avoid southern exposures, as trees and plants in such situations are liable to be injured by alternate freezing aud thawing in the spring, and hot winds in summer. Work the ground twelve to fifteen inches deep and pulverize thoroughly. *Planting—Raspberries.*—Set in rows six feet apart and four fect in the row; care should be taken not to plant the tip varieties deeper thau three inches ; the piece of old cane on these serves only the purpose of a handle and is of no use after setting out. Examples of this class are Mammoth Cluster, Shaffer and Gregg. The upright varieties, Turner, Cuthbert and Hansell, may be planted deeper. Manure freely and cultivate well. Pinch off the canes when three feet high, and prune back lateral branches the following spring to within twelve or eighteen inches of the main cane. It is necessary to bend down the canes in the fall and cover them with earth sufficient to hold them in this position. The apple and cherry trees we send out are cut back, and should be grown with low bushy heads. Bind the trnnks and main limbs in the fall with straw or hay to protect from winter cold and spring sunshine. *Currants and Gooseberries* need liberal manuring and mulching in the fall. As two-year old wood bears most fruit it is best to remove annually all canes three years and over.

You will be expected to take such notes during the growing period as will enable you to make a report at the close of the season on the behavior of each variety, giving soil and exposure. Reports will be expected whether favorable or unfavorable.

Yours truly,

WM. SAUNDERS, *Director.* JOHN CRAIG. *Horticulturist*

In addition to the above, there were distributsd 110 packages, containing a selection of strawberry, raspberry plants and forest tree seedlings, the latter being a number of incomplete bundles left over at the close of the tree distribution.

Arrangements have been made whereby this work can be continued during the coming season.

PROPAGATION OF TREES AND SHRUBS.

In view of the comparatively limited information we have in regard to the best and most expeditious methods of increasing many of the rarer and hardier forms of trees and shrubs, experiments in this direction were inaugurated during the past

summer. The work thus far has been confined to testing different methods of propagating from cuttings, using green wood tips under glass and in the open air; also spring and fall planting in the open of hardwood cuttings.

Interesting results are being developed, but the work is not sufficiently advanced to report upon at this date.

V.—EXPERIMENTS WITH FUNGICIDES.

The annual losses to orchards during the past eight or ten years from the disease known as apple-scab (*Fusicladium dentriticum* FCKL.) has been so heavy as to cause some hitherto profitable varieties to be discarded in certain localities, and to raise the question of their usefulness in future planting. These failures among old and well-tried varieties have also brought about enquiry and experiment as to the best means of combating the disease.

A series of experiments along this line were conducted at Abbotsford, Que., during the past season, on the farm of Wm. Craig & Son. I am indebted to Mr. Wm. Craig, jr., for his labour in superintending the work, and furnishing me with some of the facts upon which the following deductions are based.

I am also indebted to Mr. F. T. Shutt, Chemist to the Experimental Farms, for valuable assistance in planning the lines of experiments, and for the preparation of the copper carbonate and other necessary materials.

The trees selected were of the Fameuse variety, planted fourteen years ago on a loose, gravelly soil. During the past four years this orchard has not yielded more than 25 per cent. of first-class apples.

Five rows in the centre of this orchard were selected, each row, which contained fourteen trees, being treated with a different mixture. A row of trees untreated was allowed to remain on either side of those operated upon. Four applications were made, one on each of the following dates: 14th and 26th June, and 17th and 29th July. At the time of the first application the fruit was about the size of garden peas.

When the fruit was picked it was divided into three grades, numbered 1, 2, and 3. The results are given in this way:—

Row 1.—Treated with

Copper carbonate	1½ oz.
Ammonia	1 qt.
Water	22 gals.

Result:

	Per cent.
No. 1	33
No. 2	25
No. 3	42

Row 2.—Treated with

Copper carbonate	3 oz.
Water	22 gals.

Result:

	Per cent.
No. 1	50
No. 2	25
No. 3	25

Row 3.—Treated with

Copper sulphate	1 lb.
Ammonia	1½ pts.
Water	22 gals.

This solution was too strong, injuring the leaves to such an extent as to cause half of them to drop within ten days from time of application. A second and weaker application had the same effect.

Row 4.—Treated with

Copper sulphate	1 lb.
Water	22 gals.

This had practically the same effect as the above, and was discontinued after a second application. It would seem in this result before us that the ammonia did not increase the injurious effect of the copper sulphate.

Row 5.—Treated with

Hyposulphite of soda	1 lb.
Water	22 gals.

No beneficial effect was noted, though the experiments on this row were rendered useless by severe inroads of the leaf-crumpler.

Row 6.—Untreated.

	Per cent.
No. 1	24
No. 2	26
No. 3	50

The time occupied in making each application, covering the 70 trees, was about 3½ hours with one man and boy and a horse. Of course, if the same mixture were used on the whole lot without any change, the time taken in making the application would be greatly reduced. As the cost of the application is much increased by the addition of ammonia in the copper carbonate mixture—while the results in the experiments cited above do not seem to warrant its use—it would appear that the copper carbonate and water mixture, in the strength as applied above could be used to advantage, and at a cost of about 1 cent per tree each application, or 5 cents for the season. This is an outside estimate even for large trees. It is noteworthy to mention a fact which has attracted the attention of other investigators, viz., that the older leaves seem to be more sensitive to injury from most fungicides and insecticides, than the young and growing leaves. The later applications emphasized this observation.

OTHER FUNGICIDES.

Bordeaux Mixture.—This remedy for downy mildew and black-rot of the grape, though only of recent introduction, has, by reason of its efficacy, become one of our most important fungicides. It is prepared as follows:—

"Dissolve 6 lbs. of sulphate of copper in 16 gallons of water. In another vessel slake 4 lbs. fresh lime in 6 gallons of water. When the latter mixture has cooled it is slowly poured into the copper solution, care being taken to mix the fluids thoroughly by constant stirring. Prepare some days before needed for use. Stir before applying. Stronger mixtures were at first recommended, but they are not now used. For downy mildew and black-rot of the grape, blight, and rot of the tomato and potato." [Bailey, Horticulturist's Rule Book].

Eau Celeste.—"Dissolve 1 lb. of sulphate of copper in 2 gallons of water. In another vessel disolve 1 lb. of carbonate of soda (washing soda); mix the two solutions. When chemical reaction has ceased, add 1½ pints of ammonia; then dilute to 22 gallons." [Bailey, Horticulturist's Rule Book]. Use for treatment of the same diseases as Bordeaux mixture.

I herewith append some conclusions arrived at by Prof. C. P. Gillette of the Iowa Agricultural Experiment Station, who conducted last season an extended series of experiments on this subject:—

"The oldest leaves are most susceptible to injury from arsenical applications; they often turn yellow and drop, without showing the burnt spotted appearance." * * * "London purple, (Paris green and white arsenic have not yet been tried) can be used at least eight or ten times as strong without injury to foliage, if applied in common Bordeaux mixture instead of water." * * * "The arsenites mix readily in carbonate of copper solutions, and do not seem to do more harm than when applied in water only." * * * "London purple in sulphate of copper solution, does vastly more harm than when applied in water only."

In the Journal of Mycology, Vol. VI, No. 3, published by Prof. Galloway and assistants, Department of Agriculture, Washington, an account is given of results of spraying grape vines to prevent black-rot with "Bordeaux mixture; ammoniacal copper carbonate solution; copper carbonate in suspension; and a mixed treatment, consisting of three applications of the Bordeaux mixture, followed by five of the ammoniacal solution." The following conclusions were reached :—

I. "That while the amount of fruit saved by the Bordeaux mixture was greater than that by the ammoniacal solution, the latter preparation is, after all, the cheapest. In other words, there was more profit in using the ammoniacal solution than the Bordeaux mixture."

II. "A mixed treatment consisting of Bordeaux mixture and ammoniacal solution, is more profitable than a treatment of Bordeaux mixture alone, but not as profitable as the ammoniacal solution alone."

EFFECT OF FUNGICIDES ON APPLE LEAVES.

(Frank T. Shutt and John Craig.)

The experiments, as set forth in the accompanying table, were instituted with the following objects in view:—

1. To ascertain the greatest strength in which the different fungicides can be applied without injury to the leaves of apple trees;

2. To ascertain the effect on the leaves of the copper salts, with or without the addition of ammonia;

3. To ascertain the effect on the leaves of apple trees, of a combined fungicide and insecticide, using Paris green as the latter.

The trees chosen for the experiment were of the Wealthy variety—a row set out three years ago, in which all the trees selected were in an equally vigorous condition. As shown in the table, a series comprising 14 combinations of fungicides in different strengths was prepared. Each application was prepared on the basis of a 22-gallon mixture, though the quantity used—the trees being small—was in each case about 1 gallon. A tree was set aside for each preparation, and numbered in accordance with the number of the mixture used.

Series I, received three applications, notes being taken at short intervals after each application. At the close of this series a new lot of trees was selected; these received two applications, and were used as checks on the results of the first experiments.

TABLE showing effects of Fungicides of different strengths on Apple Leaves.

Number.	Fungicides.	Quantity.	1st. Series.—Dates of Making and Effect of Application.			2nd Series.—Dates of Making and Effect of Application.	
			July 12.	July 17.	July 23.	July 21.	July 30.
1	Copper carbonate	3 ozs	Rain 3 hrs. after application	Rain 2 days later		Slight injury	Injury increased, but slight.
	Ammonia	1 qt	Injury scarcely perceptible	Injury scarcely perceptible	Injury not increased		
	Water	22 galls.					
2	Copper carbonate	6 ozs	Injury scarcely perceptible	Injury scarcely perceptible	Injury slightly increased, a few leaves turning brown.	Very slight injury.	No increase of injury.
	Ammonia	2 qts	Considerable blue deposit on leaves.	Large blue deposit in patches.			
	Water	22 galls.					
3	Copper carbonate	3 ozs	No injury; no deposit	No injury; slight deposit	No injury; slight deposit	No injury.	No injury.
	Water	1 gall					
4	Copper carbonate	6 ozs	No injury; no deposit	No injury; slight deposit	No injury; slightly increased deposit.	Slight injury	Injury slightly increased.
	Water	22 galls.					
5	Copper sulphate	8 ozs	Injury scarcely perceptible	Injury somewhat increased; leaves brown.	Lost ¼ of leaves; much injured.	Considerable injury.	Injury somewhat increased.
	Water	22 galls.					
6	Copper sulphate	16 ozs	Distinctly injured	Considerably injured	Badly injured, ⅔ of the leaves falling.	Badly injured	⅓ leaves falling
	Water	22 galls.					
7	Copper sulphate	8 ozs	Slight injury on older leaves.	Injury somewhat increased	Older leaves badly injured, ⅓ falling.	Slight injury	Injury increasing.
	Ammonia	1½ pts					
	Water	22 galls.					

8	Copper sulphate	16 ozs	Slight injury; slight deposit.	Injury increasing	Badly injured, ⅓ leaves falling	Considerable injury.	Badly injured; leaves falling.
	Ammonia	1½ pts		Considerable deposit			
	Water	22 galls.					
9	Copper carbonate	1½ ozs	No injury; slight deposit	No injury; slight deposit	Slight injury to older leaves	No injury	No injury.
	Paris green	1¾ ozs					
	Ammonia	1 qt			Considerable deposit		
	Water	22 galls.					
10	Copper carbonate	3 ozs	No injury; slight deposit	No injury; slight deposit	Injury scarcely perceptible	Injury scarcely perceptible.	No increase of injury.
	Paris green	1¾ ozs					
	Ammonia	1 qt					
	Water	22 galls.					
11	Copper carbonate	1½ ozs					No injury.
	Paris green	1¾ ozs	No injury	No injury	No injury	No injury	
	Water	22 galls.					
12	Copper carbonate	3 ozs					No injury; very slight deposit.
	Paris green	1¾ ozs	No injury	No injury	Traces of injury barely perceptible.	No injury	
	Water	22 galls.					
13	Copper carbonate	8 ozs					Badly injured.
	Paris green	1¾ ozs	Injury barely perceptible	Injury increasing		Considerable injury.	
	Water	22 galls.			Badly injured, leaves dropping		
14	Copper sulphate	8 ozs	Injury barely perceptible	Injury increasing	Considerably scorched and injured.	Older leaves turning brown; younger curling.	Injury increasing.
	Paris green	1 oz					
	Water	22 galls.					

SUMMARY.

Quantities given below are all on the basis of 22 gals. of water, with ammonia as the solvent:—

1. Copper carbonate—3 oz. in solution, caused slight injury.
2. Copper carbonate—3 oz. in suspension caused no injury; 6 oz. in suspension caused slight injury, which did not increase with repeated applications.
3. Copper carbonate—3 oz. in solution, Paris green 1¾ oz. (proportion of 1 lb. to 200 gals. of water), caused slight injury in the later applications.
4. Copper carbonate—1½ oz. in solution, Paris green 1¾ oz., caused very slight injury after the third application.
5. Copper carbonate—1½ oz., in suspension, Paris green 1¾ oz., caused no injury.
6. Copper carbonate—3 oz. in suspension, Paris green 1¾ oz., caused slight injury after later applications.
7. Copper sulphate—8 oz. dissolved caused much injury, and proportionately as the quantity of sulphate was increased.
8. Copper sulphate—8 oz., with 1½ pints of ammonia, caused much injury.
9. Copper sulphate—8 oz.; Paris green ·93 oz., and 1¾ oz. caused much injury.

The more promising lines, as indicated in the above summary, will receive careful attention another season, and on such a scale as to enable the submitting of a more complete summary of conclusions.

VI.—REPORT ON SEEDLING SMALL FRUITS.

To Wm. Saunders, Esq.,
Director Experimental Farms,
Ottawa.

Sir,—The members of the joint committee from the Fruit Growers' Association of Ontario, and the Montreal Horticultural Society, invited to inspect the fruits of the Ottawa Experimental Farm, beg to submit the following report:—

We met at the farm on the 22nd of July, and in company with yourself and Mr. John Craig, the Horticulturist, proceeded to examine the various fruits in cultivation. The results of our observations were very gratifying, indeed, having found success and improvement far beyond our most sanguine expectations.

The raspberry being the principal fruit in bearing at the time, our attention was more particularly drawn to it. We found some twenty-five or more varieties of the well-known sorts in bearing—most of them doing well and carrying a fair crop of fruit. But the chief attraction to your committee was a patch of two or three hundred seedlings and hybrids which were originated by the Director, some of which, in our estimation, bid fair to supersede the best of the standard varieties. These were carefully compared as to apparent hardiness of plant, quality, and productiveness with the standard sorts grown under the same culture and surroundings, and we found, not only in those of the red type, but also in the black and yellow sorts, marked improvements over the leading varieties in general cultivation, from which these were produced—Some as to time of ripening, others as to flavor, and still others as to size, hardiness, productiveness, &c., and it is the opinion of the committee that if these varieties are propagated and disseminated through the country that they alone will more than pay the country, the expense already incurred in connection with the Horticultural Department of the Experimental Farm. These varieties have been grown under numbers, and we herewith append our observations in regard to the most promising of them, and would suggest that they should all be named and further tested, and propagated as fast as possible, and disseminated as you may think best.

We also inspected several new seedling black currants and gooseberries, some of which we consider improvements on our present varieties, and shall expect good results from these when further tested.

The strawberry season was over, and we had no opportunity of seeing them in fruit, but a part of your committee saw several seedlings which were brought to the meeting of the Ontario Fruit Growers' Association at Niagara on the 9th of July, by Mr. Craig; and from the fruit inspected there and the growth and foliage of the plants seen on the farm we should pronounce them very promising.

In regard to the other and larger fruits being tested on the farm, they are not yet far enough advanced to form much of an opinion; yet, we have no hesitation in saying that we believe the experiments being conducted in the Horticultural Department will result in producing varieties that will be of great value, particularly in the colder parts of our Dominion; and in conclusion, we would express our regret that the climate at Ottawa will not permit of experiments with some of the more tender and most valuable fruits, such as the peach, and with many varieties of apples, pears, plums, cherries, apricots, grapes, &c. In view of the great advantage it would be to the country to have these fruits tested by disinterested parties not engaged in the sale of trees or plants, we would express a hope that at no distant day the Government will see fit to establish somewhere in western Ontario—where the climate is suitable—a branch Horticultural station for this purpose, similar to those established in some of the neighbouring States.

Fruit Growers' Association of the Province of Ont. { P. C. DEMPSEY, A. M. SMITH, P. E. BUCKE.

Fruit Growers' Association of the Province of Que. { W. W. DUNLOP, R. BRODIE.

SEEDLING RASPBERRIES.

No. of Row.	No. of Plant in Row.	RED VARIETIES
3	11	A seedling of Biggar's Seedling. Berry above medium size; fair quality; early; firm; productive promising for market.
3	13	Seedling of Biggar's Seedling. Berry large; attractive; good quality; early; promising for market.
3	21	Probably from Biggar's Seedling. Berry as large as Cuthbert; bright red; fine quality; medium early; hardy and very productive.
3	24	Origin unknown. Large, dark red; good quality; firm; very productive; should be a good market berry.
3	36	Origin unknown. Very large; light red; good quality; firm; productive; hardy and vigorous. (I have noted this as one of the most promising for market.—J.C.)
3	39	Origin unknown. A duplicate of the last, but a few days earlier.
3	52	Seedling of Philadelphia. Medium to large; purple; early; good quality; very productive, of the same type as Philadelphia, but earlier.
4	48	Origin doubtful. Medium size; dark red; good quality; enormously productive, valuable on account of its great productiveness.
5	12	Seedling origin unknown Medium size; dark red; good quality; early. This is too nearly like the last to propagate both. (Either of these should supersede some of our present early sorts.—J.C.)
6	46	Seedling of Biggar's Seedling. Very large; bright red; first quality; firm; somewhat earlier than Cuthbert; prolific; hardy and vigorous; very promising.
6	47	Seedling of Biggar's Seedling. A little earlier, otherwise similar to last.

SEEDLING RASPBERRIES.

No. of Row.	No. of Plant in Row.	BLACK CAPS.
3	45	Seedling of Hopkins. Large; good quality; as late or later than Gregg.
3	47	Seedling of Hopkins. Size of Gregg; good quality; firm; medium early; productive. Try for market.
3	76	Seedling of Ohio. Above medium size; attractive; good quality; firm; very early; productive. (Valuable on account of its early season.—J.C.)
4	57	Doubtful origin. Large; purple; fair quality; later than Shaffer; exceedingly productive.
5	23	Seedling of Tyler. Medium to large; fine quality; fairly firm; early; season of Tyler; hardy; productive; very promising.
5	33	Seedling of Tyler. Large and equal to Gregg; good quality; medium early; very productive; hardy; very promising.
5	41	Hybrid; Gregg with Cuthbert. Shäffer type; large; dark purple; good quality; early; a typical cross; plant vigorous. (Very promising, on account of its size and earliness.—J.C.)
7	79	Chance seedling. Medium size; fine quality; very sweet; medium early; promising for home use; hardy; prolific.
7	80	Chance seedling. Largest size; fine quality; firm; productive; season just ahead of Hilborn; hardy; prolific. Promising for market.

[NOTE.—All varieties described above have been favourably mentioned for three seasons in notes taken by Mr. Hilborn, Prof. Saunders or myself. Hardiness and productiveness taken as points of primary importance.—JOHN CRAIG, *Horticulturist.*]

REPORT OF THE CHEMIST.

(FRANK T. SHUTT, M.A., F. Inst. Chem., F.C.S.)

OTTAWA, 20th January, 1891.

WM. SAUNDERS, Esq.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the fourth annual report on the work of the Chemical Department of the Dominion Experimental Farms.

During the past year much has been accomplished, and the laboratory work, ever increasing as the Experimental Farm system becomes better known and appreciated, has been of a very varied character. Farmers in all parts of the Dominion are more and more taking advantage of the aid afforded them by the Government in these institutions, and as a result a larger number of samples have been received for examination and report. The correspondence of the Department has also greatly increased, and much time is now necessarily expended in answering the enquiries of agriculturists. This portion of my work, while forming no part of the annual report, has been found very useful to the individual farmer.

The samples sent in for analysis comprise principally soils, natural and artificial fertilizers, waste products of an agricultural value, well waters and feeding materials of all kinds.

Only such specimens are examined, the knowledge of which is considered to be of importance and benefit to the farming community of Canada, or at least to a large portion thereof. Exceptions to this rule are made, as in the case of well waters, but even here the printed reports will prove of great service to all who study them. No work is done of such a private nature that the report on it would benefit only the individual. Much of the work has a national interest, as for instance, the analysis of sugar-beets grown in different sections of the country, the examination of soils representing large areas, and the like.

That intelligent interest that has been awakened in the value of such knowledge is practically demonstrated by the fact that many samples of soils, fodders, fertilizers, etc., have now accumulated, and for want of time, are still awaiting analysis.

Besides this class of work, and, probably of greater importance to the Dominion at large, is that which has for its object the solution of chemical questions in connection with experiments planned and carried out on the Experimental Farms. These investigations usually entail a large expenditure of time and work, consisting often of a long series of analyses. Many of the experiments just referred to may be said to be wholly chemical, while others require many analyses to make them complete, and, consequently, more valuable. The chemical examination of different varieties of fodder corn, native and foreign grasses, roots and cereals, of animal products, such as milk of the various breeds, finds its rightful place here.

On account of this large amount of work and the consequent need of skilled assistance in the laboratory, the services of an Assistant Chemist have been secured. Mr. Adolph Lehmann, B.S.A., late of Guelph Agricultural College, was chosen for the work. By the technical skill and ability he has displayed in chemical analysis, by his untiring industry and by the warm and intelligent interest he has evinced in the work, Mr. Lehmann has shown himself well fitted for the position. It is due largely to his valuable aid that I am enabled to insert many of the analytical results which appear in the present report.

For convenience of reference, the following classification of the contents of this report will be found useful.

PART I, contains the analyses of soils from the North-West Territories and New Brunswick, with explanatory remarks thereon. Some notes on the general composition and character of soils are also added, which it is thought may be of interest and use to our readers.

PART II, includes natural and artificial fertilizers. Among these are to be found marsh muds, mucks and peats, marl, gypsum, gas lime, wool waste from a woollen mill and a report on the value of "lamb's quarter" (*Chenopodium album*), as a fertilizer.

PART III, treats of the products of farm plants and animals, and comprises analyses and reports on various food stuffs, including fodder corn, ensilage, grasses and concentrated foods such as oil cake and cotton seed meal. The relative values of certain varieties of potatoes as grown on the Central Experimental Farm during the past season are here given. The composition of the sugar-beet is set forth in a long series of analyses. These roots were grown in different parts of Ontario, and the results no doubt represent a very fair average of what has been done during 1890 towards bringing this valuable crop to perfection. In view of the probable development of the beet-sugar industry in the near future, the present results will be deemed valuable. The composition of the milk of the cows at the Central Experimental Farm appears in tabular form. These analyses are accompanied by such other information and deductions as will render them of service to the farmer and dairyman.

PART IV, comprises miscellaneous analyses of substances under experiment or otherwise connected with the farm. The subjects treated of form separate articles under the following titles: "The composition of apple tree leaves," being the first of a series of analyses on the apple, with a view to ascertain a rational mode of fertilizing orchards; "A report on the effect of solution of copper and iron sulphates, alone and togther, on the vitality of the wheat germ;" "Well waters," being a useful chapter on a very important matter, and containing analyses of water examined during the past year; "Foundation comb," giving the composition of three adulterated samples received for examination, to which are added simple methods for detecting the presence of paraffin.

As in former reports, explanatory remarks accompany the analytical data. These remarks have been made as concise and as free from technical terms as possible, but are, however, stated in sufficient detail to make the purely scientific results of value and service to the ordinary reader

In addition to the work set forth in the following pages, there has already been completed a series of analyses of several varieties of Indian corn as grown for fodder —only the averages of which appear in this report—(See Fodders). The objects in view when this task was undertaken were to ascertain the best varieties of corn as regards composition and yield, and to find out the proper time at which to cut the fodder for the silo. The details of this work and the deductions made from them have been put into bulletin form, now shortly to be issued.

The analyses of fifty-two samples of native grasses have also been completed. These grasses were grown on the experimental plots of the Central Farm under the direction of Mr. James Fletcher, the Botanist. The analyses show their composition, and hence their value, at different stages of their growth.

The native grasses of Manitoba and the North-West Territories are now undergoing examination. These have long been favourably known for their nutritious properties by stock-raisers. Their true and comparative values, as determined by

chemistry, will be brought out by this work. When the analyses are finishe the whole will be published together as a bulletin.

There are also in progress the analyses of a number of barleys, including samples of the original importation of Carter's Prize Prolific, and of this barley as grown in the various provinces of Canada. Other 2-rowed, as well as specimens of 6-rowed, barleys, are also being examined. It is expected that the results, when completed, will throw additional light on the important question of barley for malting and export purposes.

I have the honour to be, Sir,

Your obedient servant,

FRANK T. SHUTT,

Chemist, Dominion Experimental Farms.

PART I.

SOILS.

The fertility of a soil is dependent upon its chemical composition and its mechanical texture. Soils to be fertile must contain the elements of plant food in such forms that they can be readily used for the nutrition of vegetation. At the same time its condition must not be too loose, else a firm hold will not be afforded the roots of plants, and there will be too much drainage and evaporation, nor must it be too heavy and plastic, for then air and water could not freely permeate it nor the roots extend themselves beyond a very limited area. Generally speaking, light, loose soils are not as rich in plant food as those in which clay predominates; yet, on account of their excellent condition of tilth, they often yield in favourable seasons heavier crops than the latter. Stiff, heavy clays, though rich in inorganic plant food (potash and phosphoric acid) are often poor in nitrogen, while their condition is such as to prevent thorough aeration and the penetration of the roots. It is these soils especially that are benefited by drainage. By a system of drainage the water which saturates the surface soil is carried off, air allowed to permeate, the whole rendered more friable and easily worked, and much plant food is converted into assimilable forms.

Where sand largely preponderates the soil is not retentive of moistnre and fertilizing material, especially if the subsoil be light, and though easily worked is not so desirable in dry seasons as a heavier soil.

A proper proportion of sand and clay, therefore, for many reasons, makes the best soil.

With the clay and sand, varying amounts of peaty matter or humus (derived from the decomposition of vegetable matter), and of calcareous matter (principally carbonate of lime) are usually associated, and a right proportion of the two latter exerts a beneficial influence upon the tilth of a soil. From the presence of these predominating materials soils are known respectively as clay, sandy, peaty and calcareous, according as one or the other is in excess.

By the slow decomposition of the clay and the peaty and calcareous matter, plant nutrients are liberated in a soluble form, and therefore the function of these soil fundamentals is not only mechanical but chemical.

The constituents of soils may be divided into two classes: *inorganic* and *organic*.

In the first of these is the material formed by the disintegration of the rocks at the earth's surface by atmospheric agencies. This mineral matter consists principally of lime, magnesia, oxide of iron, alumina, potash and soda, combined with silica, phosphoric, sulphuric and carbonic acids.

The actual and relative amounts of these constituents in soils vary according to the nature and composition of the rocks from which they are derived.

The organic portion of a soil consists largely of semi-decomposed vegetable matter (roots, underground stems, leaves &c.), otherwise known as hnmus, peaty matter, &c. The elements which enter into its composition are carbon, hydrogen, oxygen and nitrogen, but it is the latter only that has an agricultural valne.

INORGANIC CONSTITUENTS.

The most important inorganic constituents of a soil are potash and phosphoric acid. These together with nitrogen, are known as the essential elements of plant food.

Potash—derived principally from the decomposition of feldspathic rocks, *e. g.*, granite—exists chiefly in combination with silica in a more or less soluble condition. The limits of potash in a soil lie between a mere trace and about 2 per cent. A good agricultural soil contains between .25 per cent. and 1 per cent. Clay soils, usually, are the richest in potash.

Potash, as a fertilizer, is of special value to clover, peas and other leguminous crops; potatoes, beets, cabbage, grasses and leafy plants in general are also benefited by it.

Phosphoric acid, combined principally with lime, is found in all fertile soils. Like potash, it has been derived from the rock that originated the soil, and consequently is not constant in quantity. It seldom exceeds 1 per cent., even in the richest soils, and the average in good soils would probably be somewhat under ·5 per cent.

It benefits chiefly root crops, *e. g.*, turnips and beets, and in conjunction with nitrogenous manures is very effective for the cereals, promoting an early maturity and an increased yield.

Lime.—Of the inorganic elements of minor importance, lime is the principal. By its solution it affords food directly to the plant and liberates in the soil potash and nitrogen pre-existant in insoluble forms. Many consider that less than 1 per cent. shows a soil to be deficient in lime.

No special mention need here be made of the other mineral constituents, as most soils contain sufficient for all the requirements of farm crops.

ORGANIC CONSTITUENT.

Nitrogen is the element of value in the organic portion of a soil. It there exists, for the most part, in forms from which it can be but slowly absorbed by plants. By a process of fermentation, known as nitrification, it is rendered assimilable. The presence of lime (carbonate of lime) appears to assist in this useful operation, especially when the ground is sufficiently open for air to permeate it. Moisture and warmth are also necessary to encourage the growth of this microscopic ferment.

Very rich soils contain from ·5 per cent. to 1 per cent. of nitrogen; good, fertile soils possess on an average from ·1 per cent. to ·2 per cent.

Nitrogen is essentially the fertilizer for cereals, especially when associated with potash. An excess of nitrogen, however, promotes a rank growth of straw

Successive croppings, without a concomitant return of plant food, deplete a soil of these three important substances, and though, as we have seen, a fertile soil requires but minute quantities of them, they must be replaced in order to obtain lucrative harvests.

The examination of eight samples of soil has been undertaken since the issue of my last report. Six of these represent areas in the North-West Territories, and were analysed at the instance of L. A. Hamilton, Esq., Land Commissioner, C. P. R., Winnipeg; the remaining two soils, from the Sackville Marsh, New Brunswick, were forwarded by Josiah Wood, Esq., M.P.

Analyses of Soils.

Number.	Locality.	Water.	Organic Matter.	Clay and Sand.	Oxide of Iron and Alumina.	Lime.	Magnesia.	Potash.	Soluble Silica	Phosphoric Acid.	Carbonic Acid, &c. (undetermined.)	Total.	Nitrogen.	Clay.	Sand.
1	Walsh Flats, Tp. 11, R. 1, W. 4th	5·50	4·95	77·13	9·80	·53	·18	·39	·19	·17	1·16	100·00	·140	58·20	18·93
2	do Tp. 11, R. 2, W. 4th	3·50	5·28	80·13	8·85	·29	·63	·52	·12	·16	·52	100·00	·135	49·12	31·01
3	Tilley, Tp. 17, R. 13, W. 4th	1·31	4·66	87·15	5·94	·14	·33	·25	·10	·13	.....	100·01	·179	22·57	64·58
4	Tilley, Tp. 16, R. 13, W. 4th	2·31	10·87	78·56	6·91	·36	·41	·26	·16	·17	.....	100·01	·389	12·17	66·39
5	Vermillion Hills, Tp. 21, R. 5., W. 3rd	2·21	10·20	77·31	8·13	·49	·67	·16	·07	·16	·60	100·00	·346	16·38	60·93
6	do Tp. 21, R. 7, W. 3rd	1·49	4·42	87·88	5·32	·16	·44	·11	·07	·18	.....	100·07	·159	11·85	76·03
7	Sackville Marsh, N.B.	8·51	5·34	74·34	10·13	·12	·33	·15	·30	·15	·63	100·00	·120	63·30	11·04
	do do	14·08	4·73	69·60	9·82	·14	·70	·05	·15	·17	·56	100·00	·140	65·46	4·14

SOILS FROM THE NORTH-WEST TERRITORIES.

The districts from which these soils were taken enjoy but a very limited rainfall, and hence have yielded poor crops. It was thought desirous that the composition of these soils should be ascertained to find out if the diminished growth in these areas was due in part to the lack of any important fertilizing constituent or to the excess of alkali or other matter deleterious to plant growth. From these analyses it is conclusively proven that the soils contain a sufficient quantity of plant food for good crops, while there is in every case a total absence of free alkali.

Numbers 1 and 2 are clay loams; in numbers 3, 4, 5 and 6 sand predominates, which in 5 and 6 consists largely of undecomposed rock matter.

The mechanical condition was not of the best, especially in samples 1 and 2. This may be due to lack of working, and would doubtless improve by thorough cultivation.

The analyses were made on the air-dried samples.

Water.

The percentage of water is rather low throughout, but especially so in the sandy specimens, showing that they are apt to "dry out." The small amount of water may, however, be partly due to the fact that the samples had had a long exposure to the air before analysing.

Organic matter and Nitrogen.

In organic matter, Nos. 1, 2, 3 and 6 are comparatively close, ranging from 4·42 to 5·28 per cent. We accordingly find the nitrogen in these samples correspondingly close, the percentages lying between ·135 and ·179. Nos. 4 and 5 possess about twice as much organic matter as the foregoing, and their nitrogen is found to have increased in the same ratio. All these soils may be regarded as comparatively rich in nitrogen—the amounts being quite sufficient for paying yields of farm crops.

Potash.

In the clay loams there is a very fair percentage of this element, but, as might be expected, in some of the more sandy soils it drops below the average quantity. Nos. 5 and 6 would certainly be benefited by an application of wood ashes or potash in some form.

Phosphoric Acid.

The percentage of phosphoric acid is very constant throughout all the samples, being somewhat lower than what we might expect to find in rich soils.

Lime.

The small quantity of lime in all these soils is particularly noticeable. I am of the opinion that a liberal dressing of lime in some form would materially improve them both mechanically and chemically. The amount of available potash would certainly be increased and the nitrogen be converted into more assimilable compounds.

SOILS FROM NEW BRUNSWICK.

Samples Nos. 7 and 8 are from the Sackville Marsh. They are both clay loams. They differ chiefly from Nos. 1 and 2 in containing more water and less sand. In lime they are equally low with the specimens from the North-West Territories—a plentiful application of lime or marl would benefit them. The potash in No. 8 is low—wood ashes are to be recommended for it as a lucrative fertilizer. The amounts of phosphoric acid are similar to those found in the North-West samples. In nitrogen they are moderately rich, though only equalling in this respect the poorest of the North-West soils examined. The soils are friable and porous, and though they would not be considered as rich, they contain sufficient plant food to make them productive of good crops.

PART II.

MUDS, MUCKS AND PEATS.

Nine samples in all of these natural fertilizers have been chemically examined during the past year. They comprise two specimens of swamp muck, two of pond mud, one of mussel mud, two from under mussel beds and one of peat. Four were from Prince Edward Island, two from Nova Scotia, two from New Brunswick and one from Ontario.

ANALYSES OF MUDS, MUCKS AND PEATS.

Number.	Nature of Mud.	Sender.	Locality.	Nitrogen.	Water.	Clay and Sand.	Organic Matter.	Oxide of Iron and Alumina.	Lime.	Magnesia.	Potash.	Phosphoric Acid.	Soluble Silica.
1	Swamp.....	Hunt, W. T....	Summerside, P.E.I...	·920	6·75	41·04	42·37	3·84	3·13	·45	·18	·01	·42
2	From under oyster bed...	Compton, Geo..	St. Eleanors, P.E.I...	·237	33·38	49·99	6·99	6·27	·28	·59	·19	·05	·08
3	Mussel.	Frier, James....	Shediac, N.B.....	·124	7·73	12·89	2·94	2·68	37·81	·81	·10	traces	·62
4	From under mussel bed..	do	do	·357	27·00	48·78	10·18	9·61	·65	·21	·53	·11	·16
5	Marsh.....	do	Gaspareau River, N.S.	·084	11·11	74·28	3·35	8·08	·54	·95	·40	·12	·12
6	Pond.....	Ramsay, James.	Lot 18, P.E.I.....	1·640	7·54	28·31	48·12	7·90	1·04	·40	·39	·26	·48
7	do	do	do	·740	4·25	58·80	23·61	10·09	·33	·10	·64	·28	·22
8	Swamp.....	Hickey, J.....	Point Wolfe, N.S	1·000	7·94	1·00	88·17	2·47	·09	·06	·04	·20	·04
9	Peat.....	Meldrum, A....	Bellerica, Ont.....	1·080	4·75	4·05	89·26	·64	·30	·21	traces	·15	·06

The value of these materials as fertilizers depends largely upon the amount of nitrogen in their organic matter. In very few instances do we find either the phosporic acid or the potash exceeding the quantities present in good soils.

From the table of analyses it will be seen that those examined contained varying quantities of water. If we calculate the percentage of nitrogen upon the water-free substance we obtain the following figures, which show the relative values of these samples in the dry condition, with respect to this important element of plant nutrition. They are arranged according to order of merit.

TABLE showing percentage of Nitrogen in dry matter of Mucks, Muds and Peats.

Letter.	No. in previous table.	Nature of Mud, &c.	Sender.	Locality.	Percentage of Nitrogen in dry matter.
A	6	Pond	Ramsay, Jas	Lot 18, P.E.I	1·774
B	9	Peat	Meldrum, A	Bellerica, Ont.	1·134
C	8	Swamp	Hickey, J.	Point Wolfe, N.S	1·086
D	1	do	Hunt, W. J	Summerside, P.E.I	·986
E	7	Pond	Ramsay, Jas	Lot 18, P.E.I	·773
F	4	From under mussel beds	Frier, Jas	Shediac, N.B	·490
G	2	do oyster beds	Compton, Geo	St. Eleanors, P.E.I	·356
H	3	Mussel	Frier, Jas	Shediac, N.B	·133
I	5	Marsh	do	Gaspareau River, N.S	·095

The nitrogen in semi-decomposed vegetable matter is not in such a condition that it can at once be absorbed by plants. The process of rendering such assimilable is one akin to that of fermentation. This beneficial action goes on—though slowly—when the muck or peat is mixed with the soil, provided the degree of temperature and moisture be favourable. If, however, before application to the soil, the material be composted, its value as a fertilizer will be greatly enhanced, and a quicker return in increased crop yield made to the farmer. Composting favours fermentation, which sets free much valuable plant food. For this purpose, barn-yard manure may be used ; lime and wood-ashes are also strongly recommended. The first is an excellent composting material. The heat developed in its own fermentation starts a similar action in the colder peat or muck, converting into more soluble forms this locked-up store of nitrogen. These materials, being excellent absorbents, will retain the ammonia—valuable plant food containing nitrogen—formed in this fermentation, and which would be likely to escape, due to overheating and lack of moisture in the heap. The compost may be made by alternating layers of barn-yard manure with those of the peat or muck—the layers being about 8 inches in thickness.

Fish waste or refuse, liquid manure and all organic matter, whether animal or vegetable, if easily decomposable, may also be used to advantage in composting.

As has been stated, lime, ashes and similar substances will bring about the fermentation of peat and kindred materials, when accompanied by moisture and warmth. Besides acting directly towards "breaking down" the organic matter, the presence of an alkali appears to encourage the development of the ferment of nitrification.

When the peat or muck is dug in a very wet condition it should be allowed to dry somewhat before composting, fermentation will then proceed more rapidly and thoroughly.

The increased manurial value of these substances after treatment in the compost heap has been testified to by many of my correspondents during the past year.

The absorbent character of peat and allied materials has already been mentioned It is owing to this quality that they are of special value in the stable, the cow house and the pig-pen, and indeed, wherever there may be liquid manure to absorb. When sprinkled in such places, not only do they prevent bad smells, but they also preserve for future crops much plant food that would otherwise go to waste. Much

ammonia escapes into the atmosphere in stables where absorbents are not used. Should there not be a very good system in cow-houses and pig-pens for conducting the liquid portion of the manure to tanks, a loss of fertilizing elements will be sure to ensue through soakage, unless some material is scattered that will take it up and retain it. For this purpose, the use of dry peat and muck can be with confidence advised. In this connection, it must not be forgotten that while the plant food in manure is thus rendered permanent by such treatment, the fertilizing ingredients of the absorbent are at the same time made more valuable for immediate use.

MARL.

One sample of this natural fertilizer was analysed quantitatively during the past year. It was forwarded by H. Glendinning, Esq., of Manilla, Ont., and upon analysis was found to have the following composition:—

Moisture	8·57
Organic and volatile matter	3·24
Clay and sand (insoluble in acid)	2·50
Oxide of iron and alumina	·62
*Lime	47·22
Magnesia	·74
Potash, (slight traces)	.....
*Carbonic acid	37·11
Phosphoric acid, (traces)	.....
	100·00
*Carbonate of lime	84.33

Marl owes its fertilizing properties essentially to the carbonate of lime it possesses. This specimen contains 84·33 per cent., showing it to be somewhat above the average. In other plant food—nitrogen, phosphoric acid and potash—as is usually the case, it is not rich, these elements not being present in notable quantities.

The application of marl is especially to be recommended for heavy clay and for very light soils in which sand and peat predominate. Besides supplying lime—an ingredient of plant food—it renders the tilth of the former mellower, allowing air to permeate the soil and the roots to spread more easily; its addition improves sandy soils, by making them heavier and more retentive of moisture and fertilizing materials. By the slow oxidation of the organic matter of peaty soils it converts their nitrogen into forms which can be taken up as food by plants. This beneficial process is chiefly brought about by a microscopic plant in the soil, known as the ferment of nitrification—to which allusion has been made in the preceding chapter—the development of which is greatly encouraged by an excess of carbonate of lime. To all soils deficient in lime it may advantageously be applied, furnishing thereby not only plant food, but also setting free in the soil the inactive store of materials, so that they may be assimilable by vegetation. Lime in all its forms has been proved of special value as a manure for the leguminosae—of which peas, beans, etc., are important members.

A good marl for agricultural purposes should be of a light colour, and not of a hard or flinty nature. Such will easily disintegrate or break down on exposure to the weather, allowing it to be easily mixed with the soil.

GYPSUM.

One of the most valuable of the fertilizers that occur in nature is gypsum, commonly known as land plaster. It is the result of the union of sulphuric acid and lime, both elements of plant food. Thus it is that plaster supplies nourishment directly to the growing crop. It, however, also acts beneficially—and perhaps principally—

upon the locked-up food ingredients in the soil, setting free potash, and adding to the store of readily assimilable plant nutrients. In the third place, it is especially valuable for its property of "fixing" ammonia in the presence of moisture. The strong smell of stables, cow-houses and manure heaps is chiefly owing to an escape of ammonia—a volatile compound, the essential constituent of which is nitrogen, one of the three principal elements of plant food.

Its use, therefore, for sprinkling in stables and cow-stalls is to be strongly recommended, for thereby the ammonia is retained, the manure consequently becoming more valuable.

On rich soils the application of plaster is wont to give an immediate return; on poor soils better results are obtained by the addition of other and more complete fertilizers.

As a fertilizer for peas, beans, clover and other leguminous plants it has proved of special value. It has also been advised, owing to its property of liberating potash in the soil, as a manure for Indian corn and turnips.

A sample of gypsum was received from Col. Chas. N. Snow, of Pictou, N.S., of which the following is an analysis:

Analysis of Gypsum.

	Per cent.
Insoluble rock matter	·48
Lime (CaO)	31·75
Magnesia (MgO)	1·11
Sulphuric acid (SO_3)	45·73
Oxide of iron and alumina	Very slight traces
Carbonic acid	Small quantity

From the above data I deduce the following percentage composition:—

Sulphate of lime (gypsum)	97·53
do magnesia	·92
Carbonate of magnesia	·98
Insoluble rock matter	·48
Moisture, etc. (undetermined)	·09
	100·00

As this sample contains but 2·5 per cent. of foreign matter, it must be considered a very pure specimen of commercial gypsum, and one that is well adapted for all the purposes for which this substance is used.

GAS-LIME.

The results of my analysis of a sample of gas-lime, forwarded by W. S. Turner, Esq., Cornwall, Ont., are as follows:—

	Per cent.
Water	22·31
Volatile and organic matter	12·93
Insoluble rock matter	1·69
Oxide of iron and alumina	2·53
Calcium sulphate (gypsum or plaster)	2·09
Calcium sulphide and sulphite	1·86
Magnesium carbonate	1·55
Calcium carbonate (chalk)	53·60
Lime, slaked	1·44
	100·00

Gas-lime is a bye-product in the purification of illuminating gas. The gas in passing through or over beds of slaked lime loses the greater quantity of its sulphur, converting the lime into sulphide of lime. This sulphide, although a good insecticide and destroyer of fungi, is, in quantities, deleterious to vegetation. If, however, fresh gas-lime is exposed to the air this sulphide becomes oxidized into sulphite, and finally into sulphate of lime, or gypsum, the properties of which have already been described. After a lengthy exposure, which brings about the conversion of the sulphur compounds into the valuable form of sulphate, the use of gas-lime is attended with profit. It will be found of particular value to those crops that have been mentioned as being specially benefited by gypsum, and to soils naturally deficient in lime. To this end, therefore, it is advised that it be spread upon the fields in the autumn to the amount of two or more tons per acre and ploughed in the following spring, when it will have lost the greater portion of its water and the sulphur compounds will be converted into sulphate. The exact amount to be applied per acre must vary according to circumstances. To land naturally deficient in lime five tons is not considered too much, but on ordinary soils a dressing of two tons per acre may be used, as above recommended, with perfect safety. Owing to the variation in the composition of different samples of this material, as produced at the gas-works, more definite instructions as to the quantity to be applied cannot be given.

Recent experiments in Germany have gone to show that gas-lime when composted with garden refuse or with barn-yard manure is beneficial in helping to retain the nitrogen of these substances. For composting purposes, it is desirous that the gas-lime be first well exposed, as fresh or caustic lime has a tendency to destroy the nitrogenous matter. For ameliorating the condition of stiff clays and liberating as plant food their inorganic constituents, for rendering more compact the texture of sandy loams and for rendering available the nitrogen of peaty soils, gas-lime does good service, both chemically and mechanically.

WOOL WASTE OR REFUSE FROM A WOLLEN MILL.

At the request of the Hon. Charles Péloquin, of St. Hyacinthe, Que., an analysis has been made of a sample of the above meterial, to ascertain its value as a fertilizer. My results are as follows :—

Analysis of Wool Waste.

	Per cent.
Water	7·86
Organic and volatile matters	32·24
Clay and sand (insoluble in acids)	42·84
Oxide of iron and alumina	8·17
Lime	1.58
Magnesia	·83
Potash	3·56
Phosphoric acid	·21
Soluble silica	1·64
Carbonic acid &c. (undetermined)	1·07
	100·00
Nitrogen, in organic matter	1·31

The fertilizing elements would therefore be, per ton of 2,000 lbs.

	Lbs.
Phosphoric acid	4·2
Potash	71·2
Nitrogen	26·2

If we assign the following values—

	Per lb.
Phosphoric acid	6 cents.
Potash	4½ do
Nitrogen	8 do

the value of one ton of this wool waste is, $5.55.

This "wool waste," evidently, is chiefly valuable for the potash and nitrogen it contains. The former ingredient may be at once used by plants, but the latter (nitrogen) is not present in a form that can be directly taken up by vegetable growth. It is, however, rendered assimilable in the ground, or, still better, by composting. If the "waste" is applied at once to the soil its value will not be received for some time, and consequently the best period for such application would be before the autumn ploughing. If, however, it were first thoroughly composted and rotted with barn-yard manure or wood ashes its action in the soil would be more immediate. The extra work entailed by this treatment would in most instances be amply repaid.

"Wool wastes" are very apt to vary in their composition; hence, from this single analysis it would be impossible to state the value of such in general. That we have in all of them, however, much fertilizing material, there can be no doubt, and their judicious use must be attended with profit.

LAMB'S QUARTER (*Chenopodium Album*).

The probable value of this weed, as a cattle food, in places where it is abundant, is discussed in this report in the chapter on fodders. In the analysis there given the ash is stated as 17·74 per cent. of the dry matter. To ascertain to what extent the land was exhausted of its mineral ingredients by this plant, its ash has been analysed. The results obtained are here stated:—

Percentage Composition of Ash.

	Per cent.
Insoluble residue	·55
Soluble silica	·17
Alumina, with traces of oxide of iron	8·40
Lime	7·52
Magnesia	4·34
Potash	43·28
Phosphoric acid	4·16

The percentage of ash and essential fertilizing constituents in the original substance, before drying, are as follows:—

	Per cent.
Ash	3·27
Phosphoric acid	·14
Potash	1·41
Nitrogen	·45

If we assign the following values—

	Per lb.
Phosphoric acid	5 cents.
Potash	4½ do
Nitrogen	15 do

the value per ton of 2,000 lbs. in its green state as a manure is $2.74.

The ash of this plant is seen to consist largely (nearly 50 per cent.) of potash, and consequently this weed must be considred as one that would readily exhaust the soil of this valuable element of plant food. If the crop is not used as a fodder the plan of ploughing it under should be resorted to, in order that this potash—together with the other constituents—be returned to the soil.

PART III.

FODDERS.

By a knowledge of the composition of cattle foods and of the functions and relative values of their constituents, the economic and profitable feeding of farm stock is made an intelligent operation.

The term "fodder" may be used to include all plants or parts of plants, *e. g.*, seeds roots, &c., and all vegetable bye-products, *e. g.* oil and cotton-seed cake, that are used as foods for the animals of the farm.

Fodders consist of varying proportions of *Water* and *Dry matter.*

Water.

The percentage of water present depends upon the nature of the fodder. In root crops there is almost 90 per cent.; in green fodders, *e. g.*, corn and grass, there is between 70 per cent. and 80 per cent. according to variety, time of year, &c.; in hay we find about 14 per cent., and in corn meal, oil cake and similar materials, between 7 per cent. and 10 per cent.

Although water is as necessary to the animal as it is to the plant, yet on account of its abundance in nature no value can be assigned to it in fodders. It is, however, a most essential constituent for the well-being of the animal, acting in the body as a solvent and aid to the digestion of the solid matter of food, and forming a vehicle for conveying such dissolved and digested matter to the various organs and tissues of the animal.

During the maturing of many foliaceous plants, such as grass, Indian corn, etc., the withdrawal of water, accompanied by other changes, tends to lower somewhat the digestibility and hence the value of some of the constituents.

Hence, some plants may be more nutritious in their green and succulent state than they are when ripe and dry, in spite of the fact that in the latter condition the solid food materials may exceed in amount two or three times that found in the green and immature fodder.

The importance of a plentiful supply of pure water for cattle is spoken of in treating of well-waters— *Vide* page 148.

Dry Matter.

The dry substance of a fodder consists of an organic, and of an inorganic or mineral, part

Organic.—The valuable and nutritive constituents of fodders are of this nature. They fall into two classes, viz.: *Nitrogenous* and *Non-nitrogenous.*

The *Nitrogenous* compounds contain, in addition to carbon, hydrogen and oxygen, the valuable element nitrogen, often associated with sulphur and phosphorus. In the following table they are collated under the heading "Albuminoids." Though the albuminoids in plants and animals may differ in physical properties, they all closely approximate each other in chemical composition—containing in the neighbourhood of 16 per cent. nitrogen. Examples of albuminoids in the animal kingdom are: white of egg, casein (curd) of milk; in the vegetable kingdom: gluten of wheat—the tough elastic mass left after washing out the starch, etc., in flour, and vegetable casein found largely in the seeds of the leguminosæ—peas, beans, &c.

The nitrogenous matters or albuminoids are considered the most valuable of the nutritive ingredients of a fodder, and in the animal economy play the part of flesh-producers. They enter largely into the composition of muscle and cartilage, and are essential constituents of the vital fluids, blood and milk. They also assist in producing fat and developing heat and energy.

The *Non-nitrogenous* matter is made up of (1) fat, (2) fibre and (3) carbo-hydrates. These are all composed of carbon, hydrogen and oxygen, and their chief function in the animal is the generation of heat and muscular energy necessary for the continuance of life and the accomplishment of work.

Fat.—Of the non-nitrogenous constituents, fat has the highest nutritive value; and this because it contains a larger percentage of carbon than fibre, or the carbo-hydrates, in the burning of which in the blood much heat is evolved. Its increased value is largely due, also, to the fact that it can be converted into animal fat much more readily than the other organic ingredients.

Fibre is the least valuable of the food ingredients. It is the part of plants that corresponds in function to that of the bones of animals, viz., the supporting and strengthening of the other tissues. By chemical means it can be separated from the other parts of a fodder as a fibrous or woody material. As plants mature, the fibre, as a rule, becomes less digestible, chiefly owing to the deposition of ligneous or woody matter.

Carbo-hydrates.—These include starch, sugars and gums, and consist of carbon united with oxygen and hydrogen in the proportions in which they exist in water. They serve, by their oxidation to carbonic acid and water in the animal, to produce heat and energy.

The *Inorganic* or mineral part is recorded in the column "Ash." It is that part left when a fodder is burned, an operation that destroys and dissipates the organic matter. It is composed chiefly of lime, magnesia, potash and soda, combined with phosphoric and hydrochloric and silicic acids. The functions of these materials in the animal are to assist in forming bone (largely composed of phosphate of lime) and to furnish that small quantity of mineral matter found in all animal tissues.

Co-efficient of Digestion.

The portion of food digested is assimilated and utilized by the animal either in the formation of muscle or fat or in the production of heat; the portion undigested passes out of the animal as solid excreta. The amounts or percentages, of albuminoids, fat and fibre digested are known as the co-efficients of digestion. Thus, if 75 per cent. of the total amount of the albuminoids in a grass is digested, the co-efficient of digestion of the albuminoids in this fodder is 75.

The digestion co-efficients of the constituents of a fodder may be all different. We also find that the co-efficient for the same ingredient varies according to the nature of the fodder. The two following examples will illustrate these statements.

Digestion Co-efficients.

Name of Fodder.	Albuminoids.	Fat.	Fibre.	Carbo-hydrates.
Peas	88	58	74	97
Wheat straw	26	27	52	40

From the analysis of a fodder and a knowledge of the digestion co-efficients of its ingredients, the digestible matter in a ton can be easily calculated. The following is worked out for peas:

—	Percentage Composition.		Digestion Co-efficient divided by 100 × by 20.				Digestible Matter in ton of 2,000 lbs.
Albuminoids	22·4	×	·88	×	20	=	394·24
Fat	3·0	×	·58	×	20	=	34·80
Fibre	6·4	×	·74	×	20	=	94·72
Carbo-hydrates	52·6	×	·97	×	20	=	1020·44
Total							1544·20

Nutritive Ratio.

The nutritive ratio of a fodder is the ratio existing between the amount of digestible albuminoids (nitrogenous matter) on the one hand, and the amounts of the digestible fat, fibre and carbo-hydrates (non-nitrogenous matter) taken together, on the other hand.

Since, as has already been pointed out, the fat is considered 2½ times more valuable than the other non-nitrogenous ingredients, the per cent. of fat found by analysis is first multiplied by 2½ before adding it to the sum of the fibre and carbo-hydrates.

The nutritive ratio serves as a ready means of comparing the relative values of the dry matter of fodders.

A properly balanced food, *i. e.* one in which the several ingredients are present in right proportion, is necessary if economy in feeding and the health of the animal are to be considered.

According to the function of the animal fed—whether it be the production of milk, flesh, wool or work, so there will be the requirement in the animal for different proportions of digestible nitrogenous and non-nitrogenous ingredients in the food. Thus by experiment it has been shown that a milking cow requires daily for every 1,000 lbs. of her live weight, 15½ lbs. of digestible matter in which the nutritive ratio is 1: 5·4. In the case of oxen at rest, there is required daily, for 1,000 lbs. of live weight, 8¾ lbs. of digestible matter, in which the amount of albuminoids is to the amount of the non-nitrogenous matter is as 1: 11·9, or, in other words, in which the nutritive ratio is 1: 11·9.

During the past year many analyses of food-stuffs have been made. These fodders comprise samples of oil cake, cotton-seed meal, "germ" (Indian corn) meal, corn ensilage, various grasses and other materials. The results of these analyses are set down in tabular form, together with the amounts of the digestible ingredients per ton and the nutritive ratio.

Analyses of Fodders.

Material.	Name of Manufacturer or Sender.	Water.	Dry Matter.	Composition of Dry Matter.					Pounds of digestible matter in a ton (2,000 lbs.)					Nutritive Ratio.
				Albuminoids.	Fat.	Fibre.	Carbo-hydrates.	Ash.	Albuminoids.	Fat.	Fibre.	Carbo-hydrates.	Total.	
Oil-cake	Livingstone J., Baden	7·49	92·51	32·12	6·17	10·49	43·09	8·13	517·03	103·88	50·46	725·50	1396·87	1:2
do	Mann & Co., Buffalo	8·64	91·36	38·19	5·70	10·01	40·33	5·77	607·09	94·78	47·55	670·58	1420·00	1:1·55
do O.P	W. & L., Chicago	10·06	89·94	36·90	6·21	9·35	41·16	6·38	577·47	101·65	43·73	673·75	1396·60	1:1·68
Cotton-seed meal	P.D.M. Co., Memphis	9·42	90·58	43·70	9·17	15·00	23·48	8·65	673·54	146·26	529·87		1349·67	1:1·3
Germ meal	A. Gunn & Co., Halfax	8·64	91·36	11·22	9·18	8·51	68·19	2·90	161·96	142·57	96·40	1133·82	1534·75	1:9·8
Golden Tankard mangel	Hon. Chas. Peloquin, St. Hyacinthe	91·90	8·10	9·66	3·58	7·83	69·45	10·42	15·64	5·80	12·68	112·51	146·63	1:8·93
"Lambs Quarter" (Chen. Album)		81·56	18·44	16·12	·69	23·63	40·18	17·74	.....	.....	.....	.....	.....	
Corn ensilage (taken 4th Dec.)	C. E. Farm	78·09	21·91	9·00	3·31	22·99	59·01	5·69	28·78	10·87	72·50	173·17	285·32	1:9·5
do (taken 5th March)	"	78·00	22·00	9·43	4·37	28·37	51·85	5·98	30·29	14·42	89·88	152·85	287·44	1:9·2
Wheat and thistles ensilage (21st Nov.)	Holland Bros	77·33	22·67	8·93	2·04	36·76	39·24	13·03	.....	.....	.....	.....	.....	
Corn and Grasses.	*Stage of Growth.*													
Indian Corn, average of 7 samples	Ears appearing	80·76	19·24	9·17	1·08	26·98	55·60	7·17	25·58	3·10	77·16	143·91	256·31	1:9
" do 7 do	About glazing	77·25	22·75	8·28	1·45	27·36	57·58	5·33	27·41	5·00	89·68	175·77	297·72	1:10·4
Red top (Agrostis vulgaris)	In flower	66·88	33·12	8·06	2·88	37·10	45·97	5·99	40·04	12·59	179·40	240·56	472·59	1:11·2
June grass (Poa pratensis	Just before flowering	74·34	25·66	18·19	4·82	29·78	40·68	6·53	70·01	16·33	111·57	164·93	362·84	1:4·5
do do	Seed formed	72·37	27·63	9·87	3·06	32·72	49·41	4·94	38·18	10·99	124·76	215·70	389·63	1:9·6
Timothy (Phleum pratense)	Just speared	83·58	16·42	17·06	4·02	29·01	42·20	7·71	42·01	7·39	69·55	109·48	228·43	1:4·7
do do	Seed formed	73·55	26·45	8·19	1·50	31·17	55·30	3·84	30·32	5·13	113·77	231·09	380·31	1:11·7
Tall fescue (Festuca elatior)	Just before flowering	80·97	19·03	16·43	3·50	30·47	42·70	6·90	46·90	8·79	84·66	128·39	268·74	1:5·0
do do	In flower	71·77	28·23	11·44	1·79	39·40	40·64	6·73	48·44	6·67	162·39	181·27	398·77	1:7·4

OIL CAKE AND COTTON-SEED MEAL.

These fodders are particularly rich in albuminoids—the nutritive ratio approaching in some samples to 1:1. They also contain large amounts of fat and mineral matter, in which latter phosphates are abundant.

For these reasons, they are particularly valuable to the stock-raiser and dairyman as cattle foods for the production of flesh and milk.

The manure from animals fed with these highly nitrogenous foods is of great value—a value enhanced in the materials under discussion by the presence of a large amount of phosphates. Such manure returns to the soil the most important of the fertilizing elements for future crops.

As these are concentrated and expensive foods, their use in small quantities, and mixed with fodders low in albuminoids and fat (such as straw, roots, corn fodder, &c.,) must be practised, if profit is to be expected. The amount that can be economically fed, will depend upon the composition and quantity of the other food ingredients and the age and function of the animal fed.

"GERM MEAL.

This is manufactured from Indian corn. It differs from the fodder just discussed in containing less albuminoids and more carbo-hydrates. While therefore, compared with them, it is wanting in muscle or flesh-forming ingredients, it is richer in those nutrients that develop heat.

Corn-meal has high digestive co-efficients. It contains a large percentage of fat, and is well and widely known for its fattening qualities when fed to stock.

ROOTS.

Roots in general have a low feeding value, being very rich in water and very poor in albuminoids. Roots, however, are very easily digested, and therefore are valuable for their non-nitrogenous constituents. Owing to their large percentage of water they furnish a succulent food; and as they are also palatable, they are relished by cattle.

The sample of Golden Tankard mangel analysed contained somewhat less than 150 lbs. of digestible matter per ton, with a nutritive ratio of nearly 1:9; whereas, oil-cake meal contains about 1,400 lbs. of digestible matter, with a nutritive ratio of 1:1·5. From these figures and the explanations already given, the comparative values of roots and oil-cake meal as food may be easily ascertained.

LAMB'S QUARTER (*Chenopodium album*).

Throughout Manitoba and the North-West Territories, this well known weed is abundantly prevalent, large tracts of lands often being entirely covered with it. The high winds, so common in these districts, serve to scatter the seed over very wide areas, and, being a vigorous grower, the plant when left alone soon crowds out other vegetation.

Several enquiries have been received from farmers residing in such parts concerning the probable value of the weed as a fodder plant, and whether it would be useful as a crop for ensilage. To answer these questions, the plant has been analysed and a determination of its food constituents made. These are found in the table of fodder analyses. In another place will be found the results of the analysis of the plant's ash, which show its value as a fertilizer.

The specimen was taken at Ottawa late in autumn, after the first frost. It was quite green, and had evidently flowered but recently. From its analysis it compares very favourably with good pasture grass. The true albuminoids are probably somewhat lower than what is represented in the table, as in plants of this nature a part of the nitrogen is present in less nutritive compounds. The percentage of fat is low, that of the ash high, while the amount of fibre is about equal to that in corn ensilage. This weed belongs to the same botanical order as the beet, mangel and

spinach, and in its young condition is often used as as a pot-herb. Whether the continued use of it would affect the digestion remains to be seen; but judging from its composition and relationship to other edible plants there seems no reason why it should not make a nutritive fodder if cut young and in a succulent condition. As the plant matures there appears to be a considerable deposition of woody fibre or lignin, which would lower the digestibility of the plant considerably. Its preservation in the silo could be accomplished with the same care as that given to any fodder crop.

The fertilizing elements which this weed extracts from the ground are discussed in another part of this report

CORN FODDER AND ENSILAGE.

Experiments with fodder corn have been carried on during the past two seasons, both in the field and in the laboratory. The results of these experiments will shortly be published in detail in bulletin form. For the purpose of comparing the composition of corn fodder and ensilage with the food-stuffs just discussed, several of the analyses are here given.

Corn Fodder.—The averages representing the composition at two stages of growth of the corn plant are given. The average in each case is from the same seven varieties of Indian corn.

On account of the large yield per acre, and the succulency and easy digestibility, of the corn plant, it is one of the most valuable of all fodder crops. It is low in albuminoids, having a nutritive ratio of about 1:9·5, and consequently requires the judicious addition of nitrogenous food to make it a nutritious and well balanced fodder. According to our analyses, corn fodder at the "glazing" condition contains about twice as much digestible matter as mangels, and about two-thirds as much as timothy and red-top grass cut at their best. Corn fodder is chiefly valued for its milk-producing properties, and on this account is used by many dairymen as the staple green fodder during those summer months when the grass is short and withered.

Corn ensilage is also a fodder very widely known and used. The analyses of two samples taken 4th December and 5th March respectively, are given in the table. These prove the ensilage to be fairly similar in composition to the corn fodder from which it was made. Good corn ensilage should contain from 250 lbs. to 300 lbs. of digestible matter per ton; and its nutritive ratio should lie between 1:9 and 1:10.5.

Further information regarding the composition of the Indian corn and the ensilage will be found in the bulletin referred to.

A sample of ensilage made from thistles and wheat (about $\frac{2}{3}$ of the latter to $\frac{1}{3}$ of the former) was sent in for analysis by Messrs. Holland Bros., Ottawa, who reported it as readily eaten by their cattle. The specimen was very dark in colour and more distinctly acid than the corn ensilage. It will be observed that the fibre and ash are very high compared with corn ensilage, and that the carbo-hydrates are correspondingly low. Its feeding value would therefore be less than that of corn ensilage.

GRASSES.

Fifty-two samples of grasses, comprising forty-one varieties, have been analysed during the past year. These were all grown on experimental plots at the Central Experimental Farm. Most of the grasses were analyzed at two stages of their growth. From the results so obtained the analyses of several have been selected and inserted in the present table. The work in detail will be published separately, when the character of the grasses of the North-West will be discussed.

It is to be noticed that the percentage of albuminoids is higher in a grass before flowering or when in flower than when the seed is fully formed. As the seed matures there is a migration of the albuminoids of the leaf and stalk into the seed. As the grass ripens the seed is liable to be shed—when there will be also an additional loss in harvesting—and thus it becomes the most economical plan to cut for hay before the seed is fully formed. The best time for harvesting will vary for different grasses; but as far as general advice can be given, they should be cut while in

flower rather than when more mature. The nutritive ratio in the early and late cut grasses point to this conclusion most emphatically. Although there is a general increase in the total dry matter of the grass as maturity is reached, yet this is more than counterbalanced in most instances by the decreased albuminoids.

RED-TOP (*Agrostis vulgaris*), is a valuable grass, and contains a large amount of digestible matter to the ton. It is useful for moist land, and as a pasture grass is thought highly of. In albuminoids it is about equal to early cut timothy, but in this constituent it is exceeded by June grass and tall fescue.

JUNE GRASS (*Poa pratensis*) is an exceptionally good grass. It is also known as Kentucky blue grass. It is held to be one of the most nutritive of the pasture grasses, doing best on moist, rich soils. From the luxuriance of its growth and the excellence of its composition (18 per cent. albuminoids, before flowering) it is esteemed as a specially valuable grass. If intended for hay, the analysis shows that it should be cut before the seed is fully mature.

TIMOTHY (*Phleum pratense*).—The analyses in the table give the composition of this well-known grass at two stages of its growth. They emphatically point to the advisability of cutting while in blossom. It then forms a very valuable hay crop. If allowed to thoroughly mature, not only do the albuminoids decrease, but the digestibility of the grass is lessened by it becoming hard and fibrous. On good soils and with favourable seasons the crop of timothy is very heavy.

TALL FESCUE (*Festuca elatior*).—Tall fescue grass. Two analyses of this grass were made—one just before it flowered, the other whilst the grass was flowering. The increased albuminoids and total digestible matter in the latter show that the grass between these two stages of growth had laid up a store of nutrients, and that if intended for hay it should be cut not earlier than the blossoming stage.

The conclusion to be drawn from the grass analyses with regard to the time at which to cut for hay is, that while the grass is in bloom or directly after, the mowing should be done. Then it is that the albuminoids are in the greatest proportion to the other nutrients; that the water has considerably decreased, augmenting the percentage of dry matter and that the fibre is still soft and digestible. Although, when more mature, the grass contains a greater amount of dry matter, yet because many of the seeds have dropped, the albuminoids are proportionately less. The fibre has then increased, both in amount and in indigestibility, and the grass has generally become less nutritious.

When studying the foregoing table of fodder analyses it will be well to first inspect the column headed "Total pounds of digestible matter in a ton," then the "nutritive ratio," and thirdly the "The amount of digestible albuminoids per ton." By following this order, and then consulting the other columns, the comparison of the feeding value of any two or more fodders can easily be made.

POTATOES.

The value of this important crop depends chiefly upon the yield per acre, the size of the tuber, with its freedom from scab, and its eveness of contour. These are largely the factors that determine the market price and the profitableness of any variety to the grower.

As a vegetable, however, the value of the potato depends upon its composition. The larger the percentage of "dry matter" the better the potato. This "dry matter"—varying from 15 per cent. to 25 per cent.—consists largely of starch. Numerous experiments in Germany and the United States have gone to show that the quality improves as the percentage of starch increases. The "mealy" potatoes are those richest in starch.

Upon this basis the many varieties of potatoes grown during 1890 at the Central Experimental Farm have been tested, and an estimation of their contained dry matter and starch made. These have been calculated from the specific gravity, using the table prepared by Holdefleiss. The results by this method, while not pretending to scientific exactness, show undoubtedly the approximate and relative proportions of starch possessed by the potatoes examined.

On an average, seven fair specimens of each variety were taken, from which to determine the "average weight of tuber," and the "specific gravity."

The results of this investigation are given in the following table, in which the varieties are arranged in the order of decreasing merit:—

No.	Name.	Average Weight of Tuber.	Specific Gravity.	Percentage of Starch.	Percentage of Dry Matter.
		ozs.			
1	Rural Blush	4¼	1099	18·56	23·25
2	Carter's Magnum Bonum	3	1097	18·17	22·81
3	Early Onion	7¼	1095	17·78	22·37
4	Fidelia	3¾	1095	17·78	22·37
5	Richter's Schnee Rose	4¾	1095	17·78	22·37
6	Alexander Prolific	6½	1093	17·41	21·95
7	White Star	4½	1091	17·05	21·53
8	"Large" from British Columbia	5¼	1091	17·05	21·53
9	"Blue"	4	1090	16·88	21·32
10	Richter's Improved	5½	1090	16·88	21·32
11	Clark's No. 1	6	1089	16·71	21·12
12	Sharpe's Seedling	6½	1088	16·54	20·92
13	Gleason's Late	2¾	1088	16·54	20·92
14	St. Patrick	2½	1088	16·54	20·92
15	Early Maine	7½	1088	16·54	20·92
16	Carter's Sukreta	4	1087	16·38	20·73
17	Wonder of the World	5½	1086	16·22	20·54
18	Burpee's Superior	5¼	1086	16·22	20·54
19	Early Eating	8	1086	16·22	20·54
20	White Sprout	5¾	1086	16·22	20·54
21	Beauty of Hebron	7¾	1086	16·22	20·54
22	Empire State	5¾	1086	16·22	20·54
23	Six Weeks Round White	2½	1086	16·22	20·54
24	Early Ohio	6¼	1085	16·07	20·25
25	Snow Flake	3¾	1085	16·07	20·25
26	Early Albino	6¼	1085	16·07	20·25
27	Ruby	5¾	1085	16·07	20·25
28	Sugar	4	1085	16·07	20·25
29	Burpee's Seedling	6¼	1085	16·07	20·25
30	Dumfries Early White	4¼	1085	16·07	20·25
31	May Queen, Early	6	1085	16·07	20·25
32	Late Goodrich	4½	1085	16·07	20·25
33	Thorburn's Paragon	3½	1084	15·92	20·17
34	Carter's Holborn Abundance	5½	1084	15·92	20·17
35	Early Callao	3¾	1084	15·92	20·17
36	Rosy Morn	7¼	1083	15·77	19·99
37	Prairie Seedling	5	1083	15·77	19·99
38	Flower of Eden	6	1082	15·63	19·81
39	Compton's Surprise	5	1082	15·63	19·81
40	White Star	5	1081	15·50	19·63
41	Sukreta	3¼	1081	15·50	19·63
42	Ohio Gunner	6¼	1081	15·50	19·63
43	King of the Russets	6½	1081	15·50	19·63
44	"International Seed Co."	8	1081	15·50	19·63
45	Holton Seedling	5¾	1081	15·50	19·63
46	May Queen, Early	9	1080	15·37	19·46
47	Vanguard	7½	1080	15·37	19·46
48	Member of Parliament	5½	1079	15·24	19·30
49	Pride of America	3¼	1079	15·24	19·30
50	Crown Jewel	7¾	1079	15·24	19·30
51	Lee's Favourite	6¼	1079	15·24	19·30
52	Schoolmaster	3	1079	15·24	19·30

No.	Name.	Average Weight of Tuber.	Specific Gravity.	Percentage of Starch.	Percentage of Dry Matter.
		ozs.			
53	Pearl of Savoy	6½	1079	15·24	19·30
54	Emperor William	3½	1078	15·12	19·14
55	Great Eastern	6½	1078	15·12	19·14
56	Burpee's Early Crane	6¼	1078	15·12	19·14
57	English Kidney	2	1078	15·12	19·14
58	Kidney August	2¾	1077	15·00	18·98
59	Adirondack	4¾	1077	15·00	18·98
60	Chicago Market	7½	1077	15·00	18·98
61	Vermont	5¾	1076	14·89	18·83
62	Eye Carpenter	5¼	1076	14·89	18·83
63	Rose's New Giant	6¼	1075	14·79	18·69
64	New Badger State	9¾	1075	14·79	18·69
65	Alpha	3	1075	14·79	18·69
66	Manhattan	5¾	1075	14·79	18·69
67	Frame Early	2¼	1074	14·69	18·54
68	Carter's Surprise	2¾	1073	14·60	18·40
69	Early Household	2¾	1072	14·51	18·27
70	Mammoth Prolific	5½	1072	14·51	18·27
71	Scotch Champion	5½	1070	14·36	18·02
72	Carter's Cosmopolitan	3	1070	14·36	18·02
73	Rennie's Stray Beauty	5	1069	14·29	17·80
74	Rennie's Dakota Red	6½	1069	14·29	17·80
75	First Crop Ash Leaf	2¼	1069	14·29	17·80
76	King of the Earlies	4¼	1069	14·29	17·80
77	Conqueror	4½	1068	14·22	17·69
78	Prime Minister	3¾	1067	14·15	17·58
79	Bliss' Triumph	6½	1067	14·15	17·58
80	Telephone	3¾	1059	13·59	46·87

SUGAR BEETS.

The results of the analyses of sugar beets examined in the Farm Laboratory during the past year will be found in the subjoined table. The beets were grown from seed imported from Germany by Wilfred Skaife, Esq., President and Manager of the Berthier Beet sugar factory, Montreal. The work of distributing the seed among the farmers of Ontario and of collecting and forwarding the roots for analysis was undertaken by Mr. Robt. H. Lawder of Toronto.

The chemical data include the percentage of sugar in the juice and the co-efficient of purity—the latter representing the percentage of sugar in the total solids of the juice. Besides these analytical results there will be found the average weight of one root in lbs. and ozs., the nature of the soil in which the beets were grown, the dates of sowing and pulling, and such general remarks as to the manuring, drainage and method and thoroughness of culture as were thought justifiable from the information afforded by the growers.

The last fourteen of the series are from beets grown on the Central Experimental Farm, Ottawa; the other localities—widely representative of different portions of Ontario—are indicated in the column provided for that purpose.

The method of analysis was the same as that adopted in 1889, viz., the determination of the specific gravity of the expressed juice by the Westphal balance, calculating therefrom the co-efficient of purity, and the estimation of the percentage of sugar in the clarified juice by a Schmidt and Haensch polariscope.

The averages of the first 68 samples, as shown by the following table, are:—

Sugar in juice	12·47 per cent.
Co-efficient of purity	76·70 do
Weight of one root	1 lb. 14 ozs.

According to the percentage of sugar they contain, the roots fall into the following classes:—

			No. of Samples.
Over	17 per cent. sugar		2
Between	16 and 17 per cent. sugar		1
do	15 and 16	do	0
do	14 and 15	do	10
do	13 and 14	do	12
do	12 and 13	do	15
do	11 and 12	do	13
do	10 and 11	do	12
Under	10 per cent. sugar		3

In other words:

60 per cent. of the samples yielded over ..... 12 per cent. sugar,
and 38 do do ..... 13 do

The average percentage of sugar this year is somewhat lower than that obtained in 1889—when, however, only 25 samples were examined. This falling off may in part be due to the difference in the seasons, though it is quite possible that badly prepared ground and careless cultivation may, in many instances, have been the cause of the lower sugar-yield.

The averages, however, as they stand, indicate a very fair factory beet, and all things being considered, compare well and favourably with those of other countries in which beet-sugar is manufactured. Sufficient work has been done to indicate that both as regards yield per acre and richness in sugar, with a more careful cultivation, sugar-beets may be raised in many parts of Ontario fully equal to those of Europe and the United States.

ANALYSES OF

No.	Name of Grower.	Locality.	Percentage of Sugar in Juice.	Coefficient of Purity.	Average Weight of One Root.	
					Lbs.	Ozs.
1	Billing, W. H.	Tp. Gosfield, Co. Essex	10·41	73·1	.....	
2	Walters, John	Tp. Maidstone do	10·53	73·9	1	9
3	Hunt, John	London South, Co. Middlesex	13·06	79·1	....	11½
4	Hunt, C. B.	do do	11·90	77·9	1	1
5	Hill, James	Tp. Trafalgar, Co. Halton	13·08	77·7	1	3½
6	McConachie, S.	Tp. Pickering, Co. Ontario	14·77	85·0	....	15
7	Laing, Geo.	do do	12·53	80·8	2	1½
8	Willis, R.	Tp. Whitby do	14·15	82·1	....	15¼
9	Moody, Thos.	Tp. Pickering do	11·32	75·7	1	11¾
10	Wilson, John	Oakville, Co. Halton	10·78	74·5	2	11
11	Robson, E. H.	Waterdown, Co. Wentworth	10·83	74·1	1	6½
12	Fothergill, Chas	Appleby, Co. Halton	8·65	67·3	3	8½
13	Graham, Jas. H.	Tp. Scugog, Co. Ontario	12·00	76·9	....	11
14	Pearson, Wm	Tp. Reach do	11·92	75·6	1	8½
15	Dryden, Hon. John	Brooklin P.O. do	14·78	78·7	1	11
16	Kellett, C. C.	Port Perry do	10·38	71·7	1	12
17	McGill, Wm	Tp. Reach do	11·06	73·1	1	7½
18	Whitfield, John	Port Perry do	11·73	76·0	1	8
19	Coates, Jas.	Tp. Cartwright, Co Durham	12.50	80·0	1	11
20	Heard, John	Tp. Reach, Co. Ontario	11·87	79·2	3	0
21	Steele, Geo.	Tp. Cartwright, Co. Durham	13·84	82·3	1	1½
22	Steele, Wm	Tp. Reach, Co. Ontario	13·84	82·4	1	9
23	Grierson, G. H.	Tp. Whitby do	14·23	77·9	2	4
24	Lick, Jas.	do do	10·49	73·2	2	5
25	Jeffrey, Wm	do do	12·69	78·3	1	9½
26	Lynde, R.	do do	12·84	70·4	3	2½
27	Ballantyne, Thomas	Stratford, Co. Perth	13·11	77·4	1	11
28	Bell, Alfred	Tp. Hamilton, Co. Northumberland	11·12	72·4	1	10½
29	Russell, Jas.	do do	11·64	77·4	1	14½
30	Weaver, Peter	Paisley Block, Co. Wellington	13·07	81·7	1	13½
31	Betzner, David	"Paisley German Tract"	14·22	86·0	1	5½
32	Hoskins, Thomas	Tp. Haldimand, Co. Northumberland	10·72	75·2	1	15

SUGAR BEETS.

Nature of Soil.	Date of Sowing.	Date of Pulling.	Remarks.
Gravelly loam....	.....	.....	
Rich loam.....	May 14..	Oct. 2..	Kept well cultivated and covered.
Rich garden soil..	.....	.....	Fairly well cultivated, allowed to grow above ground.
do ..	.....	.....	do do
Sandy loam.... ..	do 8..	do 10..	Manured in 1889, undrained, not kept clean nor covered.
Clay loam.....	do 25..	do 11..	Manured, tile drained, kept partially clean and covered.
do	do 15..	do 11..	Tile drained, manured, kept clean and partly covered.
do	do 12..	do 11..	Natural drainage, kept covered and clean, manured.
Heavy clay.....	do 26..	do 11..	Drained, not manured, kept clean and covered.
Sandy loam.....	do 5..	do 10..	Manured, not carefully cultivated nor covered.
do	do 24..	do 11..	Manured, kept fairly covered, roots wide apart.
Clay loam.....	do 24..	.....	Manured, grown too far apart, kept covered.
do	do 15..	do 13..	Manured, undrained, kept clean and covered.
do	do 26..	do 11..	Manured, tile-drained, kept partially clean and covered.
Black loam.....	do 1..	do 12..	Unmanured, tile drained, kept clean and partially covered.
Loam	do 1..	do 13..	Manured do do covered.
Saudy loam.....	do 15..	do 13..	Manured, undrained do do
Clay loam.....	April 28..	do 11..	Unmanured do do do
Sandy loam.....	May 26..	do 13..	Manured do do do
Heavy clay loam..	do 15..	do 14..	do do do do
Sandy loam.....	do 20..	do 13..	do do do do
do	do 15..	do 13..	do do kept partially clean and covered.
.....	.....	.....	
....	....	.....	
Clay loam.....	do 20..	do 15..	Plot tile-drained, manured, kept scuffled and clean, and covered.
do	do 31..	do 15..	Plot not drained, manured.
Clay.....	.....	.....	Manured, kept fairly well covered.
Clay loam.....	do 22..	do 14..	Manured, undrained, kept fairly clean.
Rich black clay...	April 27..	do 8..	Tile-drained, manured, clean and partially covered.
Rich sandy loam..	May 22..	do 16..	Roots well cultivated, planted close together, well covered.
do ..	do 22..	do 16..	Lightly manured, roots kept covered.
Heavy clay.....	do 10..	do 17..	Manured in 1889, undrained, kept clean and covered.

No.	Name of Grower.	Locality.	Percentage of Sugar in Juice.	Coefficient of Purity.	Average Weight of One Root.	
					Lbs.	Ozs.
33	Riddell, Walter.....	Tp. Hamilton, Co. Northumberland.....	12·43	78·4	1	5¾
34	Mulholland, J. T.....	Tp. Haldimand do	12·33	77·9	2	.....
35	Westington, J..	Tp. Hamilton do	14·18	82·0	2	2¼
36	Bowman, John.....	do do	13·45	79·0	2	6
37	Schumacher, B.....	"German Block".....	12·57	70·6	1	9
38	Shantz, Aaron.....	Berlin, Co. Waterloo.....	12·25	77·7	1	15
39	Merner, Ab.....	.....	12·01	79·0	1	14
40	Page, Seth.....	Tp. Pelham, Co. Welland.....	17·05	82·6	1	8
41	Hilton, H.....	Tp. Trafalgar, Co. Halton.....	14·50	84·5	1	5¼
42	Barrie, Geo.....	Tp. Dumfries, Co. Waterloo.....	13·39	82.1	1	10¼
43	Todd, Thos.....	Galt do	12·00	74·7	1	3½
44	Howland, Sir W. P....	Toronto, Co. York.....	10·10	67·3	1	.....
45	do	do do	10·83	68·5	1	9
46	do	do do	8·52	62·0	1	.....
47	Leslie & Sons.....	do do	16·53	77·8	....	13
48	Richmond, Wm.....	Tp. South Dumfries, Co. Brant.....	11·61	74·5	2	5½
49	Scott, Alex. E.....	Tp. North do Co. Waterloo.....	14·05	81·6	1	14½
50	Goldie, D.....	Ayr do	11·20	74·6	2	7¼
51	Stewart, Erskine.....	Tp. N. Dumfries do	9·89	69·1	2	14¾
52	McEwan, A.....	do do	13·51	80·0	....	12¾
53	McDonald, A.....	Tp. Howard, Co. Elgin.....	10·63	73·5	6	3½
54	Brubacher, M. E.....	Tp. Woolwich, Co. Waterloo.....	11·83	76·9	2	14
55	Schmidt, G. B.....	do do	10·92	74·1	3	3½
56	Carlow, T. B.....	Tp. Percy, Co. Northumberland.....	13·55	83·8	1	13¾
57	Murray, B. W.....	Tp. Toronto, Co. Peel.....	12·56	76·4	2	¼
58	Hinch, Ogden.....	Napanee, Co. Lennox.....	12·70	79·5	2	14½
59	Wordsworth, T. K...	Weston, Co. York.....	13·81	75·7	1	7¾
60	McAllister, T.....	Tp. King do	13.86	79·9	1	11
61	Mitchell, J. & J. W.....	Tp. Vaughan, Co. York.....	17·42	83·0	....	11¾
62	Dempsey, W. R.....	Ameliasbourgh, Co. Prince Edward.....	14·06	79·9	3	11
63	do	do do	10·74	69·4	3	7
64	do	do do	11·50	76·0	3	1

SUGAR BEETS.—*Continued.*

Nature of Soil.	Date of Sowing.	Date of Puiling.	Remarks.
Strong clay loam..	June 20..	Oct. 17..	Manured, undrained, kept clean and fairly covered.
Clay loam.....	May 5..	do 14..	do kept fairly clean and partially covered.
do	do 5..	do 14..	Unmanured, undrained, kept clean and covered.
Rich clay.....	do 15..	do 14..	Manured, undrained, kept fairly clean and partially covered.
Rich sandy loam..	do 22..	do 6..	
do ..	do 22..	do 16..	
.....	.....	.....	
Sandy loam.....	do 1..	do 18..	
Clay loam.....	do 1..	do 10..	Unmanured, kept clean and well covered.
do	.....	do 23..	
Garden soil.....	do 9..	do 23..	
Clay soil.....	do 1..	do 3..	Heavily manured, shaded, some roots very small.
do	do 1..	do 15..	do do do
do	do 15..	do 15..	do do do
Clay loam.....	do 15..	do 25..	Kept well covered.
Rich loam.....	do 5..	do 29..	Manured, tile-drained, kept fairly clean and covered.
Light loam.....	do 1..	do 25..	Manured, undrained, kept fairly clean and partially covered.
Rich garden soil...	do 1..	do 22..	Undrained, unmanured, kept clean and covered.
Old do ..	do 3..	do 22..	Tile-drained, unmanured, kept clean, but not covered.
Light soil.....	do 4..	do 25..	Manured, undrained, kept fairly clean and covered.
Gravel loam.....	do 27..	do 25..	Manured, tile-drained, kept clean.
.....	.....	.....	
.....	.....	.....	
.....	.....	.....	
.....	.....	.....	
.....	.....	.....	
.....	.....	.....	
.....	.....	.....	
.....	.....	.....	
.....	.....	.....	
.....	.....	.....	
.....	.....	.....	

ANALYSES OF

No.	Name of Grower.	Locality.	Percentage of Sugar in Juice.	Coefficient of Purity.	Average Weight of One Root.	
					Lbs	Ozs.
65	Groh, Anson	Preston, Co. Waterloo	14·67	78·1	1	12¾
66	Goodfellow, W	Tp. Albion, Co. Peel	12·90	66·6	1	7¾
67	Berwick & Co.	Shelburne, Co. Grey	11·70	72·7	3	5½
68	Rathbun Co	Tp. Richmond, Co. Lennox	12·38	77·9	1	10½
	Average		12·47	76·7	1	14
A	C. E. Farm	"Musy"	12·41	81·0	1	9½
B	do	White Silesian "Steele"	11·70	81·6	1	8¾
C	do	do "Rennie"	11·18	77·5	1	9
D	do	Vilmorin's Improved	12·77	81·2	1	13¼
E	do	Red Top "Rennie"	7·99	63·0	1	14¼
F	do	Carter's "Prize Nursery"	6·76	65·4	2	9¾
G	do	Imperial	8·37	69·0	3	½
H	do	Silesian "Landreth"	9·97	72·7	1	11¼
I	do	Imperial do	10·21	73·5	1	13¼
K	do	White "Buist"	8·77	66·3	3	6
L	do	"Musy"	11·33	80·7	1	11½
M	do	do	12·12	79·7	2	1½
N	do	"C. P. 2."	10·74	76·5	2	14¼
O	do	"Skaife"	13·59	83·2	1	11½

SUGAR BEETS.—*Concluded.*

Nature of Soil.	Date of Sowing.	Date of Pulling.	Remarks.
.....	.....	.....	
.....	.....	.....	
.....	.....	.....	
Clay loam.....	June 25..	Oct. 17..	Unmanured, tile-drained, kept clean and covered.
.....	.....	.....	
Sandy loam.....	May 13..	do 21..	Manured, tile-drained, kept clean.
do	do 2..	do 18..	do do
do	do 2..	do 18..	do do
do	do 2..	do 18..	do do
do	do 2..	do 18..	do do
do	do 2..	do 18..	do do
do	do 2..	do 18..	do do
do	do 2..	do 18..	do do
do	do 2..	do 18..	do do
do	do 2..	do 18..	do do
do	do 13..	do 18..	do do
do	do 13..	do 21..	do do
do	do 13..	do 21..	do do
do	do 2..	do 18..	do do

Cultivation of the sugar-beet.

The sugar-beet is a variety of the ordinary beet that, by careful and scientific selection and propagation, has been improved, so that now examples are not wanting whose juice contains 20 per cent. sugar.

It is not intended to describe the many different kinds of sugar-beets developed of late years and now grown on the continent of Europe for the sugar factory, but it is necessary to say that the seed of such varieties as have been proved to be rich in sugar should only be sown.

The sugar-beet has been found to thrive throughout the greater part of Europe and the United States. As the northern or southern limit of this very extended area of growth is approached the sugar-beet increases in richness. What the sugar-cane is to the tropics, the sugar-beet is to the temperate zones. As it has already been said, there can be no doubt but what the climate of a large portion of Canada is suitable for the development of beets rich in sugar.

The value of beets for the manufacture of sugar depends upon their richness in sugar and the purity of their juice (co-efficient of purity), and these again in turn depend upon the kind of seed, the quality and condition of the soil, the extent and nature of the cultivation and the character of the season. Failure in the past has often resulted from not recognizing the fact that the sugar-beet requires a different and more thorough cultivation than beets grown for fodder purposes. A right preparation of the soil, correct planting, and the keeping of the root well below the surface of the ground, all exert their influence upon this crop, both as to quality and quantity.

In view of the probable extension of the beet-sugar industry in the near future and the consequent growth of these roots in large quantities in this country, it has been thought advisable to give some information—necessarily in a concise form—regarding those methods of culture which have been found advantageous by experienced sugar-beet growers.

Soil.—The sugar-beet will grow in almost any soil, but its profitable culture requires a good soil, properly prepared.

Heavy clay and wet soils, rocky and marshy lands, are not desirable. By judicious drainage the former may be vastly improved. Soils in which clay predominate are often too hard and impenetrable. In a ground full of stones the roots become forked and unsuited for the factory, and in a wet soil a watery root is produced.

Rich, loose, sandy soils, containing a fair proportion of lime, are the most favourable for the growth of beets rich in sugar.

Too much organic matter in the soil is apt to impair the purity of the juice, and for this reason the soil selected should be well manured the previous autumn, no application being made in the spring. The manure used should be in a thoroughly rotted condition.

The soil must not only be fertile, but its mechanical condition must be such that the roots may easily penetrate it. Soils in suitable condition for grain crops give excellent results, and a soil in which the in-turned sod is thoroughly rotted is also good. New soil is not considered the most desirable.

In seasons when it is hot and dry the stronger and heavier soil, if well drained, will be found more favourable than a loose sandy soil, but the latter, if well manured, will be the better if the summer is rainy or cold.

The ground should receive a thorough cultivation previous to seeding. If at all heavy it should not be worked while wet.

Sowing.—The proper time for seeding will depend upon the season and the soil, but during the latter part of April or the beginning of May the soil will in most localities be sufficiently dry, without having lost that degree of moisture necessary for the germination of the seed. The earlier the sowing the better, as the beets require to grow as long as possible. If found desirable, the seed may be soaked from five to ten hours before sowing.

The seed should be planted from $\frac{3}{4}$ to $1\frac{1}{4}$ inches deep, and in drills 12 to 20 inches

apart. As it is not the purpose to raise a large beet—from 1 lb. to 2 lb. is a good size for sugar-content—the closer the plants in the row and the nearer together the drills the larger will be the yield to the acre, other things being equal.

Weeding.—When the weeds appear, if the beets are above ground, this operation should be commenced. A dry day should be selected for the work, which may be done by a hoe or suitable cultivator.

Thinning.—This may be done when the beets have attained a thickness of about ½ inch. A damp day should be chosen, the roots being be left from 6 to 9 inches apart, according to the richness of the soil. The richer the soil the closer the beets may be left. It is not desirable to raise a very large beet; small beets are the richer in sugar and have purer juice.

Cultivation.—It is of the utmost importance that the weeds be constantly destroyed and the soil kept loose. The number of times necessary to go over the ground will depend on the nature of the soil and the season.

Moreover, it is necessary that the beet should not be allowed to grow above ground; and consequently, as the summer advances, earthing up will have to be resorted to. In the part of the beet root developed above ground there is very little sugar. In the manufacture of the sugar this portion, if present, is always cut off and discarded—for not only is it poor in sugar, but it contains an excess of other substances, which makes difficult the extraction of the sugar. Care should be taken not to break off the leaves during the early growth of the plant, for it is by them that the sugar is developed.

Harvesting.—When the leaves turn yellow the beet is approaching maturity. Although it is desirable to leave the beets in the ground as long as possible, they should be pulled before the first heavy frost, as such would materially lower the percentage of sugar.

If not intended at once for the factory they may be kept in a pit.

Secondary Advantages of Sugar-beet Culture.

The indirect benefits to be derived from the sugar-beet culture are not few, and chief among them is the improvement of the soil.

The thorough state of cultivation necessary for the profitable growth of sugar-beets vastly increases the soil's fertility for succeeding crops. Land in a perfectly clean condition, with a proper mechanical texture, and rich in plant food, is the result.

The pulp from the sugar-beet factory has been largely used as a fodder. According to the richness of the beets and the process by which the sugar is extracted its composition and value varies. As part of a ration for milch cows it is highly spoken of, causing an increased flow of milk without lowering its quality. With straw, hay and a small quantity of oil cake an excellent ration may be prepared. Pulp has been successfully preserved as ensilage, in which condition it is much relished by cattle. In feeding beet pulp the mineral fertilizing elements withdrawn by the growing crop are for the most part returned to the soil.

MILK.

In order to obtain data that could be used as a basis for future reference in connection with milk experiments, a large number of analyses of the milk of the thoroughbred cows at the Central Experimental Farm has been made during the past year.

The analyses comprise 93 samples, and were all made in duplicate—the average of the closely concordant results being given. The milk was from 31 individuals, representing the following breeds: Jersey, Holstein, Ayrshire, Aberdeen, Angus and Shorthorn. Of the Jerseys, there were 5 cows; of the Holstein, 7 cows; of the

Ayrshire, 5 cows; of the Aberdeen Angus, 2 cows; and of the Shorthorns, 9 cows. In addition to these, the milk of 3 grade cows was examined.

The constituents of milk are water, fat, casein (or curd), milk-sugar and mineral matter or ash—the four latter being known together as the "total solids."

From a commercial standpoint, the element of chief value is the fat—the richer in percentage of fat, the more valuable the milk becomes. It is therefore of the first importance to ascertain by a separate determination the percentage of fat, which being substracted from that of the total solids (directly determined), leaves the percentage of "solids not fat." This latter includes the casein, milk-sugar and ash.

Although the fat is the principal constituent of milk that will command our attention here, it must be remembered that milk as a nutritive food is not valuable simply from its contained fat. The casein or curd, which separates on the milk becoming sour or on the addition of acid, is the nitrogenous part of milk, and therefore the most highly nutritious from a food standpoint. Milk is an exceptionally complete food, the nitrogenous part being well proportioned to the non-nitrogenous portion. This, together with the fact that it is very easily digested, makes milk the most nourishing of all foods for the young.

The fertilizing elements remain in milk after it has been skimmed, so that when the fat (as butter or cream) is alone sold, and the skimmed milk fed on the farm, the land is enriched rather than impoverished, for thereby is returned to the soil by the manure much plant food (especially nitrogen and phosphoric acid) in an easily available form.

The quantity and quality of milk of a cow at any given period depend upon numerous factors, chief among which are nature and quantity of food and water, breed, state of health, individual characteristics, age, length of time since calving, and date when bred.

In the following table, besides the analytical data—comprising specific gravity, total solids, fat and solids not fat—will be found information regarding many of the points above mentioned as affecting the quality and flow of milk.

The rations fed during the periods in which the samples analysed were taken are as follows:—

Ration 1.

Fed 7 per cent. of live weight daily, from 1st December, 1889, till 2nd March, 1890.	Corn ensilage	25 lbs.
	Roots	20 "
	Oat straw	7 "
	Provender ($\frac{4}{5}$ oats, $\frac{1}{5}$ barley)	4 "
	Bran	4 "

Ration 2.

Fed 7 per cent. of live weight from 3rd March to 31st March, 1890.	Corn ensilage	25 lbs.
	Roots	20 "
	Oat straw	10 "
	Provender (as in Ration 1)	2 "
	Bran	3 "

After 12th January, the milking cows, except Countess of Darlington, and the grades, were fed in addition to above 2 lbs. of oil cake daily.

After 31st March, Ration 1 was fed until the cows went out to pasture.

The times of milking were 4 p.m. and 6 a.m., making the interval between the evening and morning milking 14 hours, and that between the morning and evening milkings 10 hours.

ANALYSES OF MILK.

Breed.	Name.	Date.	Milking.	Weight of Milk in lbs.	Age.	Calved.	Bred.	Specific Gravity.	Total Solids.	Fat.	Solids not fat.	Milk produced during Month of Analysis. Lbs.	Oz.
		1890.											
Jersey	Oriondo's Girl	Jan. 31	Morning	10¼	4 years	June 14, 1889		1032·1	15·31	6·01	9·30	452	8
do	do	Mar. 2	Evening	6½				1031·8	17·26	8·12	9·14	436	15
do	do	May 3	Morning	7⅛				1034·1	14·33	4·82	9.51	455	2
do	do	do 6	Evening	6				1031·7	15·35	6·46	8·89		
do	Clenna Rex, 2nd	Jan. 31	Morning	11¾	4 years	Nov. 15, 1889		1033·4	13·71	4·36	9·35	629	..
do	do	Mar. 2	Evening	5			Feb. 4, 1890	1032·5	15·15	6·09	9·06	471	10
do	do	May 3	Morning	8				1032·9	13.63	4.56	9·07	430	14
do	do	do 6	Evening	5½				1031·8	16·25	7·13	9·12		
do	Barberry of Dorval	Apr. 22	Morning	6	3 years		Feb. 20, 1890	1033·9	14·56	5·26	9·30	256	10
do	do	do 24	Evening	4½				1033·6	15·27	5·91	9·36		
do	Flora's Oriondo	May 10	Morning	10¼		June, 1889	May 8, 1890	1034·2	14·06	4.68	9·38		
do	do	do 13	Evening	7				1034·9	14·47	5·23	9·24		
do	Clenna Rex, of Glen Duart	Oct. 16	Morning	10¾	2 years	Sept., 1889	Jan. 29, 1890	1035·3	13·65	4·17	9·48	500	12
do	do do	do 17	Evening	8¼				1032·8	14·26	5·33	8·93		
Holstein	Netherlands Dorinda, 2nd	Jan. 28	do	12½	5 years	Aug. 20, 1889	Nov. 23, 1889	1032·5	12·84	3·81	9·03	888	8
do	do do	Feb. 14	Morning	18¼				1033·3	12·63	3·45	9·18	809	12
do	do do	May 10	do	12				1034·0	12·42	3·17	9·25	702	4
do	do do	do 13	Evening	8				1033·9	13·16	3·88	9·28		

ANALYSES OF MILK.—*Continued.*

Breed.	Name.	Date.	Milking.	Weight of Milk in lbs.	Age.	Calved.	Bred.	Specific Gravity.	Total Solids.	Fat.	Solids not fat.	Milk produced during Month of Analisis. Lbs.	Oz.
Holstein	Netherlands Dorinda, 2nd	Sept. 11	Morning	25½		Aug. 24, 1890		1032·3	11·82	3·05	8·77	1280	2
do	do do	do 11	Evening	21½				1031·2	12·52	3·68	8.84		
do	do Dorinda, 3rd	Jan. 28	do	10¼	4 years	Jan. 13, 1890		1033·7	14·35	4·64	9·71	504	..
do	do do	Feb. 14	Morning	16			May 4, 1890	1033·4	11·63	2.56	9·07	799	12
do	do do	May 10	do	11¼				1032·3	11·43	2·79	8·64	619	2
do	do do	do 13	Evening	9½				1032·7	12·14	3·31	8·83		
do	Abi	Mar. 2	do	16	3 years	Feb. 21, 1890		1031·0	12·26	4·04	8·22	1160	13
do	do	Apr. 22	Morning	18¼				1031·5	10·25	2·22	8·03	1012	8
do	do	do 24	Evening	14			May 4, 1890	1031·2	11·41	3·26	8·15		
do	Bonnie Ethel's Mercedes	Mar. 2	do	8	2 years	Feb. 14, 1890		1033·3	12·69	3·85	8·84	685	5
do	do	Apr. 22	Morning	10				1031·9	12·15	3·59	8·56	574	12
do	do	do 24	Evening	8½			June 22, 1890	1031·7	11·65	3·25	8·40		
do	Inchfawn	May 20	Morning	10¾	3 years	About 1 year		1031·0	11·07	2·80	8·27	612	2
do	do	do 22	Evening	7½			June 29, 1890	1031·0	11·93	3·57	8·36		
do	Siepkje 3rd, Queen	Aug. 5	Morning	10	2 years	July 4, 1890		1032·6	12·53	3·61	8·92	597	..
do	do	do 6	Evening	8				1030·9	12·30	3·86	8·44		
do	Aggie Cornelia, 2nd	Sept. 11	Morning	15½	2 years	Aug. 31, 1890		1033·5	12·92	3·61	9·31	863	14
do	do	do 11	Evening	15½				1032·7	13·25	4·03	9·22		

Ayrshire	Eva	Jan. 31	Morning	10	6 years	Oct. 2, 1889		1032·5	11·98	3·47	8·51	622	4
do	do	Feb. 25	Evening	8				1032·0	13.18	4·42	8·76	511	4
do	do	May 10	Morning	9¼			Mar. 12, 1890	1032·2	12·25	3·64	8·61	506	6
do	do	do 13	Evening	7¼				1032·0	12·44	3·81	8·63		
do	Countess	Jan. 31	Morning	9¾	5 years	Dec. 23, 1889		1033·2	13·03	3·95	9·08	1039	4
do	do	Feb. 25	Evening	9½			Feb. 13, 1890	1033·3	13·43	4·31	9·12	741	4
do	do	May 3	Morning	10				1032·4	12·98	4·12	8·86	475	12
do	do	do 6	Evening	6¼				1032·6	13·52	4·50	9·02		
do	Gipsy	Feb. 6	Morning	14¼	5 years	Sept. 15, 1889	Nov. 13, 1889	1032·9	12·11	3·11	9·00	643	4
do	do	do 25	Evening	8¾				1032·5	12·68	3·80	8·80		
do	do	May 10	Morning	10½				1033·2	12·67	3·69	8·98	586	2
do	do	do 13	Evening	8½				1031·9	12·55	3·77	8·78		
do	do	Aug. 5	Morning	18		July 11, 1890		1033·8	12·92	3·56	9·39	966	8
do	do	do 6	Evening	14				1032·5	13·07	4·22	8·85		
do	Clara	Feb. 6	Morning	13	6 years	Aug. 3, 1889	Oct., 1889	1031·0	12·20	3·58	8·62	575	4
do	do	do 25	Evening	7½				1031·8	13·13	4·35	8·78		
do	do	May 3	Morning	2				1031·4	13·02	3·93	9·09	53	8
do	do	do 6	Evening	¾				1030·8	13·82	4·97	8·85		
do	May	Feb. 6	Morning	12¾	7 years	Aug. 13, 1889	Jan. 27, 1890	1033·2	13·16	3·81	9·35	567	..
do	do	do 25	Evening	7½				1033·5	13·56	4·21	9·35		
do	do	May 10	Morning	10				1033·8	13·43	4·17	9·26	529	8
do	do	do 13	Evening	8				1032·6	13·62	4·49	9·13		
Aberdeen Angus	Daisy of Eaton, 4th	Oct. 16	Morning	11¼	2 years	Oct. 5, 1890	Jan. 2, 1890	1038·8	14·30	4·17	10·13	484	10
do	do	do 17	Evening	7¾				1034·8	13·30	3·93	9·37		

ANALYSES OF MILK.—*Concluded.*

Breed.	Name.	Date.	Milking.	Weight of Milk in lbs.	Age.	Calved.	Bred.	Specific Gravity.	Total Solids.	Fat.	Solids not fat.	Milk produced during Month of Analysis. Lbs.	Oz.
Aberdeen Angus..	Stella of Eastview.....	Oct. 16..	Morning.....	8	3 years...	Oct. 5, 1890...	Jan. 1, 1890...	1036·0	14·73	4·87	9·86	.....	
do ..	do	do 17..	Evening....	7½	.....	.....	.....	1034·6	14·34	4·84	9·50		
Shorthorn	Countess of Darlington.....	Jan. 28..	do	5¼	5 years...	July 16, 1889..	Oct. 1, 1889...	1033·0	15·21	5·40	9·81	459	12
do	do	Feb. 14..	Morning....	8	.....	.....	.....	1035·0	13·84	4·09	9·75	370	..
do	do	May 3..	do	5	.....	.....	.....	1034·0	15·54	5·09	9·45	211	8
do	do	do 6..	Evening....	3½	.....	.....	.....	1033·0	16·18	6·73	9·45		
do	do	Aug. 5..	Morning....	18	.....	July 24, 1890..	.....	1033·1	11·64	2·73	8·91	882	4
do	do	do 6..	Evening....	14½	.....	.....	.....	1032·4	12·30	3·67	8·63		
do	Miss Elgins, 5th.....	Jan. 28..	do	14	4 years...	Dec. 30, 1889..	.....	1032·1	12·77	3·90	8·87	1056	12
do	do	Feb. 14..	Morning....	18¾	.....	.....	Apr. 20, 1890..	1033·9	12·47	3·34	9·13	897	4
do	do	May 3..	do	10½	.....	.....	.....	1034·5	13·07	3·86	10·21	574	10
do	do	do 6..	Evening....	7½	.....	.....	.....	1035·4	13·78	4·25	9·53		
do	Wildame	Apr. 22..	Morning....	6¼	3 years...	Feb. 20, 1890..	.....	1035·9	12·96	3·54	9·42	341	10
do	do	do 24..	Evening....	5	.....	.....	.....	1034·4	13·07	3·65	9·42		
do	Cowslip, 3rd	do 22..	Morning....	12¼	3 years...	Mar. 7, 1890..	.....	1033·7	12·13	3·12	9·01	684	..
do	do	do 24..	Evening....	3½	.....	.....	.....	1033·8	12·61	3·60	9·01		
do	Elmwood Garland, 3rd.. ...	do 22..	Morning....	6	4 years...	July 30, 1889..	Nov. 22, 1889.	1034·8	12·32	3·05	9·27	276	12
do	do	do 24..	Evening....	4	.....	.....	.....	1035·0	13·02	3·57	9·45		

Shorthorn	Guelder Duchess	May 20	Morning	11¼	2 years	Apr. 18, 1890		1033·5	12·40	3·45	8·95	663	2
do	do	do 22	Evening	10¼				1033·0	13·29	4·25	9·04		
do	Wild-flower	Aug. 5	Morning	12	4 years	June 16, 1890		1032·7	11·24	2·60	8·64	715	8
do	do	do 6	Evening	10¼				1030·1	11·98	3·66	8·32		
do	Flower of Berkeley	do 5	Morning	8	4 years	July 10, 1890		1030·6	12·63	4·13	8·50	498	14
do	do	do 6	Evening	6½				1031·2	12·35	3·91	8·44		
do	Constance, 3rd	do 5	Morning	12	3 years	June 5, 1890		1033·6	12·18	3·16	9·02	622	12
do	do	do 6	Evening	9¼				1032·5	13·04	4·06	8·98		
Grade	Ruth	Feb. 6	Morning	10¾	8 years	May 23, 1889	Nov. 10, 1889	1033·8	13·89	4·38	9·51	500	..
do	do	Mar. 2	Evening	6½				1034·3	14·08	4·59	9·49	479	9
do	do	May 20	Morning	6½				1035·7	14·90	4·66	10·24	347	2
do	do	do 23	Evening	4				1035·7	15·50	5·15	10·35		
do	Mollie	Feb. 6	Morning	7½	8 years	Mar., 1889	Aug. 28, 1889	1032·6	13·50	4·31	9·19	.....	....
do	Sussie	May 20	do	18½		Apr. 5, 1890		1033·5	12·32	3·39	8·93	1003	..
do	do	do 22	Evening	14				1031·6	13·49	4·73	8·76		

A careful study of the foregoing data will reveal: 1st, how individuals of the same breed differ in the quantity and quality of their milk—a difference no doubt partly due to the varying ages and lengths of time since calving of the individuals tested; 2nd, how the same cow will vary in the richness of her milk within a comparatively short period of time; 3rd, how—except in the case of the Aberdeen Angus, of whom only 4 samples were analysed—the evening milk was invariably the richer, though less in quantity, of the two. Further experiments are required to prove if this difference remains when the intervals between the milkings are more equal.

From the results of these analyses, the following instructive table of averages has been prepared in which will be found: First, the average composition of the total number of milks; next the averages for the whole number of the morning and evening milks respectively; next follow the average composition of the milk of the different breeds—morning and evening milk taken together; and finally, the averages of the morning and evening milks separately of the different breeds. The order of the first table has been preserved.

TABLE OF MILK AVERAGES.

—	Specific Gravity.	Total Solids.	Fat.	Solids not Fat.
Average composition of 93 samples	1033·0	13·20	4·13	9·07
do morning samples	1033·4	12·91	3·78	9·13
do evening samples	1032·7	13·49	4·47	9·02
do Jersey	1033·2	14·80	5·58	9·22
do Holsteins	1032·4	12·24	3·46	8·74
do Ayrshire	1032·5	12·94	3·99	8·95
do Aberdeen Angus	1036·0	14·17	4·45	9·72
do Shorthorn	1033·4	13·00	3·87	9·13
do Grades	1033·9	13·95	4·46	9·49
do Jersey (morning)	1033·7	14·18	4·84	9·34
do do (evening)	1032·7	15·43	6·32	9·11
do Holstein (morning)	1032·6	11·88	3·08	8·80
do do (evening)	1032·1	12·54	3·42	9·12
do Ayrshire (morning)	1032·7	13·61	3·73	9·88
do do (evening)	1032·3	13·18	4·26	8·92
do Ab. Angus (morning)	1037·4	14·51	4·52	9·49
do do (evening)	1034·7	13·82	4·38	9·44
do Shorthorn (morning)	1033·8	12·70	3·51	9·19
do do (evening)	1033·0	13·30	4·22	9·08
do Grade (morning)	1033·9	13·65	4·19	9·46
do do (evening)	1033·9	14·36	4·82	9·54

What has already been said with regard to the richness of the evening milk is here very apparent. The averages of the total morning and evening milk show that the percentage of fat in the latter exceeds that of the former by ·69 per cent. At the same time it is to be noticed that the increase in total solids in the evening over the morning milk is ·58 per cent. From this it would seem that the "solids not fat" decrease somewhat as the percentage of fat increases. *i. e.*; that fat is developed at the expense of one or more of the other constituents.

The averages of the morning and evening milk of the Shorthorns, Ayrshires and Jerseys are all in accord with this deduction.

PART IV.

THE COMPOSITION OF APPLE TREE LEAVES.

At the Dominion Fruit Growers' Convention held in Ottawa, February, 1890, I had the honour of reading the following paper, which is the first of a series on the chemistry of the apple. As time allows, the fruit and the old and young wood of the tree will be analysed. From the data thus amassed it is confidently hoped that we shall be able to ascertain with more or less accuracy the nature and amount of those fertilizing elements withdrawn from the soil by the apple tree in bearing. This will be the first step towards a more rational mode of applying fertilizers to orchards.

"THE COMPOSITION OF APPLE TREE LEAVES.

"Agricultural chemists throughout the world are, and have been for some years, directing their attention towards the solution of questions concerning the growth and bringing to perfection of plants and animals which serve for the use of man. With regard to plants—and by that term I include all farm crops—analyses have been made of all their parts, so that their composition is, to-day, pretty well known.

"Field experiments and experiments in water culture—in which the various salts required by the plants are dissolved in water—have also been made, enabling us, at the present time, to state definitely what special fertilizing constituents are valuable for the growth of certain crops, what classes of soil are most suited to cereals, the leguminous plants, and so on.

"But as yet it appears that little has been done in this direction for the fruit-growers, and the reason for this is not difficult to find. In all experiments of this nature it is necessary to weigh and analyse an aliquot part of the final product of vegetable growth in order to arrive at the amount of plant food absorbed from the soil and other sources, and in this way ascertain the extent to which the soil has been exhausted and the special inorganic and organic elements which enter into the composition of plants tissues. In the case of farm crops, which are reaped annually, this is comparatively an easy task, but it is obvious that in the case of fruit trees—both small and large—this of necessity cannot easily be done. As, however, it is as highly important to the fruit-growers to know what kind of food and what class of soils are best suited to produce the largest amount of fruit as it is to the farmer to be in possession of such information respecting his crop, it is but the duty of those engaged in working out these problems to direct their study, as far as in their power lies, towards the solution of such difficult questions.

"It was with a view of throwing some light upon this abstruse subject, of proposing some rational mode in the application of fertilizers to orchards, that the work included in this paper was undertaken.

"Now, it must not be thought that even if we knew the exact composition of all the parts of the tree (and as long as the fruit is hanging it remains part of the tree), and the total weight of those component parts, and had also a knowledge of the composition of the soil in which the tree was growing, that the whole question would be settled. Until a few years ago it was thought that such data were sufficient to guide the agriculturist in manuring certain fields for certain crops, but later facts, evolved by patient experiments, conducted most carefully over many years, have now proved this theory fallacious. I might illustrate this by reference to the cereals and leguminosæ. The former contain but half the nitrogen of the latter, yet notwithstanding this fact, and all that it seems to imply, it is found that the application

of nitrogen is specially beneficial to the cereals, but of little or no value to the leguminosæ, especially after a certain stage of their growth. Without going into the reasons, or rather theories, which have been advanced to account for this state of affairs, I will ask you to bear these facts in mind, and at the same time to remember that *ex nihilo nihil fit*, that we have to draw upon the soil, the air and water for the constituents of plant food, and that the soil, generally speaking, is the only one of the three we can modify or alter in composition by mechanical or chemical agents. The climate, including degree of frost, amount of rainfall, snow, sunshine, &c., all these are important factors in agriculture. But as we have no control over the elements the line of experiment seems rather in making choice of and breeding from such varieties, whose qualities, dependent upon heredity and environment, make them seem especially adapted to the climate immediately under consideration, and then finding out, by all the means at our command, and applying those elements of plant food best suited to their growth and development.

"In this series of experiments five well-known and hardy varieties of apple trees were selected and the leaves gathered at two stages of their growth, viz., 25th May and 20th September. The leaves in all cases were taken from two or more trees, so that their analysis should reveal the fair average composition of the leaf of that variety at that particular stage of the tree's growth. Upon the first date some difficulty was experienced in a few instances in getting sufficient leaves for analysis without seriously denuding the tree of foliage, so that these first specimens represent leaves in a very early stage of development. On 20th September all the leaves were still quite green, and their life apparently unimpaired and vigorous.

"Mr. John Craig, Horticulturist to the Central Experimental Farm, has kindly furnished me with the following descriptions of the apple trees under discussion :—

"*Duchess of Oldenburgh.*—Tree is vigorous and hardy, forming a roundish, upright head. Bears young, and abundantly. Young shoots, smooth, reddish. Leaves medium-sized, firm and glossy. September.

"*Tetofsky.*—Tree upright, very hardy, vigorous. A young and annual bearer. Young shoots, stout, reddish-brown. Leaves very large. August.

"*Wealthy.*—Hardy, vigorous and healthy. Spreading, open head. Bears young; is an abundant and annual bearer. Shoots, dark, medium. Leaves medium. October.

"*Fameuse.*—Tree moderately vigorous and hardy, round-topped, spreading. Young shoots, reddish-brown. Fairly young annual bearer.

"*Northern Spy.*—Rapid, upright growth. Tardy and moderate bearer. Young shoots, large, dark reddish-brown. Winter.

"The following table shows the composition of the leaves, together with such other data as may help to elucidate the question under consideration. After the column containing the name of the apple tree and the date when the leaves were gathered are three columns, representing in percentages the composition of the leaf—the water, organic matter and mineral constituents. Then follow six columns, showing the percentages of the chief inorganic components of the ash. The percentages of nitrogen in the dry organic matter are then given, followed by columns depicting the amounts of nitrogen, phosphoric acid and potash contained in 1,000 lbs. of the green leaf, which serve to illustrate the absolute and relative values of the leaves as a fertilizer, as well as to show the quantities of these materials taken from the soil for the growth of the leaves.

ANALYSES OF APPLE TREE LEAVES.

Composition of the Leaf, Percentage Composition of Important Constituents in Ash.

Name.	Composition of Leaf.				Percentage Composition of Important Constituents in Ash.						Nitrogen.	Weight of Fertilizing Constituents in 1,000 Lbs. of Leaves.		
	When Gathered.	Moisture.	Organic Matter.	Ash.	Phos. Acid.	Potash.	Lime.	Magnesia.	Oxide of Iron.	Silica.	Nitrogen in Organic Matter.	Lbs. of Nitrogen in 1,000 lbs. Leaves.	Lbs. of Phos. Acid in 1,000 lbs. Leaves.	Lbs. of Potash in 1,000 lbs. Leaves.
	1889.													
Duch. of Oldenburg..	May 25..	70·94	26·67	2·39	9·67	9·25	21·50	9·56	1·63	·92	2·87	7·65	2·31	2·21
Tetofsky	do 25..	72·11	25·40	2·49	8·82	14·33	18·20	7·52	·81	1·16	2·84	7·21	2·20	3·56
Wealthy	do 25..	71·25	26·84	1·91	8·95	10·19	16·02	8·49	1·44	·93	2·98	7·99	1·71	1·94
Fameuse	do 25..	75·45	22·01	2·54	11·61	9·54	16·26	10·84	1·64	1·04	3·01	6·62	2·94	2·42
Northern Spy	do 25..	72·04	25·62	2 34	13·33	.....	14·00	12·43	1·92	1·30	2·99	7·66	3·11	.....
Average	.....	72·36	25·31	2·33	10·47	10·82	17·40	9·77	1·49	1·07	2·94	7·42	2·45	2·52
	1889.													
Duch. of Oldenburg .	Sept. 20..	57·30	38·75	3·95	3·00	6·35	34·80	5·62	1·43	1·00	2·48	9·61	1·18	2·50
Tetofsky	do 20..	60·49	35·87	3·64	5·93	11·02	33·59	5·55	1·19	1·28	2·20	7·80	2·15	4·01
Wealthy	do 20..	60·02	36·53	3·45	5·23	13·09	22·40	5·22	1·08	·80	2·38	8·70	1·80	4·51
Fameuse	do 20..	63·45	33·15	3·40	5·64	13·65	26·35	4·16	1·56	1·05	2·50	8·28	1·91	4·63
Northern Spy.....	do 20..	62·30	34·85	2·85	9·31	14·04	22·40	3·50	1·80	1·57	2·84	9·89	2·65	3·99
Average	.....	60·71	35·83	3·46	5·82	11·63	27·91	4·81	1·41	1·14	2·48	8·87	1·94	3·92

"*Moisture.*—With the exception of the Fameuse, the percentage of water in all the specimens taken 25th May lies between 70·94 and 72·11—practically, between 71 and 72. The Fameuse is more succulent, and contains 75·45 per cent. water. In the leaves gathered 20th September we find a general diminution in the percentage of water, the loss being in the neighbourhood of 12 per cent. It is interesting, and perhaps instructive, to note that with regard to the amount of water, the leaves of 25th May fall into the same order with those of 20th September, the Duchess of Oldenburgh containing least and the Fameuse most water, showing clearly that while all have followed the general law in loss of moisture, each has retained its own characteristic individuality.

Average percentage of water in young leaf.....	72·36
do do maturer leaf.....	60·71

"*Organic Matter.*—This includes all the combustible material of the leaf, and is composed of carbon, oxygen, hydrogen and nitrogen. In the leaves of 25th May, those of the Duchess of Oldenburgh and of the Wealthy, the percentages of organic matter are almost the same, and head the list. The Tetofsky and Northern Spy also contain almost identical amounts, or somewhat less than the two first mentioned, while the Fameuse contains the smallest quantity of organic matter. This order is preserved in the leaves plucked 20th September. From an inspection of these two columns it will be observed that there is a general diminution of water and increase of organic matter as the season advances, and that any special variety preserves its relative position to other varieties in this respect throughout the season,

Average percentage of organic matter in young leaf.....	25·31
do do maturer leaf...	35·83

"*Ash.*—The percentage of all the inorganic or mineral constituents of the leaf are found in this column. With the exception of the Wealthy we find the amounts of ash of the leaves of 25th May closely approximating one another. The leaves of the Wealthy fall about ·5 per cent. below the others in ash constituents. In those of the 20th September we find a general increase in the percentage of ash, amounting from ·5 to 1·5 per cent. over those of 25th May.

Average percentage of ash in young leaf.....	2·33
do do maturer leaf.....	3·46

"*Phosphoric Acid.*—With regard to the composition of the ash as detailed in the columns following, it is difficult to discover in many cases what principle, if any, underlies the distribution of the mineral constituents throughout the tissues of the leaf during its growth. Without reading too much, however, into the results of a single analysis, an inspection of this column shows most clearly that the young leaf contains in its ash a much larger percentage of phosphoric acid than the maturer one—in some instances the phosphoric acid in the latter is but one-half, or even less, than that of the younger leaf. This would lead us to suppose that, as the season advanced, there was a retrograde movement of the phosphoric acid of the leaf to other parts of the tree. As the seed is well known to contain a relatively large quantity of this acid we may legitimately be allowed to think that the food elaborated in the leaf found its way finally, in part, at all events, to the fruit and other portions of the tree. And this undoubtedly expresses a truth (though probably not the whole truth), for we observe that the average number of pounds of phosphoric acid per 1,000 pounds of the younger leaf is higher than the corresponding number for the maturer leaf, viz.: as 2·45, 1·94, and this in spite of the fact that the percentage of ash in the latter is considerably higher than the former.

Average percentage of phosphoric acid in the young leaf...	10·47
do do maturer leaf	5·82

"*Potash.*—It would not be safe from the results tabulated to advance strongly any theories regarding the disposition of this important element in the leaf. The percentage of potash in the young leaf is somewhat lower than that in the maturer leaf. When we, however, consider the increased amount of ash in the latter, we find

that per 1,000 lbs. the older leaves contain 1·5 lbs. more potash than the younger leaves. On comparing the amounts of potash obtained in these analyses with the quantity as found in leaves of other trees it is at once apparent that the leaves of the apple tree are exceptionally rich in this material.

"*Lime.*—The average percentage of lime in the ash of the young leaf is 17·40, while that of the maturer leaf is 27·91, an increase of 10 per cent. This increase would appear also to be regular throughout the varieties examined. Thus, the Duchess stands first in percentage of lime in both lists, followed closely by the Tetofsky, and so on.

"*Magnesia.*—While the percentage of lime increased during the growth of the leaf, the analytical data show that the percentage of magnesia decreases during that period. Thus, in the young leaf we have magnesia 9·77 as the average percentage, and in the maturer leaf this number is reduced to 4·81. This fact is the more remarkable and interesting when we remember that the percentage of phosphoric acid diminished in the same ratio during the same period. It seems quite possible that these two elements of plant food are intimately related in the economy of the plant, and that in the elaboration of the plant food within the tissues and the distribution of this food to the different parts of the tree these two play a very important role.

"*Oxide of Iron and Silica.*—Throughout the whole series the amounts of these constituents are seen to be very similar, and the average in the young and the mature leaf closely approximate each other. The iron after it has performed its functions in the chlorophyll of the leaf appears to remain in the leaf, and from the figures in the table it is seen that there is no extra deposition of silica in the cells of the leaf as it grows older.

"*Nitrogen.*—The only constitutent of great importance that remains to be discussed is nitrogen. The differences in the amounts of nitrogen contained in the organic matter of the leaves of the different varieties examined are so small that one would not be warranted in drawing any conclusion therefrom as to differences in this constituent between the varieties. On taking the averages, however, of nitrogen of the leaves in the two stages of their growth, a considerable difference is at once apparent—a difference that corresponds to 3 per cent. of albuminoids. The figures are:—

Nitrogen in young leaf	2·94	corresponding to	18·61	per cent albuminoids.
do maturer leaf	2·48	do	15·50	do

"The amount of nitrogen per 1,000 pounds of the maturer leaf is 8·87 pounds, as against 7·42 pounds in the young leaf. This is due to the increased percentage of organic matter in the older leaf. It is evident from these results that changes which affect the relative percentage of nitrogen in the organic matter take place in the leaf during its development—but what these changes may be is beyond the scope of the present paper to discuss.

"Phosphoric acid, potash and nitrogen are the three constituents which above all others must be put back into the soil if we are to preserve its fertility. Plants of certain orders require more of one or other of these than plants of other orders. Some soils are specially rich or poor in one or more of the materials—and consequently in the rational mode of application of fertilizers much intelligence and patience must be exercised.

"That the leaves of the apple trees draw a large amount of food from the soil annually has been shown. This must be replaced in excess for the vigorous growth of the tree. The leaves of the tree play no unimportant part—respiration and digestion are their two chief functions—which, if they do not perform well, the tree cannot live and bring to perfection its fruit. Therefore when we feed the leaves we are indirectly feeding the fruit.

"The results of this work seem to point in the direction of mineral fertilizers, and specially of potash, as being more particularly equired for the growth of the leaves, and, therefore, for the vigorous development of the tree, including an abundant crop of fruit.

"A heavy dressing of wood ashes (which may be procured in many parts of Canada at a very low price), or of kainit or other form of potash, is, therefore, to be recommended for orchards.

"The value of the leaves composted—a process to be advised as more economical than burning—is also well established by the data afforded by this work."

REPORT ON THE EFFECT OF SOLUTIONS OF COPPER SULPHATE (BLUE VITRIOL), IRON SULPHATE (GREEN VITRIOL), AND OF "AGRICULTURAL BLUE STONE," ON THE VITALITY OF SEED WHEAT.

A communication was received in March last from Messrs. Tees and Persse, of Winnipeg, Man., accompanied by a sample of "agricultural blue stone"—a substance now in the market for destroying the germs of smut. The following extract is from their letter:—

"As you are no doubt aware, it has long been the custom of farmers to soak their seed grain in a solution of blue vitriol to destroy the 'smut' before sowing. The sample sent you is cheaper than the regular blue vitriol, but it is claimed that it is better for destroying smut; while some hold that the sulphate of iron in sample sent you will destroy the germ in the wheat. As this is a matter of such great importance to this country, we have taken the liberty of bringing it under your notice, and would be glad if you would give us your opinion upon the merits of this new article at as early a date as possible."

An analysis of this sample of "agricultural blue stone" gave the following results:—

Sulphate of iron (green vitriol)	69·30
do copper (blue vitriol)	30·70
	100·00

A series of experiments was then inaugurated to ascertain the effect of solutions of iron sulphate, copper sulphate and of the "agricultural blue stone" on the vitality of the wheat germ. The sample of wheat selected to be experimented with was Red Fife and yielded 97·5 per cent. of germinating seed.

The first experiment consisted in soaking the grain for 36 hours—the seed being totally submerged—in (*a*) a solution of "agricultural blue stone," and (*b*) a solution of sulphate of iron. The strength of the solutions was 1 lb. of the material to 8 gallons of water. The seed, at the expiration of the 36 hours, was taken out of the solutions and allowed to dry in the air at ordinary temperatures. It was then sown in earth in the conservatory.

The following table gives the number of plants from the grain on the dates which appear at the head of the columns. Two hundred grains were sown in each experiment.

Red Fife Wheat. Sown 15th March.	27th Mar.	28th Mar.	31st Mar.	7th April.	22nd Apr.	Percentage of Vitality.
Untreated	191	193	194	195	195	97·5
Treated with sulphate of iron	166	170	171	173	173	86·5
Treated with "agricultural blue stone"	103	108	116	126	128	64·0

From the figures in this table it will be seen that the effect of this method of treatment with sulphate of iron was a reduction of 11 per cent. in the vitality of the seed, while the solution of "agricultural blue stone" diminished the vitality by 33·5 per cent. It may fairly be concluded from these results that the sulphate of copper present in the "blue stone" acted more injuriously than did the sulphate of iron. The following experiment was then made, in order to arrive at the action of the sulphate of copper *per se* upon the grain. The mode of treatment was the same as in the previous experiment (submergence for 36 hours, etc.), and the strength of the solution in the proportion of 1 lb. of the material to 8 gallons of water, as before. The seed treated with sulphate of iron and "agricultural blue stone" was part of the quantity tested on 15th March, and consequently had been dry after treatment 13 days.

Red Fife, 200 Grains. Sown 28th March.	2nd Apr.	5th Apr.	7th April.	10th Apr.	12th Apr.	17th Apr.	22nd Apr.	Percentage of Vitality.
Treated with Suphate of Iron	112	154	177	.....	183	.....	193	96·5
Treated with "Agricultural Blue Stone.....	22	43	72	83	98	100	111	55·5
Treated with Sulphate of Copper.....	30	43	61	67	72	74	80	40·0

It is thus apparent that the sulphate of copper in the "agricultural blue stone" during the 13 days had had the effect of still further lowering the percentage of vital seeds; while the sulphate of iron had not impaired the vitality of the wheat. The seed treated with sulphate of copper gave but 40 per cent. of growing plants. We may thus conclude that while sulphate of iron had but little action on the vitality of the wheat germ, sulphate of copper by the same treatment has a most deleterious effect.

As the method of treatment received in the foregoing experiments may be considered an extreme one, I determined to ascertain what the effect on the wheat germ would be by simply sprinkling the seed with solutions, allowing them to dry, and sowing at once. The following table shows the results obtained by this means, the solution being of the same strength as before:—

Red Fife, 200 Grains. Sown 28th March.	2nd Apr.	5th Apr.	7th Apr.	10th Apr.	12th Apr.	17th Apr.	22nd Apr.	Percentage of Vitality.
Treated with sulphate of iron.....	115	170	181	184	192	198	.....	99·0
do "agricultural blue stone".....	47	93	130	138	144	151	159	79.5
do Sulphate of copper.....	40	69	99	113	126	130	145	72·5

A marked difference, due to the mode of treatment, is at once seen. The seed thus subjected to sulphate of iron had its vitality uninjured; that with the "agricultural blue stone" lost 19·5 per cent. of its vitality, while that with sulphate of copper was destroyed to the extent of 26·5 per cent.

Throughout these experiments it was noticed that the seed treated with the different solutions had the growth of their plants retarded and weak as compared with those of the untreated grain, and this was much more marked in the case of seeds subjected to solutions of copper sulphate and "agricultural blue stone" than when sulphate of iron was used. As soon as roots had begun to absorb nourishment from the soil this lack of luxuriousness of growth was less noticeable.

The following conclusions from these experiments may, I think, be safely drawn:—

1. That a solution of sulphate of copper of the strength of 1 lb. to 8 gallons of water has the effect of destroying a number of wheat germs, and that even when the sulphate of copper is present only to one-third of this amount (as it is in the "agricultural blue stone") the injurious action is still strongly marked.

2. That a solution of sulphate of iron of the same strength has eventually but little destroying action on the wheat seed, though at first the plants from seed so treated have their growth somewhat retarded.

3. That the length of time that the sulphate of copper is in contact with the seed determines, to a large extent, the amount of damage done to the vitality of the germ. If sprinkling be sufficient to destroy the smut spores the grain should not be left in contact with the solution longer than necessary, but dried and sown at once.

In order to supplement this work and to ascertain, if possible, the effect of these solutions on bunt or hard smut, further experiments were undertaken during the past season at the Central Experimental Farm, Ottawa.

These experiments consisted of two series, in one of which the grain was Ladoga, in the other Red Fife. Each series comprised four plots. In the first plot of each series the grain sown was untreated, in the second it had been previously treated with sulphate of iron, in the third with solution of "agricultural blue stone," and in the fourth sulphate of copper had been used.

The strength of the three solutions was 1 lb. to 8 gallons of water. The grain in each experiment with treated wheat was thoroughly sprinkled, allowed to dry by spreading in a thin layer exposed to the atmosphere, and at once sown.

The results of these experiments are as follows:—

There was no smut of either kind upon any of the Red Fife plots.

In the case of the Ladoga, loose smut appeared on all of the four plots, the percentages of diseased ears from the treated and untreated grain being very close—between 3 and 5 per cent. There was no hard smut on any of the Ladoga wheat.

The results of these experiments seem to indicate that none of the solutions tried are efficacious in preventing the development of loose smut.

In view of the fact that it is the "hard," "stinking smut" or bunt that is chiefly deleterious in Manitoba and the North-West Territories, and that such rarely occurs when the wheat is grown here, it seems highly desirable that these experiments should be repeated in the districts above named, and to this end it is proposed to conduct the investigation during the coming year upon the Experimental Farms at Brandon and Indian Head.

WELL WATERS.

Attention was drawn in my last report to the great importance to farmers of a pure and abundant water supply, for use in their own families and for watering stock. At the same time, an offer was made of a free analysis to those farmers who suspected the quality of their water, if they were willing to prepay the freight on the sample. In response to this inducement several have asked for the examination of their drinking waters. To these, instructions were sent as to the manner of taking the sample The right collection of the water is a very important matter, and it is particularly desired that those in the future wishing an analysis should write for the necessary instructions beforehand.

It is especially to the dairymen that this question of pure water is of interest and importance. Pure and wholesome milk can only be obtained from cows supplied liberally with pure, fresh water. The general health of the animal must be impaired by drinking polluted water, and many germ diseases in man have had their origin traced to the milk from cows having access to impure and contaminated water.

From the following table it will be seen that out of ten drinking waters submitted to analysis only three were returned safe to drink. In many instances gross contamination had taken place by drainage from stables, barn yard or other source of pollution, thereby rendering the water poisonous and extremely dangerous for use.

ANALYSES OF WELL WATERS.

Results Stated in Parts Per Million.

Name.	Locality.	Free Ammonia.	Albuminoid Ammonia.	Chlorine.	Solids before Ignition.	Loss on ignition of solids.	Oxygen absorbed in 15 min. at 80° F.	Oxygen absorbed in 4 hrs. at 80° F.	Particulars of Source.	Report.
Thompson, C. J.	Virden, Man.	1·651	2·6700	48·00	2564·0	340·0	1·20	2·64	Well, 33 ft. deep, 120 ft. from stable.	Unfit for use; contaminated by drainage.
do	Bonaly, Man.	·1942	·0728	25·00	802·0	130·0	.64	1·44	Well, 28 ft. deep, 90 ft. from privy	Suspicious; use attended with danger.
Mackay, Angus.	Indian Head, N.W.T.	1·626	·6798	35·00	5032·0	1006·0	3·896	9·00	Well, 65 ft. deep, close to outbuildings.	Exceedingly bad water; quite unfit for use.
Bedford, S. A.	Brandon, Man.	·0728	·1821	18·00	468·0	90·0	2·316	4·508	Spring creek.	Fairly good water; wholesome, free from injurious contamination.
do	do	·2428	·0849	30·00	604·0	180·0	·293	.712	House well, 21 ft. deep, 60 ft. from privy.	Unfit for use; polluted with sewage matter.
do	do	1·1654	0546	110·00	896·0	174·0	·212	·632	Stable well, 23 ft. deep, 10 ft. from stable.	Unfit for use; very bad; polluted with sewage matter.
Carling Bros.	London, Ont.	·2063	·0485	32·00	2032·0	302·0	5·60	8·000	Artesian well.	Of the nature of a mineral water.
Smith, David,	Brandon, Man.	·1335	·2003	1·00	550·0	116·0	·860	1·672	Well, 40 ft. from house, 200 yds. from stable.	Water highly suspicious.
Cowan, William.	Galt, Ont.	1·460	·9200	40·00	520·0	212·0	3·008	5·856	Water from creek at Berlin, Ont.	Unfit for drinking purposes; very bad.
do	do	·280	·3950	40·00	388·0	132·0	2·144	3·408	Water from creek one mile below Berlin, Ont.	do do do do
Pollock, W. C.	Almonte, Ont.	·040	.1400	46·00	740·0	355·0	.....	.....	Well, 55 ft. deep, unused for some time.	A suspicious water.

The chief impurities found in drinking waters, as detected by chemical analysis, are of an organic nature, and arise from the presence of decomposing animal or vegetable matter, or both. The former is to be regarded as the more deleterious of the two, and comprises the solid and fluid excreta of animals, decaying animal matter and the like; vegetable pollution consists of peaty matter—the more or less decomposed remains of plants. Although vegetable matter is not as injurious as that of animal origin, an excessive quantity is very apt to cause diarrhœa and kindred complaints.

Whether the organic matter itself always acts in the water as a poison or not is yet a question open for discussion, though there seems to be ample evidence that in many instances active organic poisons are developed by the decomposing matter.

It has, however, been well established that it is the organic matter of a water that forms the food for the growth of bacteria—microscopic plants, among which are the disease germs—and cases of typhoid (a germ disease) have been repeatedly traced to drinking water surcharged with organic matter.

For these reasons we may safely conclude that a water containing much organic matter must be more dangerous to health than water comparatively organically pure.

It is of the first importance, therefore, to discover the degree to which any water may be contaminated by organic matter and to endeavour to establish whether such be vegetable or animal.

The amounts of free and albuminoid ammonia, of the oxygen absorbed in fifteen minutes and four hours, and of chlorine, are a measure of the organic impurities of a water.

Large quantities of free ammonia associated with a considerable amount of chlorine prove contamination with sewage.

Small quantities of free ammonia and chlorine and high amounts of albuminoid ammonia and "oxygen absorbed" indicate vegetable pollution.

When the ratio of oxygen absorbed in 15 minutes to that absorbed in 4 hours is as 1:2 dissolved vegetable matter is indicated; when this ratio approaches 1:1·5 the presence of animal organic matter is shown. A water contaminated with vegetable matter will absorb or use up more oxygen than one polluted with animal matter.

As every water must be judged according to its source and surroundings, it is impossible to lay down rules that could be applied rigidly in every case, though it has been abundantly shown that a good water, wholesome for use, should not contain more than ·08 parts per million of free ammonia, nor more than ·10 parts per million of albuminoid ammonia, and the amounts of chlorine and total solids should not exceed 70 and 570 parts respectively.

Those who are about to dig wells are cautioned against locating them in barn yards and stables or near any source of pollution—and this is especially urged where the soil is sandy or gravelly. It has been proved beyond dispute that the soakage from such contaminating sources will travel comparatively long distances in light soil, and it is in such that it will act as a cesspool.

The surroundings of the well should at all times be kept clean, and the well itself examined from time to time as to its freedom from refuse material. Vegetable *debris* and dead animals are often the cause of impure water.

FOUNDATION COMB.

In June last we were requested by the D. A. Jones Company Limited, of Beeton, to analyse and report on several samples of "foundation comb," which they suspected to be adulterated. As the matter was deemed of great importance to bee-keepers

throughout the country, this request was complied with. Three samples of suspected comb were received, which, upon analysis, were found to have the following composition :—

ANALYSIS OF FOUNDATION COMB.

——	No. 1.	No. 2.	No. 3.
Beeswax	31·24	43·60	70·06
Paraffin	68·76	56·40	29·04
	100·00	100·00	100·00

The parties who sent these samples to Messrs. Jones & Co. all claim to have procured them from R. E. Smith, Tilbury Centre. The above analyses, with remarks on the fraud in selling, and the danger in using such adulterated comb, have been published by the editors of the *Canadian Bee Journal.*

In the opinion of bee-keepers, pure beeswax is the only material that can be satisfactorily used for foundation comb. Paraffin melts at a much lower temperature than beeswax, and this fact alone militates against its use in bee-hives. It has been proved by experience that manufactured comb containing paraffin melts in hot weather, a total collapse of the comb, often full of brood or honey, resulting. Besides this loss of honey or brood, the bees are smeared by the melted mixture. Messrs. Jones write me as follows, regarding their experience with foundation comb containing paraffin :—

"Paraffin was tested as a base for comb years ago, and, owing to the temperature at which it melts, was found totally useless as a substitute for beeswax. In all cases which we have had this summer, where adulterated comb had been sent out, great loss has been sustained through the comb breaking down when partly built out, and this will always be the case with foundation containing any great amount of paraffin."

In addition to this, it must be noted that the difference in price per pound of beeswax and paraffin is from 25c. to 30c. To sell adulterated comb at the same price as the pure article is therefore a dishonest practice.

When the foundation comb contains a comparatively large percentage of paraffin, the adulteration may be detected by one or more of the following means :—

1. By its smell, colour and consistency. Adulterated wax has not the strong characteristic odour of beeswax, developed especially by friction, neither has it the tough and pliable nature of genuine wax. On being kept, the wax containing paraffin becomes white and brittle.

2. If a small lump of this impure article be placed in cold water, together with a similar quantity of comb known to be pure, and the temperature of the water gradually raised, the comb containing paraffin will melt first and form a fluid layer on the top of the water, while the pure beeswax is but just beginning to melt.

4. Make a mixture of alcohol and water, in such proportions that a piece of pure beeswax will stay suspended in the middle of the fluid. This is most easily done by placing a piece of pure wax on the top of some spirit in a glass, and then adding carefully, and with constant stirring, sufficient water to make the wax sink slowly. If the mark is at first overstepped the addition of a little more spirit will cause the beeswax again to rise.

As paraffin is much lighter than beeswax, the adulterated sample will be found to float on this liquid, and a considerable quantity of alcohol will have to be added to cause the impure wax to sink.

SPONTANEOUS COMBUSTION.

The following article on the causes and prevention of cases of spontaneous combustion in barns and stables written by me in response to the enquiries of a correspondent, was published in the pages of the *Canadian Live Stock and Farm Journal.* The importance of the subject to the farmers throughout the Dominion is such that no apology will be needed for its insertion here.

"SPONTANEOUS COMBUSTION."

"Combustion, as it is ordinarily known and recognized, is the chemical combination of combustible matter with the oxygen of the air, the union of the two being accompanied by the giving out of heat and light. When the union takes place rapidly the heat evolved is intense, but when slowly, the heat produced may be almost imperceptible—though the sum total of the heat produced may be the same in both cases. Combustion may therefore occur without the phenomenon of flame—as flame is really burning gas, which, for its generation from ordinary combustible material and ignition, requires a somewhat intense heat. The heat of our bodies is maintained by a process of slow combution, *i.e.*, evolution of heat unaccompanied by flame, through the union of the organic matter of our food with the oxygen of the air we breathe.

"Spontaneous combustion (or ignition of inflammable material without contact with flame) occurs when the union of the oxygen (oxidation) is sufficiently rapid to raise the temperature to the ignition or burning point of the inflammable substance. The first great requisite of combustion is air—or rather the oxygen of the air. Woollen and cotton rags saturated with oil are capable of absorbing oxygen rapidly, and in consequence of which have their temperature raised to the ignition point—a comparatively low temperature for such material. Very many well-known and authenticated instances are on record of this character as causing fire in the holds of vessels and in manufactories. Dust, formed by the deposition of organic matter in an exceedingly fine state of division, often causes, in like manner, fires in woollen and grist mills.

"The spontaneous fires which break out in hay-stacks, barns, manure piles, etc., are all due to this same process of oxidation, and are caused by the inflammable material being damp—moisture greatly assisting slow combustion. Fermentation may be considered as one of the many forms of combustion. It is a process in which the decomposition of the material is brought about by bacteria—microscopic plants always present in the air—whose development requires moisture and warmth. By their growth more heat is generated, until that point is reached at which the material upon which they feed takes fire. Fermentation is the principal agent in causing spontaneous ignition in barns, outhouses, etc.

"There are other causes besides those given above for spontaneous combustion. A not infrequent one is the slaking of lime. Two instances have come under my notice in which barrels of quicklime, left uncovered in a leaky building, have become slaked by the rain, the heat generated by the operation of slaking—really a chemical combination of the lime with the water—being sufficient to ignite the surrounding woodwork. The prevention in such cases as these it is not necessary to enlarge upon. As to those instances in barns, etc., in which the fire is caused by damp hay or clover, I would say, if possible, do not store it damp, and see that the roof is water-tight or the stack well thatched. If, however, circumstances necessitate the putting away of the hay moist, salt it well. Salt is a preventative of fermentation, and consequently of heat. If, in spite of these precautionary measures, heat begins to generate in the mow, ventilation should be resorted to, so that the heat as it is developed may be carried off, and not allowed to accumulate or become so intense as to raise the hay to its burning temperature. In the case of manure piles, it is a wise

practice to mix together in the heap the horse and cow dung. Horse manure ferments and heats more readily and rapidly than cow dung. The mixing of the two prevents the former from becoming fire-fanged, which means, to a large extent, depreciation in value, and at the same time a fermentation is set up in the colder cow dung which renders its fertilizing constituents more available for plants.

"With regard to your question respecting the frequent fires 'commonly credited to unknown causes,' it is quite possible that many of these are true cases of spontaneous combustion; yet, undoubtedly some are occasioned by the smouldering embers from the pipe of the farmer, his hired man, or the tramp, or are due to the carelessness in the use of unprotected lights, or caused by the viciousness of incendiaries. Without data, it is impossible to state what percentage of fires is due to these respective causes."

REPORT OF THE ENTOMOLOGIST AND BOTANIST.

(JAMES FLETCHER, F.R.S.C., F.L.S.)

W. SAUNDERS, Esq.,

Director, Dominion Experimental Farms.

SIR,—I have the honour to hand you herewith a report upon the work carried on in my Department during the past year. It is of course impossible to report in full upon the multiplicity of subjects which are brought officially under my notice during the year. I have treated at some length certain of the more important subjects, so that information as to the nature of the objects discussed, and remedies when known, might be disseminated as widely as possible.

DIVISION OF ENTOMOLOGY.

There has been much correspondence to attend to as well as field work to prosecute. I have reported fully upon the American Frit Fly, which has been a serious pest of wheat, barley and grasses for the last three or four years; the Mediterranean Flour Moth, a dangerous imported insect; the Pea Weevil, which is beginning to increase in numbers; the Diamond-back Cabbage Moth, and the Cabbage Maggot, dire enemies of that wholesome vegetable; the Strawberry Weevil, and an injurious caterpillar which periodically strips the oak trees on Vancouver Island of every vestige of foliage.

DIVISION OF BOTANY.

The work in this division has consisted chiefly in looking after the experimental grass plots, which are reported on in full herewith, and the arboretum; in naming botanical specimens and weeds sent in for identification; and in giving instructions in the use of the various remedies which have lately been used with such good effect against fungous diseases of plants. I regret that the space at my disposal precludes the possibility of treating of these in this report; but I hope at no very distant date to issue in bulletin form an account of the successful work which has been accomplished, particularly in the United States, in fighting these troublesome diseases.

In the meantime, I wish to announce that I shall be glad to send instructions for the treatment of fungous diseases, where remedies are known, to all who may wish for them.

These studies are very recent, dating only from about 1885. The good work which has been done is due largely to the energy and ability of Mr. B. T. Galloway, the chief of the Division of Vegetable Pathology at Washington, who, in writing on this subject in the *American Garden* for October, 1890, says as follows: "Let us now see what have been some of the practical results of this work. In the first place, grape-growers everywhere have been made acquainted with the causes of such diseases as black-rot, downy-mildew and anthracnose. Moreover, it has been proved to their entire satisfaction that these diseases can be prevented by proper treatment. Between two and three thousand grape-growers in all parts of the country used the remedies in 1889, and from estimates based on reports received from about thirty, we know that the actual saving in money to these, above all expenses, was something over $10,000. Our agents last year, in treating potatoes for blight and rot, succeeded in saving 75 per cent. of the crop. On this basis, the amount saved to the entire country, if all the infected districts had been treated, would have been something over a million dollars."

A memorandum is submitted herewith by Mr. Galloway, concerning a curious bacterial disease of oats, which, although not very injurious in Canada, has been very prevalent in some districts.

In the Arboretum and Botanic Garden the work begun last year has continued. The collection of trees and shrubs has been considerably augmented, and next spring several herbaceous perennials, which have been grown from seed, or have been collected from the woods in this and other parts of Canada, will be planted out in their proper places. Particular efforts will be put forth to render the collection of native Canadian plants as complete as possible. At present, nearly 400 different kinds of shrubs and trees have been set out, in most cases two specimens of each kind, which are made up as follows:—

Anacardiaceæ	7	Juglandaceæ	3
Araliaceæ	1	Leguminosæ	23
Berberidaceæ	12	Oleaceæ	30
Betulaceæ	5	Rhamnaceæ	4
Bignoniaceæ	4	Rosaceæ	92
Caprifoliaceæ	30	Rutaceæ	1
Celastraceæ	5	Salicaceæ	33
Compositæ	1	Sapindaceæ	17
Coniferæ	65	Saxifragaceæ	19
Cornaceæ	10	Simarubaceæ	1
Cupuliferæ	16	Tiliaceæ	4
Elæagnaceæ	7	Urticacæ	7

Several low spots which needed draining were attended to last autumn, and locations were decided upon for groups to illustrate some natural orders of plants not as yet represented in the Botanic Garden.

MEETINGS ATTENDED.

By permission of the Hon. Minister of Agriculture I was allowed to attend the Second-Annual Meeting of the Association of Official Economic Entomologists, held at Champaign, Ill. The meeting was one of much importance to all concerned, and this association cannot but be a great influence in helping on the cause of agricultural entomology, by binding together all the students, over the whole globe, who are engaged in that study. The undersigned was highly honoured by being elected President for the ensuing year.

In February last I attended the Dominion Convention of Fruit Growers held at Ottawa and read a paper on "Insects Injurious to Fruits," which was listened to and discussed with interest.

I have also, by intruction of the Hon. Minister, attended several Farmers' Institute meetings. These opportunities of meeting the farmers have been gladly embraced, as I find them a most effective means of apprising farmers of the fact that such work as I am engaged in, is being carried on, and also of showing that it is of great importance to them. Not only this, but I have assured them that my services are entirely at their disposal, and that I shall be pleased at all times to advise them with regard te injurious insects and fungous diseases, if they will correspond with me. In this way, I believe the work will yearly become more useful and popular.

In January, 1890, I attended a very successful meeting of the County of Frontenac Farmers' Institute at Inverary, Ont., and delivered addresses upon "Farm and Orchard Insects" and "Weeds of the Farm." After this meeting I proceeded to the County of Peterboro' Institute at Norwood and Keene. At each of these places an afternoon and evening meeting was held. At the former I spoke upon "Injurious and Beneficial Insects" and "Window-gardening for Farmers' Wives," at the latter upon "Injurious Insects a direct tax of 10 per cent. upon all Farm Products" and "Farmers' vegetable and Fruit Gardens."

In June I was invited to attend a summer meeting at Picton of the Prince Edward County Institute, and through the kindness of Mr. W. Boulter, of Picton, I was enabled to visit many of the farms, hop-gardens and orchards in the vicinity of Picton. Mr. Boulter's own orchard was most instructive from an entomological point of view It would be impossible to find better trimmed and cleaner trees than were there. The smoothness and cleanness of the trunks of some trees which had been planted twelve years was remarkable, and was due entirely, he assured me, to watching them at the periods of insect occurrence and then attending to them promptly. A part of his regular annual treatment has been, for some years, washing them in June, with ordinary home-made lye. He says: "This is made by filling a large barrel, 'leach' as it is called, with hard-wood ashes, pounding them in tight, and then pouring water on as it soaks up. If the ashes are pounded in thoroughly it will take two days before it starts to run. This lye is very strong. If the ashes are not pounded down well it soon soaks through and the lye is weak. The proper strength is found out by experience, as farmers' wives know in soap-making. We put this lye on all our trees every year. For trees from four to six years old, we dilute the lye about one-half with water; after that we use it nearly full strength, applying it with a corn broom, rubbing the trunks and limbs thoroughly. We also let a good deal run down the trunk to kill any insects that may be at the ground. Many have told me that the lye is too strong. I think not, and you can judge from what you saw when here. We think the lye kills many insects which harbour in the bark; at any rate, we know that since we have tried washing we have been very little troubled with borers. We also draw all our ashes from the canning factory and spread them around (away from) the trees. These I consider one of the best fertilizers in an orchard."

The black-spot of the apple (*Fusicladium dendriticum*) was found to be very prevalent upon both apples and pears. I therefore made "Fungous Diseases and their Remedies" the subject of one of my addresses at Picton. Another was "Insects Injurious to the Pea Crop."

From Picton I went to Leamington, in the County of Essex, where I addressed a meeting in the afternoon upon "Fungous Diseases of Fruits" and "Fruit Insects," and in the evening spoke on "Window Gardening." The next day was spent with Mr. W. W. Hilborn, the President of the local Fruit Growers' Association, who kindly drove me to several of the large peach orchards and farms in the district.

CORRESPONDENCE.

The interest in the work under my charge is indicated by the large number of letters which have been received. These numbered 1,547 during the last year, and about the same number were dispatched. By far the larger proportion of these were from farmers and others in Canada, but many were from co-workers in other countries. During the past summer an important step has been taken in Great Britain by the introduction, by Miss Eleanor A. Ormerod, the distinguished Entomologist of the Royal Agricultural Society of England, of the arsenites as insecticides. It is somewhat remarkable that notwithstanding the fact that these materials are now so much used in America as to be considered indispensable in the cultivation of certain crops, it is only within the last year that they have been used in England. Owing to my position as Government Entomologist, I was honoured by being consulted, at the suggestion of Miss Ormerod, as to the best treatment for certain leaf-eating caterpillars which had been committing grievous depredations to fruit trees in the south of England. In response, an account was given of the American method of treating such insects, and under Miss Ormerod's able direction most satisfactory results were secured. On 23rd December, 1890, in reply to my inquiry, "Has the Paris Green treatment for leaf-eating orchard insects, which you have introduced into England this season, proved as satisfactory as you were led to expect?" Miss Ormerod writes, after expressions of thanks for assistance, which is very highly over-estimated, as follows:—

"With regard to results of our work, so far as is to be gathered from the reports which I have received from February up to date, I consider I am justified in saying that the Paris green treatment was quite a success wherever we know that it was applied in the proportion recommended, and with tolerable sprayers." Mr. C. D. Wise, Superintendent of the Toddington Fruit Farms, says: Paris green is the only thing which we have found really efficaceous; the foliage was not injured and the caterpillars were killed. In autumn, when the operation of sticky-banding the trees was carried on as usual, the lesser quantity of wingless moths captured was very remarkable. Up to date of report nine moths on one tree was the largest number captured, against 500 previously." On the whole, this treatment was most successful, and there is little doubt that it will soon be universally used in England.

ACKNOWLEDGMENTS.

My thanks are due to many of my correspondents who have assisted by making observations and giving information concerning injuries by insects and fungi. These cannot all be treated of in this report; but the data are all carefully recorded and will be made use of as occasion permits.

I wish particularly to acknowledge my indebtedness to Prof. Riley, the United States Entomologist, and Dr. George Vasey, the United States Botanist, for the identification of specimens and for their kindness in lending me most of the excellent figures in this report; to Miss Eleanor A. Ormerod, the Entomologist of the Royal Agricultural Society of England, for Figs. 3 and 4, and to Prof. H. Garman, of the Kentucky Agricultural Experiment Station, for Figs. 1 and 2. My thanks are also due to all the above for their valuable opinions concerning many matters which I was allowed to discuss with them. Mr. B. T. Galloway, Chief of the Department of Vegetable Pathology at Washington. Prof. W. G. Farlow, of Cambridge, Mass.; Prof. B. D. Halsted, of New Brunswick, N. J.; and Prof. T. J. Burrill, of Champaign, Ill., have also rendered me invaluable service in identifying difficult species of fungi which I have no facilities in the way of library or instruments to determine.

Donations have been received from the following:—

Dr. George M. Dawson.—Several remittances of seeds and cuttings from the Rocky Mountains.

Prof. J. Macoun.—Several packets of seeds of rare native plants, as well as a large collection of herbarium specimens.

Prof. S. M. Tracy, Agricultural College, Mississippi.—A large collection of grass seeds.

Prof. W. J. Beal, Agricultural College, Michigan.—A collection of grass seeds.

Messrs. J. S. Pearce & Co., London.—Samples of European grass seeds.

Government Botanical Garden, Bangalore, India.—Two remittances of seeds of ornamental plants for the green-house.

Mr. John Mather, Ottawa.—Collection of samples of weed seeds from various points in the North-West Territories, also seeds of *Ammophila arundinacea* and *Elymus arenaria*, two grasses used to keep sand from blowing and washing along sea-shores.

Mr. J. M. Macoun.—Bulbs of *Camassia esculenta* from British Columbia.

Mr. John Tolmie.—Bulbs of *Camassia Leichtlinii* from Vancouver Island.

Mr. J. W. Mackay, Kamloops, B.C.—Seeds of native grasses.

Mr. W. Scott, Ottawa, and Messrs. J. Dearness, W. E. Saunders and J. A. Balkwill, of London, for specimens of dried plants for the herbarium.

Miss Alice Williams, Victoria, Vancouver Island.—Insects and seed.

I have the honour to be, Sir,

Your obedient servant,

JAMES FLETCHER,

Entomologist and Botanist.

DIVISION OF ENTOMOLOGY.

Fig. 1.

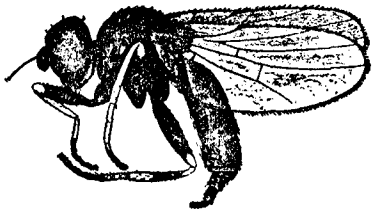


Fig. 2.

The American Frit Fly (*Oscinis variabilis*, Loew.)

Attack.—1. A small yellowish-white, legless maggot, which may be found in autumn, destroying the bases of the stems of several kinds of grasses and fall-wheat.

2. Also occurring in spring-wheat and grasses in June, attacking the young root-shoots close to the ground, and either destroying or seriously weakening them.

For the last three years a small Oscinid fly has been bred from the roots of various grasses, to some species of which the injuries had been considerable. *Agropyrum caninum*, *A. tenerum* and *A. repens* (Couch grass) suffered severely. Two forms of *Poa pratensis*, from the North-West Territories, and *Elymus Canadensis*, were also badly attacked.

During the past summer spring-wheat has been seriously injured in several places in the neighbourhood of Ottawa, and specimens of infested spring wheat, sown on 19th April, were sent to me in June, containing not only the pupæ or chrysalis cases of this fly, but also those of the Hessian Fly (*Cecidomyia destructor*, Say), and the Wheat-stem Maggot (*Meromyza Americana*, Fitch).

These specimens, which were forwarded by Mr. Freeman Britton, of Gananoque, Ont., were of particular interest. From them were reared the Hessian Fly and American Frit Fly at the end of June, and a few weeks later the fly of the Wheat-stem Maggot appeared. Thus it was proved that all of these insects attack spring-wheat in the stools or root-shoots in the same way as they are known to attack autumn-sown grain. In my last report I drew attention to the fact that the Wheat-stem Maggot attacked certain grasses in this manner; but it is now shown by the above that there is in this district a brood of each of the three above-mentioned pests, which appears in the beginning of May, and that the eggs are laid on the root-shoots of young growing grain. I am not aware that this fact has been previously noted. Later in the season abundant evidence was found as to the extent of this injury. At Eastman's Springs a field of spring-wheat was observed, the yield of which had certainly been reduced 75 per cent. In hardly any part of the field could a plant be found with more than one stem, and this was weak and spindly, with the ear frequently only half filled with grain. Upon examining the roots it could plainly be seen that the stools had formed, but had been subsequently destroyed by hosts of larvæ of the above insects. The dead plants in the drills also showed that many more plants had been killed than there were growing in the field. Of the insects occurring in the injured plants, the American Frit Fly was by far the most abundant.

The three insects are easily distinguishable in all their stages. In the larval or maggot stage, in which they do all their injury to crops, they may be known by the following characters.

1. *The American Frit Fly.*—The maggot is long and slender, of a yellowish-white colour, and has two small but distinct black hook-like jaws. The last division of the body bears two little knob-like processes. Length when full-grown, about $\frac{1}{12}$ of an inch.

Prof. H. Garman, of the State College of Kentucky, who has studied this insect and published his observations (Bulletin 30, Kentucky Agricultural Experiment Station), gives also the following differences: "Under the microscope another difference is apparent. The first two divisions and the under-side of those following are roughened with very fine raised lines, directed crosswise of the body in the wheat Bulb-worm*, while in the Frit Fly grub the first divisions and the under-side of those following in the region of the joints are roughened instead, with numerous scale-like thickenings of the cuticle, with the hind edge of each thickening finely toothed."

2. *The Wheat-stem Maggot.*—This resembles the last in shape and structure, but is conspicuously different by reason of its colour, which is clear, glassy green, and also by its much larger size, which is $\frac{1}{4}$ inch when full-grown.
3. *The Hessian Fly.*—This is proportionately much broader than the other two, of a clearer white than the American Frit Fly maggot, and nearly always shows a green stripe down the centre. Instead of the two hook-like black jaws, which are present in the two previously mentioned maggots, the Hessian Fly larva has a horny, forked organ, sometimes called the "breast-bone." Length of maggot when full grown, $\frac{1}{8}$ inch.

In the chrysalis stage the differences are equally marked:

1. *The American Frit Fly.*—The pupa-case is shaped as shown above (Fig. 1), and is of a pale chestnut-brown.
2. *The Wheat-stem Maggot* changes to a pale translucent green pupa.
3. *The Hessian Fly.*—The pupæ of this insect are of a deep, rich brown, like small flax-seeds, Fig. 4, and it is in this stage that farmers will most easily and surely recognize the Hessian Fly when present.

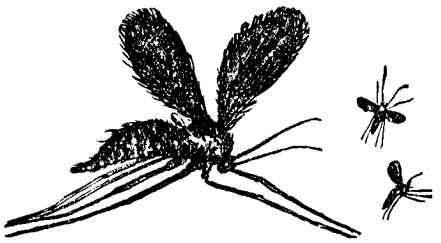


Fig. 3.

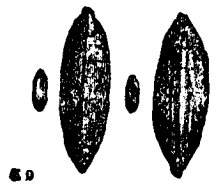


Fig. 4.

The attacks of these three insects also differ somewhat, although the effect upon the crop is of course similar. The only known method of attack upon our grain and grass crops by the Frit Fly is by the larvæ attacking the young shoots at the ground. The egg is probably laid near the base, on the upper side of the leaf, and when it hatches the young maggot works its way down and destroys the centre of the young stem. There are, however, sometimes as many as four or five puparia found in a single dead shoot. These do not appear to always lie in the centre of the stem, but between the bases of the sheathing leaves; but when there is only one larva it is generally in the middle of the shoot. This attack is very similar to an injury to grain by an insect of the same family *Oscinis*, which has been known for many years in Europe, and which is sometimes very injurious to oats and barley.

The Hessian Fly (Fig. 3) lays its eggs in the crease on the upper side of the leaves, and the young maggots work their way down to the heart of the plant just inside the leaf whereon they hatched. They lie there until full grown, and turn to "flax seeds," two or three being frequently found round one stem. They have not the

* = *Wheat-stem Maggot.*—I have used this name heretofore because the stem attack, which I have styled "Silver-top," is the more conspicuous of the two injuries committed by this insect.

power to tear up the tissues of the plant, as is done by the Frit Fly and Wheat-stem Maggot, because they have not the hooked jaws; but they do effect a certain amount of penetration, for they are frequently found partially embedded in hollows in the stem of the plant they are infesting. The Wheat-stem Maggot is hatched from beautiful white grooved and elongated eggs, which are laid upon the upper surface of the leaf, sometimes at a considerable distance from the axil. When the young maggot hatches, it like the others referred to above, works its way down into the shoot and destroys the central leaf. It tears the tissues apart and eats a gallery up the centre of the shoot. In the summer brood the maggot occurs at the base of the top, or ear-bearing joint, and by consuming the lower portion causes the ear to die and turn conspicuously white ("Silver-top") before the uninjured plants have shown any sign of ripening.

The perfect forms of these insects are extremely unlike. The Frit Fly is shown at Fig. 1 very much enlarged. The colours are black and yellowish-white. It is a very small insect, large specimens being only about $\frac{1}{15}$ of an inch in length. They are extremely active and hard to observe.

The fly of the Wheat-stem Maggot is a slender yellowish-green fly, $\frac{1}{8}$ of an inch in length, with three dark lines extending down the back. Eyes golden-green, when the fly is alive.

The Hessian Fly is a delicate dusky gnat, well shown in Miss Ormerod's excellent figure (No. 3,) where it is represented magnified and enlarged.

The somewhat remarkable popular name of the Frit Fly is explained by Miss Ormerod and Prof. Garman as follows:—

"Besides the attack to the young growing plant, great damage was recorded formerly in Sweden from the second or summer brood, the maggots of which fed on the soft grains in the ears of barley, and thereby caused the light worthless development of the corn, known in Swedish as 'frits,' whence the name of the fly. (Ormerod, E. A. Manual, 1890, p. 74.)

"The fly was long ago named *Oscinis frit* by the illustrious Linnæus, who also made record of its injurious habit, stating that in 1750 the annual loss from its depredations in Sweden alone reached 100,000 gold ducats." "From the accounts of the Frit Fly given by Curtis and Miss Ormerod it is evident that the insect works on grain much like a small fly which I find in the grub state infesting wheat in Fayette County, Kentucky. In structure and habit, as far as I have observed the latter, it proves so like the Eurepean species, that it might perhaps be appropriately named the American Frit Fly." (Garman, H., Kentucky Ag. Ex. Station. Bul. 30 August, 1890.)

Of all the insects attacking grain crops in the Ottawa district last summer, the American Frit Fly was by far the most destructive. In all cases observed the Hessian Fly and Wheat-stem Maggot were found associated with it. The injury to the plants was almost exclusively in the stools or root-shoots, and the usual summer attacks of the two last named insects on the stems of grain were conspicuously absent. On the other hand, the attacks upon the stools by the summer brood, in the same manner as fall wheat is attacked in the autumn, were this year for the first time observed.

That the American Frit Fly was abundant in the locality previous to this season was shown by its presence in injurious numbers upon the grass patches at the Experimental Farm during the seasons of 1888 and 1889. Indeed, it was so abundant that in these years, as well as during last season, the extermination of some species of grasses was threatened.

There were peculiarities about the attacks of all these insects during last season which would indicate that they may have been influenced by some meteorological conditions, and it is possible that these may have affected the growth and maturing of grasses and grain in the early spring. A remarkable fact was the enormous abundance of the perfect insects of the Wheat-stem Maggot in the month of May. This was so great as to have caused fear of a serious destruction of the wheat and barley crops. As a matter of fact, however, there was less injury both to

small grains and grasses, by this insect, than for many years previously. This diminution I can only account for by the supposition that the eggs must have been destroyed by some predaceous insect. The eggs were certainly laid in large numbers, but there was very little evidence of the presence of the larvæ, either in the growing wheat or barley.

Remedies.—The life-history of the American Frit Fly, in all its phases, is not yet completely worked out, and much careful work is yet required, of which accurate notes must be taken at the time of observation, before any definite statement can be made as to the best remedies to apply.

From what is known of its habits, which seem to be very similar to those of its associates the Hessian Fly and Wheat-stem Maggot, some of the remedies which have been suggested for those insects may be applied for this.

The insect passes the winter in the form shown at Fig. 1, either in fall-wheat or grasses. When fall-wheat is attacked a liberal top-dressing of some quick-acting artificial fertilizer, sowed broad-cast over the fields in springtime, when growth re-commences, would help injured plants to overcome part of the injury by production of supplementary stools.

A knowledge of the exact time of the occurrence and the number of the broods would be of great use towards an intelligent treatment of stubbles and volunteer crops, by burning over or deep-ploughing, after a field had been found to be attacked.

I shall be obliged if any one who finds his crop attacked by this insect will correspond with me promptly upon its first appearance.

So far it can only be stated that two species of parasites were bred from this insect during the past summer. The specimens were accidentally destroyed so nothing more can be said at present concerning them.

The two figures used to illustrate the pupa and perfect fly of the American Frit Fly are by Prof. Garman, who has been good enough to lend me the blocks. They show the stages fifteen times larger than in life, and will be a great assistance in identifying the insect wherever it may be observed.

The Cabbage Maggot. (*Anthomyia brassicæ*, Bouché.)

Attack.—From one to many white, legless, maggots, which attack the roots of young cabbage plants soon after they are pricked out, frequently destroying all the roots and burrowing in the stems.

In most parts of Canada the insect which gives the greatest trouble to the cabbage-grower is the Cabbage Maggot. This is the larval form of a small gray, two-winged fly, somewhat resembling the common house-fly, but smaller, and with a slenderer body. The wings, too, shut one over the other, and are conspicuously longer than the body. The thorax, or portion to which the wings are attached, in the male bears three dark stripes, and there is also one down the centre and on the edge of each ring of the abdomen or hind-body. The female resembles the male, but is more ashy in general colour, and has not the stripes on the thorax nor the bands on the abdomen.

It is the usual custom to force cabbage in frames, which are kept covered during the first part of the season, but are left open for some time before the young plants are pricked out in the field or garden. Although in years of bad attack plants are sometimes injured in the frames, this is the exception. As a rule, they are not infested until some time after they are transplanted. It is probable that the handling, and the partially faded condition of the plants consequent to their transplantation, bring out the characteristic odour of the cabbage, and that this attracts the female flies, which lay their eggs close to the stem and as much below the surface as possible. The females will spend a good deal of time running over the earth and trying to find some crevice by which they can creep beneath the surface of the soil and lay their eggs close to the stem, or they will creep close up to it and push the eggs down below the surface by means of their extensile ovipositors. These eggs in a few days hatch, and the young maggots at once attack the outside

surface of the root. As they grow larger they penetrate the stem and when there is only one it appears to remain inside the stem; when, however, as is frequently the case, there are a dozen or more, most of them lie outside in the soil, which is kept wet by the juices of the injured plant.

The maggots when full grown are white, about ¼ inch in length, with the front end pointed, and furnished with two hard black hook-like jaws. The hind end is cut off obliquely and flattened with an irregular rosette of fleshy points round the margin, and on the flattened surface two conspicuous dark-brown points, which are breathing pores. These maggots are a great pest to the cabbage-grower, destroying large numbers of his plants when he thinks he has saved them from the omnivorous cut-worms.

Unless very numerous at the root of a cabbage it takes some time before the injury becomes apparent. There is a common saying that "the maggot takes them after the first thunderstorm in July." In the Ottawa district there is frequently a thunderstorm early in July, followed by hot, muggy weather. This is the time that cabbages which have been badly injured at their roots by the maggots succumb. The injury has been going on for some time, but the June rains have enabled the plant to preserve a healthy appearance; immediately the hot weather comes it turns pale and the leaves droop. If one of these plants be taken up it will be frequently found that the roots and all the lower part of the stem have been utterly destroyed, and many of the maggots are full grown.

The past season was marked by the great abundance of this insect. In a large patch of various kinds of cabbages, containing about 1,200 plants, which I examined 22nd June upon the Central Experimental Farm, I could find very few plants which did not show the work of the maggot upon the roots or on the underground stem, and in many gardens from one-half to three-quarters of the crop was destroyed. During the first part of July several letters were received, complaining of its ravages, from various parts of the Dominion. However, during the last week of June I visited the County of Essex, and was much surprised and pleased to learn from farmers and gardeners that this insect was practically unknown in the district round Leamington.

Remedies.—A satisfactory remedy for this insect has long been a desideratum. From some experiments tried during the past season I have received such success that although they are not yet complete and will require further verification, I consider it well to relate the details, so that, should the remedy prove satisfactory, others may have the advantage of the knowledge as soon as possible.

Some three years ago I was told of some experiments, made by Mr. S. Greenfield, of Ottawa East, to destroy the onion maggot by the use of white hellebore. This was made into a decoction, and watered along the rows of half a bed, with the result that the onions upon that portion of the bed were far superior to those on the part untreated. In fact, the onions were almost all sound, whilst the others were nearly all destroyed. This led me to try the same remedy for the cabbage maggot, and the result this year has been successful beyond all my expectations.

About 1st July the whole of the bed of 1,200 cabbages mentioned above was gone over by myself and one assistant. One person carried a 3-gallon pail full of water in which 2 oz. of white hellbore had been steeped, and an ordinary green-house syringe, the other placing the left hand beneath the cabbage, palm downwards, with two fingers on each side of stem, drew away the surface soil from the root of the cabbage, and at the same time, with the right hand, pulled the head a little over, so as to expose the roots. About half a tea-cup-full of the liquid was then syringed forcibly round the roots, and the earth was quickly pushed up again round the stem. The result of this treatment was that only about 1 per cent. of the cabbages was lost.

There is no doubt that the forcible syringing of the liquid removed the maggots to some distance from the roots; but by actual experiment it was found that the white hellebore killed them also. Furthermore, the moisture was of great assistance to the cabbage in recovering from the injury. The power of the cabbage plant to survive and out-grow injury is very remarkable. Several plants of which the roots

and nearly all the underground stem had been destroyed, were washed and trimmed, and then planted and watered, and the earth kept well hoed up round them. Every one of these grew and produced a head. In years of only light attack it is not at all uncommon to find, when cabbages are pulled up, that they had been supported by roots which were produced some distance above the original root-mass, which had been destroyed early in the season by the cabbage maggot.

Frequent cultivation or light hoeing is of great benefit to cabbages in dry weather. By this means the thin layer of surface soil is loosened, aërated and thoroughly dried, so as to become a non-conducting medium, which prevents the evaporation of moisture from the soil below. Hoeing the soil well up to the stems of cabbages which have been injured gives them a chance to make fresh roots, and also prevents the flies from getting at the stems to lay fresh eggs.

In the third week of July, I visited the garden of Mr. S. A. Fisher, M.P., at Brome, P.Q., and was shown by his gardener, Mr. Louis Graindorge, a bed of cabbages which was in some parts badly infested with the Cabbage Maggot. I suggested that he should try the Hellebore application, and the whole bed was treated. One particular plant was taken as a test and marked. This was so badly injured that the root was almost severed from the head by the attacks of the maggots on the underground stem. There were more than a dozen of the larvæ lying close to the stem in the earth, which was quite wet from the juices of the cabbage. The earth was carefully removed sufficiently to pour in the decoction around the injured stem and then was replaced, the larvæ being disturbed as little as possible and left where they were at the root. In the end of September Mr. Graindorge writes me: "All the cabbage plants are doing well. Your test plant, the one which was nearly dead when you treated it now weighs about three pounds. I am very much satisfied with this experiment, and shall certainly try it another year and begin earlier in the season, when I believe I shall be able to save all my plants."

In the above mentioned experiment it would appear that the Hellebore killed by contact, for where a dozen cabbages were treated with Paris Green and water, 1 lb. to 100 gallons, not only did it fail by noticeably checking the growth of the cabbage, but the maggots were not killed. In applying this hellebore remedy, care must be taken not to dig down too deep or disturb the root too much. The chief seat of injury is the underground portion of the stem above the mass of roots. If about two inches of the soil be removed that part of the stem most attacked is laid bare, but the roots need not be disturbed. An important thing is not to put off treatment too long. In this district injury is made manifest in the first week of July, examination should therefore be made, and the remedy, if necessary, applied about the third week in June.

Late planting has been rather extensively practiced by some growers, but is not always a satisfactory remedy. With early cabbage the most paying market is over before they are ready, and with winter varieties there is the risk of their not heading well before winter sets in. The actual success of the practice however as a preventive of attack is sometimes most marked.

The greatest amount of injury is caused by a brood of flies which appears in the middle of June and up to about the first week of July. Cabbages planted out in the middle of July were not at all troubled by the Maggot. This was in low moist ground where the plants did not suffer from drought. They were kept well cultivated and produced a large crop of fine cabbage.

It is not, of course, wise to grow cabbage upon land where there has been an infested crop the previous year. The usual method of hibernation is in the puparium form; but the attack continues throughout the whole growing season, and where, as is frequently the case, the ground is not cleared up in the autumn and stems of cabbages that have been cut, or "blind" plants which have not headed, are left in the fields all the winter, many larvæ hibernate as such, in the stems and roots. This shows the importance of cleaning up and ploughing the fields in autumn. In this way many larvæ and pupæ will be destroyed, both by exposure to the weather under unnatural conditions and in other cases by being buried so deeply that the flies cannot emerge.

Nitrate of soda is also recommended by some growers. This is applied as a surface dressing in June and is washed in by the spring rains.

In my Report for 1887, I related the success attending the use of this fertilizer by Mr. R. Brodie, of Montreal. His method of using it was to place about a tablespoonful of nitrate of soda around each plant. One row of plants not treated with nitrate of soda was destroyed whilst the others were untouched.

In Miss Ormerod's New Manual of Injurious Insects the following appears at p. 27 :—

"When attack is present, heavy showers of rain, on land previously dressed with nitrate of soda round the plants, and superphosphate, stopped the spread of the maggots. Also, the application of lime-water has been found very serviceable. The plan adopted was soaking hot-lime for twenty-four hours in water, and watering with this, when clear, in the afternoon. This was found to destroy the maggot.—(J. Mc K.)"

Another active remedy which has been used with good effect is a Kerosene Emulsion applied beneath the surface as recommended above for the Hellebore decoction. Sand saturated with coal oil, placed round the base of the stems immediately after the plants are set out is a good preventive; but must be repeated every week until the middle of July.

In addition to all that man can do to keep down the numbers of this troublesome insect, he has a most potent ally in the shape of a small beetle belonging to the Staphylinidæ or Rove Beetles. This little friend which is named *Aleochara Anthomyiæ*, Sprague, is a small black elongated beetle, which was found in considerable numbers running about amongst the cabbages and burrowing down beneath the soil in search of the maggots. Not only is it extremely active in preying upon the maggots, but it is also a true internal parasite feeding inside them and completing its transformations inside the pupa case. In the hope of rearing this beetle, 16 larvæ and pupæ were taken from the root of a cabbage, where the perfect beetle had been seen and were enclosed in a breeding jar. From these were reared 9 beetles and one fly, the remainder of the pupæ dried up without coming to maturity. In some of them, however, the immature beetles were found when the cases were broken. When the beetle eats its way out of the pupa-case it gnaws a ragged hole at one end quite different from that made by the emergence of the fly. A description of the habits of this little beetle is given with a figure in Prof. Lintner's first report on the Insects of New York, p. 188, and mention is made of it in Prof. Riley's 1884 Report. The full description by Mr. Philip S. Sprague is to be found in the American Entomologist, Vol. II, p. 370. It is a small, slender, black beetle, about $\frac{1}{6}$ of an inch in length, covered all over with short silky hairs. The most notable features, when it is examined under a magnifying glass, are that the whole body is covered with hairs and small punctures, these are less numerous on the head, thorax, and first four joints of the antennæ, which thereby look blacker than the rest of the insect. The wing cases in some specimens have a greenish-coppery sheen. The feet are brownish which colour gradually deepens into black on the shanks or tibiæ. The antennæ after the fourth joint are so densely covered with short hairs as to have a grey appearance. I have generally been able to find a few of these beetles in beds of cabbages infested by the Cabbage Maggot and upon one occasion bred a specimen from the Onion Maggot. It is probable that other species of the genus are also parasites, but nothing definite is known of their habits. Mr. W H. Harrington has shown me specimens of *A. lata*, which he found in a breeding jar containing the cocoons of saw-flies. It did not occur to him at that time that they might be parasites, and the fact was merely recorded in his notes without any special examination being made of the cocoons.

A new attack of a serious nature by an Anthomyian larva has come under my notice during the present winter.

I have found full-grown larvæ mining in the mid-ribs and also boring through the heads of winter cabbage. These have not so far been bred to maturity, but from the larvæ and pupæ, I am unable to distinguish them from the Cabbage Maggot and

believe they are that species. The varieties of cabbage most attacked belong to the class known as Savoys, which have hard, close heads. A few other varieties, however, were also attacked. The eggs are apparently laid near the top of the head and the young maggots work their way down between the leaves, generally following the course of a mid-rib, frequently confining their operations to that alone, but also sometimes boring straight into the heart of the cabbage and thus rendering it unsaleable. There does not appear to be much decay of the tissues, but simply an irregular channel is eaten out, which is filled with the shredded tissues of the leaf and a mucilaginous exudation from the plant.

Some of the larvæ have turned to pupæ inside the cabbages; but others placed in breeding jars have buried themselves in the soil.

I have so far received no complaints of this injury from outside sources; but should it become widespread, it will be a matter demanding the earnest attention of entomologists, to discover a remedy as soon as possible. As many as twenty larvæ were taken from one head.

In Prof. Riley's report for 1884, mention is made of a summer attack upon the mid-ribs of the leaves, as follows: "Our first acquaintance with this insect was in June, 1867, when Prof. A. N. Prentiss, then at the State Agricultural College, Lansing, Mich., sent us specimens of the larvæ, with an account of their gnawing and excoriating both the stems and roots of cabbages, and thereby doing much damage. They transformed June 21-25, just below the surface of the ground, to puparia of a honey-yellow colour, some lighter, some darker, and the first flies issued June 29 onward. We have since (in 1878) found the species not only working in the normal way in the roots, but also burrowing in the stout mid-ribs of the leaves. From June 8-13, quite a number of the perfect flies were obtained." This summer attack I have also occasionally noticed at Ottawa; but it is of far less importance than the winter attack above-referred to, because when the individual leaf only is destroyed, the plant soon replaces it, and when, as is usually the case in this attack, the stem is also injured, the plant is destroyed early enough for it to be replaced by a healthy one. This summer attack also has been very rare in my experience; the winter attack, however, is more serious, because the maggots work in the solid heads after they are stored in the root-house. I am under the impression that in ordinary summers, here, there is not sufficient moisture in the atmosphere above the surface of the soil to allow the young maggots to live long enough to penetrate the epidermis of the leaf before they are dried up. In the case of the eggs of the Onion Maggot (*Phorbia ceparum*) out of several clusters of eggs laid in the axil of the first leaf, where the ground beneath had been sprinkled with sand saturated with coal oil, not a single maggot effected an entrance, and in only one instance have I ever found an individual of this insect in the stem of the onion above the surface of the ground.

The Diamond-back Moth (*Plutella cruciferarum*, Zell.)

Attack.—Small green, exceedingly active, caterpillars about ¼ of an inch in length, which attack the leaves of cabbages, eating numerous small holes through the younger leaves and irregular blotches from the under surface of the older leaves. When disturbed they run backwards, wriggling their bodies violently from side to side, and fall to the ground by means of a silken thread, where they lie quite still.

This little insect although very small is a serious pest to cabbages every year in some parts of British Columbia, the North-West Territories and Manitoba, and in 1889 was extremely troublesome upon the Experimental Farm here. The eggs are laid on the under sides of the outer leaves of cabbages and many other plants belonging to the same botanical order. I have found the caterpillars on turnips, cabbage, cauliflower, pepper-grass (*Lepidium*), shepherd's purse, and in 1889 it was an incessant and most troublesome pest upon garden stocks and wall-flowers from about July till the frosts set in in November. The caterpillar is pale green in colour, sometimes almost yellow, and bears some black dots and short bristles in regular series, as shown at Fig. 5—*b-c*. When full grown the larvæ spin pretty open net-work

cocoons upon the lower surfaces of the leaves, through which the pupæ can be easily seen (Fig. 5—*e*). These cocoons are open at each end. The pupæ (Fig. 5—*d*) are very pretty objects, being white with conspicuous black lines down the back and sides. In some specimens, however, these lines are entirely wanting, while in others they are so wide as almost to cover the whole chrysalis. The sheaths of the legs, tongue and antennæ are also dark coloured.

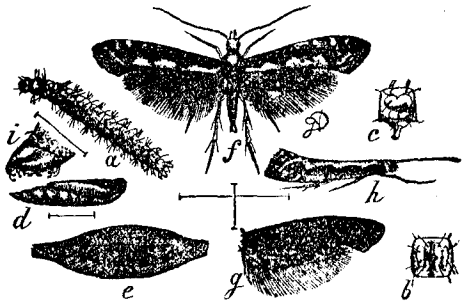


Fig. 5.

Fig. 5 is by Prof. C. V. Riley, who kindly lent me the figure.

The perfect moth is a beautiful, slender little creature, very variable in size and markings. A well marked example is shown in Prof. Riley's excellent enlarged figure above. The actual size of the moth is shown by the crossed hair-line beneath. The general colour is ashy-gray, with the light stripe of somewhat diamond-shaped marks on the back, more or less distinct, and in some specimens almost or quite wanting, as shown at *g*. The upper wings are freckled with black dots and small blotches of yellowish scales. The inner irregular margin of the light stripe is bordered with clear white, and is shaded outside with rich brown, which extends up the middle area of the wing to the end. The legs and body are silvery gray and the antennæ or feelers white, ringed with black.

There are two or three broods of this insect in the year. At Ottawa, Ont., the first moths were taken July 1, 1889, the only year I have ever found it here. Moths were also found through August and September, and the larvæ into November; the last brood passes the winter in the pupa state. Moths were first seen in Victoria, V. I., in 1885, in the month of May when I found it a most troublesome pest. Caterpillars taken at Regina, N. W. T., in the first week of August, did not emerge at Ottawa until the next spring; but a large number sent from Indian Head, N. W. T., at the end of last August, emerged during the next month.

This moth is said to have been imported into America from Europe; but is found in various parts of the world besides. A peculiarity of its occurrence is in the enormous numbers in which it sometimes appears and then as suddenly disappears entirely and is not seen again for several seasons. In 1885 it was most abundant at Victoria, but has not been reported since. In 1887 at Regina in Captain Deane's garden cabbages were almost destroyed. In Winnipeg, in 1885, it was a serious pest, but has not been complained of since. In 1889 it suddenly appeared in great numbers over a restricted area upon the Experimental Farm here. It was first observed upon a clump of Pepper grass (*Lepidium Virginicum*), from this it spread to almost every cruciferous plant near this patch, attacking various garden flowers as well as turnips slightly, and cabbages severely. Last season although sought for assiduously not a specimen could be found.

During 1889 also it was sent in by Mr. S. A. Bedford, the Superintendent of the Experimental Farm for Manitoba. He had found it a most troublesome pest amongst his cabbages at Brandon. It was also sent in from other parts of Manitoba; but did not occur last year. In August, 1890, Prof. Saunders sent me specimens from the Experimental Farm for the North-West Territories at Indian Head with the following letter:—"I send you herewith some small larvæ and chrysalids of a

moth which has proved a very serious injury to the cabbages and cauliflower on the farm here. The outside leaves are all completely riddled with holes of various sizes and the larvæ also eat into the first two or three leaves on the head disfiguring the cabbages and making them worthless." Upon enquiry Mr. A. MacKay informed me that a few specimens were noticed last year; but that it had been abundant this year right through the season. The eggs are laid under the leaves where the caterpillar chiefly works. Although so abundant with him, it did not occur in other gardens near by.

Remedies.—I found that this insect was much more difficult to kill with Insect powder (*Pyrethrum*) than most of the other larvæ upon the cabbage. Hellebore was slightly more effective; but the most satisfactory remedy was a Kerosene Emulsion prepared after the usual manner (kerosene 2 parts, boiling soap-suds 1 part (1 gallon of water and ½ lb. soap), and the whole churned with a syringe until emulsified and then mixed with 9 times its quantity of cold water. To make the emulsion, boil the soap in the water till all is dissolved and then turn it into the kerosene and churn violently.

When the caterpillars appear early in the season, before the cabbage-head begins to form, Paris Green and flour, one part of the former to fifty of the latter, may be dusted on the plants. The Kerosene Emulsion will, however, probably be the best remedy, because owing to the readiness with which the caterpillars drop to the ground from beneath the leaves, they would be sure to be covered with the kerosene mixture which dripped from the cabbages, even if they were not touched by the spray when they were on the plants. The most convenient method of applying the Kerosene Emulsion is by means of a force-pump and spray nozzle; but it may also be applied (although clumsily and wastefully) by means of a whisk or small broom.

This insect increases most rapidly in hot, dry summers, and Dr. Cyrus Thomas, in the Ninth Illinois Report, p. 56, suggests "that thoroughly showering the vegetation, which is attacked, with water will be found a most effectual remedy for the expulsion of the worms of this group."

Miss Ormerod also mentions: "In the South African observations, sent by Mr. J. deWitt Meulen, of the Witterhock, he noted 'heavy rains or frequent watering of the leaves destroys many grubs.'" (New Manual, p. 194). Dressings of soot and nitrate of soda and soot, are also recommended. Miss Ormerod says: "Almost the only method of lessening amount of damage from presence of these caterpillars appears to be from natural or artificial applications suited to drive on growth." In her manual it is treated of as a turnip insect. Upon that crop there need be no hesitation about treating it with Paris Green mixed with either flour or land plaster. These diluents must, however, always be perfectly dry, so as to be applied in the form of fine dust. If they are not they must be dried artificially or, I find, they will not adhere to the plants.

Natural Enemies.—This insect is remarkably subject to the attacks of parasites. In every one of the attacks recorded above more than 50 per cent. of the caterpillars collected were found to harbour internal parasites, which eventually destroyed them and emerged as small four-winged flies. Some of these have been sent to Prof. Riley, at Washington, who has kindly identified them for me as *Limneria parva*, Prov., bred from all localities, and *Phœogenes discus*, Cress, bred from Indian Head and Ottawa. Prof. Riley has also bred *Limneria annulipes*, Cress, from the same insect.

This little moth has been treated of by authors under various names. Asa Fitch, in Report II, p. 170, (1855) gives a very full account of it under the name of "The Cabbage Moth," *Cerostoma Brassicella*. Later, it was described by Dr. Clemens under the names *Plutella limbipenella* and *P. mollipedella*. Dr. Thomas, in Ill. Rep., IX, treats of it as the Cabbage Tinea, *Plutella cruciferarum*, Zell., and Prof. Riley, in his Second and Fourth Missouri Reports, refers to it under the same name. In his 1883 report as United States Entomologist, he gives some interesting information not found in the other accounts The popular name he uses in this article is the Cabbage Plutella. Miss Ormerod uses the name, "The Diamond-back Moth," that

being the name by which I have always known and spoken of it, and by which it is known in England, at the Cape of Good Hope and in Australia.

John Curtis, in his "Farm Insects" (1860), treats of it as The Turnip Diamond-back Moth (*Cerostoma xylostella*, L.) and states that in Europe it lives principally upon the upright honey-suckle, *Lonicera xylosteum*, and attacks a great number of culinary plants; but seems to prefer the cabbage and turnip.

The Mediterranean Flour Moth (*Ephestia kühniella*, Zeller).

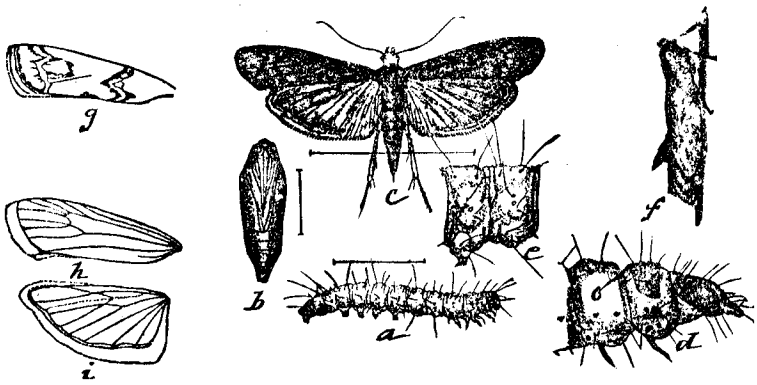


Fig. 6.—The Mediterranean Flour Moth (*Ephestia kühniella*,): *a*, larva; *b*, pupa; *c*, adult enlarged; *d*, head and thoracic joints of larva; *e*, abdominal joints of same—still more enlarged; *f*, moth from side-resting; *g*, front wing, showing more important marking; *h*, venation of fore-wing; *i*, venation of hind-wing—somewhat enlarged; (*a*, *b*, *c* and *e*, (Riley) *d*, *f*, *g*, *h*, *i*, (Snellen).

Attack.—Slender white or pinkish, cylindrical, caterpillars. When full grown from ½ to ¾ of an inch in length, with reddish brown heads, and having four conspicuous, and two smaller, dark bristle-bearing dots on each side of every segment. These caterpillars are found feeding in flour and manufactured foods prepared from wheat, rice and Indian corn, through which they burrow, spinning silken tunnels and threads wherever they go. They also infest the mills where these grains are ground, doing much harm by clogging the apparatus and by destroying the fine silk gauze of the machines.

In my last report I drew attention to the occurrence of the Mediterranean Flou Moth in Canada as an injurious insect, and in such numbers as to have already caused at the time of discovery considerable pecuniary loss to the firm into whose premises it had been introduced.

Mention was also made of the thorough investigation which was undertaken by the Ontario Government under the direction of Dr. P. H. Bryce, as Secretary of the Provincial Board of Health, and the vigorous measures which were adopted to ensure the eradication of a pest which it was justly surmised might materially affect one of the most important products of the whole North American Continent.

The gravity of the case demanded the full treatment which I gave it in my last annual report, and in order that the identification of the moth by millers and those most concerned might be facilitated, the above excellent figure, showing the moth in all its various stages, was lent to me by Prof. Riley, the United States Entomologist.

The official bulletin, prepared with great care by Dr. Bryce, illustrating the insect in all its stages and also giving full instructions as to the course to pursue should the insect appear in any mill, was widely distributed and noticed in the public press, "and was also sent to Boards of Health, members of the Ontario Millers' Association, and to such other persons as it was known would be interested in the matter." A particular request was made that the Board of Health might be notified of any occurrence of the pest, and promises were made of such practical assistance as the great interests at stake demanded.

It might naturally have been supposed that millers and produce dealers would have taken a little trouble to understand this matter and assist the Government in carrying out these measures which were being adopted for their special benefit; but such is by no means the case; and a most remarkable apathy and indifference prevails amongst millers in the very centre where one of their number has suffered so severely for unwittingly committing the same offence of "not thinking there was anything to fear," when the moths were found on his premises, which some of themselves are now guilty of, with the great difference that they, having been warned and shown the danger to themselves, their country, and the whole of North America, have no excuse for such unpardonable carelessness.

It is strange that no enquiries for information concerning this much-to-be-dreaded enemy have been sent either to the Ontario Board of Health or to this Department from millers of the city, where it first occurred and still exists. The enquiries have all been from millers of other Canadian or United States cities, where the moth had not appeared, or from consumers who have, upon several occasions, sent in larvæ for identification.

With regard to the steps taken by the Provincial Board of Health, and the Milling Company, on whose premises the caterpillars of the Mediterranean Flour Moth worked such havoc last year, it is very satisfactory to be able to report that they were entirely successful. The manager of the mill writes as follows: "I am thankful to say we are entirely free of them; but knowing the great danger if we ever allowed them to get a foothold in our premises, we have exercised the closest scrutiny the whole time, and every suspicious appearance has been at once attended to. A few straggling specimens were seen last spring. One hearty full-fledged fellow was found in the office in April. This must I think have come out of the books, which were not steamed. A few shrivelled up specimens were found in the packing room in June, and these we traced to an old trunk containing some clothes that a mill-wright had left, who had worked in an infested mill. This trunk had escaped our notice when the other things were steamed. We kept a sharp lookout all summer, and the only other discovery was under a hopper that had been put down without steaming. As soon as this was discovered we put the hopper and all material around it into the furnace. From the above facts you will see what a terrible pest this is to get rid of. We were not absolutely clear of the moth until mid-summer, even after all the steaming, burning and extra caution we had taken. Since August, however, we believe and claim that we have been absolutely free; but if we had not adopted all the measures referred to by Dr. Bryce in his report and followed up the stringent measures with a vigilance that many people considered altogether unnecessary, we should not have been clear of it now; but we feel sure that the pest would have come upon us with increased strength. We have great confidence in steam as a remedy, and we have so planned our mill that we can at any time fill it with steam and sulphur fumes should it ever be necessary. We keep it also cold—freezing cold—and have plenty of light. During this summer we have kept it thoroughly cleaned and dusted, and some places scalded, all ceilings and walls swept several times. Every bag, barrel, package and movable thing moved frequently, and in this way we have at last conquered this dire enemy. You enquire about possible infestation by means of bags returned to us. With regard to these, and sometimes goods from shops which may have been infested, I may say that we have had a room built which we heat up to 250° and into this we put everything we are the least doubtful of. This is not much trouble; at least, we do not consider it so, when we consider the possible danger it saves us from, and if some of the men who are now making light of this scourge, should get into the position we were in, they will wish they too had taken this precaution.

"In conclusion, sir, I do trust that you will not let this matter drop. I have been surprised all this summer to see the apathy, indifference and manifest carelessness about this moth on the part of those most interested. I have repeatedly telephoned and written about it. I also sent out and investigated certain stores, and found that in some places they were swarming; again, others came and told me that they were infested with the moth and did not know what to do about it. I am still

afraid that unless more extreme measures yet are adopted, this awful pest will get such a foothold that it will be impossible to eradicate it. Now is the time to kill them out. They can't stand severe cold, plenty of light and cleanliness, but they do thrive in heated, dark and dirty places, such as many of our stores and feed shops provide them with. If they once get a hold there they will increase marvellously and spread rapidly. The winter is the best time to begin the war of extermination. In every place, mill or shop where there has been trouble, the frost should be allowed to enter several times during the winter. When zero weather comes the windows and doors should be thrown open and the places cleaned thoroughly from top to bottom and all the rubbish burnt. This would make a good beginning, to be followed up next spring with great vigilance, and upon the first appearance of moths a prompt application of the remedies recommended in Dr. Bryce's pamphlet and your reports."

There can be no doubt but that if millers and produce dealers would all recognize the danger of allowing this pest to increase, and would adopt the wise suggestions of my correspondent above quoted, a great deal might be done towards the extermination of this enemy; but this is a matter which, from its importance to the country at large, concerns everybody and I have not scrupled to request such consumers as have applied to me for information, to warn dealers from whom they have purchased infested foods of the nature of the infestation, and at the same time to remove their custom to such firms as would supply pure, clean food.

So little attention was paid to this important matter by the millers of Toronto, and the insect was found to have increased to such an extent, that the Provincial Board of Health found it necessary to issue, in October last, a printed circular letter addressed to millers and produce men, from which we learn that the insect has been found in several large establishments. The secretary of the Board (Dr. Bryce) goes on to say: "The Board, in view of the measures taken last year, not only to apprize millers and produce men of the nature of the pest which threatened them, but also of the offers of co-operation in the endeavours made to stamp it out, should it again appear, has to regret that its endeavours have not been seconded by the persons most immediately interested. In view, therefore, of the great loss which the reputation of the Province in the matter of pure grains and flours would sustain in its export trade, in addition to the health interests involved, should the pest become generally prevalent, the Board publishes herewith, not only the authority under which its inspections and those of local Boards are made, but also the penalties attached to any violation of the statute in the matter of selling unsound grain or flour."

A copy is here given of the Provincial Act (47 Vic., c. 38, s. 39 and s. 40), by which it is provided, that any medical officer or sanitary inspector may at any reasonable time inspect any mill and examine the goods being manufactured for sale as food, and may condemn and order to be destroyed any food-products which may be found to be unfit for use. In addition to this, the person exporting them for sale shall be liable to a penalty not exceeding $100 for each parcel of grain, bread or flour.

An appeal is made to millers and others to co-operate in the important matter of maintaining the reputation of Canadian grain and flour. In conclusion, the steps to be taken to stamp out the pest are reprinted from the Bulletin issued last year, so as to give them the widest possible publicity.

Remedies.—The remedies for this most persistent enemy have been already referred to, and consist chiefly of great cleanliness and constant vigilance when the perfect insects appear; frequent fumigation should be made with sulphur, so as to destroy all the moths before they lay eggs for another brood. This should be done night after night, until not a moth is to be seen. Dr. Bryce gives the following instructions for making sulphur fumes; "Place a metallic dish containing hot ashes on some support in a pan of water, or place in an old pan or other vessel, a bed of ashes at least 6 inches deep and about 15 inches in diameter, and place the sulphur and saltpetre in a slight depression in the centre, and ignite. The proper proportions are 3 lbs. sulphur and 3 oz. saltpetre per 1,000 cubic feet of air space. All

doors, windows and other openings should be tightly closed before the sulphur and saltpetre are ignited." If the fumigation with sulphur be persistently kept up, and the mill be frequently swept and kept clean, this pest can certainly be kept in check; but the treatment must be incessant. There are probably two normal broods of this insect, one emerging in the spring and another in autumn; but in a jar kept constantly under observation, in my office (which was heated during the winter), there have been, I judge, three distinct broods; although from the fact that some retarded individuals have been emerging the whole time, and no special study was made of them, it has been very difficult to keep track of the separate broods. These insects are very retentive of life, and the following fact will indicate with what difficulty they will be eradiated if they are allowed to be introduced:

In the autumn of 1889, when studying the species, I placed a worn female in a small tight-fitting cardboard box, with about half a thimbleful of cornmeal, to obtain the eggs. The box was put on one side and forgotten until a week ago, when it was found to contain several half-grown larvæ, which, although much shrivelled, were still alive, and since, they have been supplied with food, have grown rapidly. From the appearance of the contents of the box this brood was hatched from the eggs laid by the female enclosed a year ago, and they have been for several months at any rate without any fresh food. All who have had experience with this insect notice its preference for dusty corners; these, therefore, should be carefully brushed out. When the caterpillars are full grown and ready to spin their cocoons, they have a tendency to climb up to an angle, such as is afforded by the meeting of a wall with the ceiling. Such places also should be frequently brushed. When possible, spraying the walls and floors with the ordinary kerosene emulsion would have a most beneficial effect. Anyone who sees this insect cannot fail to recognize it, if they will examine the figure given herewith. The moth differs from the ordinary flour moth found in mills (*Asopia farinalis*) in every way. The colour of the Mediterranean Flour Moth is slate-gray, with dark markings, and the outline is narrow and slender, the wings sometimes being slightly curled under the sides of the body when the insect is at rest. The ordinary flour moth (*Asopia farinalis*), which is produced from the meal worm, and which has been known in our mills for many years, is a pretty, triangular-shaped moth, in colour chocolate-brown and creamy-white.

The Pea Weevil. (*Bruchus pisi, L.*)

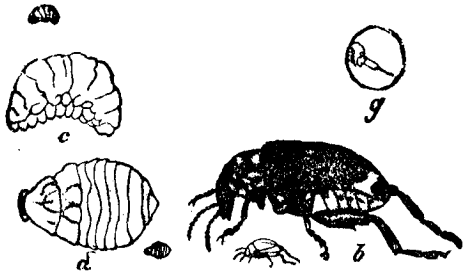


Fig. 7, *B. pisi* (after Curtis) kindly lent by Prof. Riley, the U. S. Entomologist.

Attack.—A small brownish-gray, very active beetle, about $\frac{1}{5}$ inch long, with two conspicuous black spots on the end of its body, which emerges from seed pease late in the autumn or in the spring, leaving a small round hole, through which it may be seen that the greater part of the inside of the pea has been eaten away. There is only one beetle in each pea.

During the last two years I have received abundant evidence of the rapid increase of this troublesome insect in the pea-growing districts of Ontario.

Mr. T. G. Raynor writes me from Rose Hall, Prince Edward County :—

"I have consulted the grain buyers and others about the Pea-Weevil and they say that the weevils are very bad this year, especially two or three miles back from the lake shore. With us here there were only a few."

Mr. J. H. Allan, a large seedsman and pea buyer of Picton, Ont., also writes to me: "The weevils are much worse this year than they have been for years."

Some years ago the pea weevil was a most serious enemy to the pea crop; but for the last eight or ten years it has been almost unknown in many districts where a few years before it destroyed from 50 to 75 per cent. of the crop. This exemption I attribute almost entirely to the care taken by farmers and seedsmen to treat the seed pease as soon as harvested. Owing to the small amount of injury for some years past, this extra labour and expense has been considered unnecessary, until now the insect has again increased in such numbers as to be a serious menace to this important industry. The high quality of Canadian-grown seed pease is acknowledged by all seedsmen in Europe and America, and it is important that every effort should be put forth to maintain the high standard of excellence to which they have attained. The cause which affects this most is the insect under discussion, and there really should be no difficulty, under the circumstances, of keeping this enemy in check, if all the pea-growers would act in unison.

There are very few native plants in Canada upon which it could live, and the seed for the next year's crop can be so easily treated to destroy the weevils, that it is merely a matter of close attention and the application of cheap and simple remedies.

The life-history of the Pea Weevil is well known. "The eggs which are spindle shaped, three times as long as wide, pointed in front, blunt behind, but larger anteriorly than posteriorly, are laid on the outside of the young pod, to which they are fastened by a viscid fluid, which dries white and glistens like silk."—(*Riley.*)

As soon as the larva hatches it eats its way through the pod and penetrates the nearest pea; the hole in the pod soon fills up, but that in the pea can always be seen as a minute black spot on the skin. The larva, which is a legless, yellow, maggot, soon attains full growth, and turns to the perfect beetle in autumn inside the pea. Frequently, the germ of the seed is left uninjured, and many of the injured pease will germinate and produce a weakened plant. Many of the perfect beetles leave the seed pease in the autumn and seek a suitable place for passing the winter; a large number however hibernate inside the pease until the following spring. The proportion of those which follow this course seems to depend upon the nature of the season, various observers estimating it from 25 to 75 per cent, according to the season. The following extracts from correspondence are of interest:—

"In reference to the percentage of weevils leaving the seed before spring, this depends on the weather. During a warm winter or early in the spring they eat their way out, and from 50 to 75 per cent. of the pease would be empty in this way. Where they are bad they cause the pease to heat; and a few years ago, in loading vessels, they would crawl out, and in some instances become 2 feet deep on the top of the pease."—(*T. G. Raynor.*)

"A considerable proportion of the beetles emerge from the pease in the autumn if the crop is left out until the bug is fully developed. In threshing them in this state the caps are removed and the bugs get out and conceal themselves in some dry place until the spring, when the heat revives them, and they will fly from field to field until they find the young crop of pease. They feed on the young leaves and flowers until the pods take form. The eggs are laid when the pease are quite small, about the size of a mustard seed. As soon as the beetles have laid their eggs they die. I advise early cutting and threshing so that the seed can be treated while the insect is in the larval stage."—(*J. H. Allan.*)

Remedies.—1. Bisulphide of carbon.—The distribution of the Pea Weevil is undoubtedly aided by means of infested seed pease. As stated above, many of the beetles do not leave the pease until the spring, and in this way many are carried to the field and sown with the seed, from which they soon emerge. Care should therefore be taken in the selection of sound pease. It is found that the beetles, even inside the pease, can be easily destroyed by the vapour of bisulphide of carbon, and this method, which is the best, is now adopted by most seed-dealers. In answer to the question:—"Is the treatment of seed pease with bisulphide of carbon much practised by seedmen?" Mr. J. H. Allan writes to me as follows:—"Yes; nearly every large

grower has a building for the purpose. If properly made it works well. The whole building must be perfectly tight to be of any use. Some use tin, others cement and paint and paper lining, with a double floor with tarred paper between. The pan we use to put the bisulphide of carbon in, is about 3 feet across and only about 4 inches deep. The chemical is thus exposed to more air than it would be in a deep dish, from which it would not evaporate quickly enough to do good service. I put my pan up close to the ceiling above the pease, because the vapour being so much heavier than air it works down through the pease. We fill the building with bags as close as possible up to where the pan hangs, empty the carbon into the pan and get out as quickly as possible and close the door up tight and leave it for forty-eight hours. This must be done in warm weather, as it does not work well when colder than ten degrees above zero.

The bugs will live well into the second season if left in the pease in a bin or bags. This insect has, I know, been in this country for the last thirty-five years. A sharp, cold winter with a cold wet spring does a great deal of good in thinning out the bugs. They want hot and dry weather to do much harm.

Many of our farmers sow the late sorts of pease late in the season—say, the first part of June—with good results. I have seen a field of Golden Vine pease sown early in May. The crop was literally filled with bugs. The neighbour of this farmer planted his in June and his crop had none. I would say, plant as late as possible; but this will not answer for all kinds. The extra early varieties must be put in as early as possible to ensure a paying crop."

From the above, and what is known of the habits of the Pea Weevil, it is evident that steps should be taken to destroy the beetles infesting seed pease as soon as possible after they are ripe. In this way the insect will be destroyed in the larval stage, before it has consumed much of the substance of the pea in which it is passing through its transformations. This is an important matter, because by so much as the pea is reduced in volume, to that extent will the vigour of the plant grown from it be reduced, if even it be not destroyed altogether.

2. Warm Storage.—Another remedy which has been successfully practised by farmers who save their own seed, is to store the pease in strong, close bags, of either paper or close canvas, which the beetles cannot penetrate, and store them for the winter in a warm room. In this way the perfect insects are developed early and die long before the seeds are required for sowing.

3. Holding over Seed.—Pease can be held over until the second year after harvesting without injury, with the same result as above, but must of course be enclosed in bags or other receptacles to prevent the beetles from escaping.

4. Salt.—A plan, which, however, I have never tried myself, has been highly recommended by Mr. C. C. Bessey, of Ottawa. He informs me that when farming some years ago in Halton County, Ont., with his father, Mr. J. B. Bessey, it was their custom to thresh as soon as possible and then store the pease in bins with salt. After putting about 4 or 5 inches of pease in the bin a little salt was sprinkled over them; then more pease and more salt, until the bin was filled. This plan Mr. Bessey claims always killed the weevils when quite small, in the larval stage, without in any way injuring the pease.

The Strawberry Weevil (*Anthonomus musculus*, Say.)

Attack.—Just before the flowers of the strawberry expand they are sometimes found to be severed from their stems by a small reddish beetle, which pierces the buds and lays one white egg in each, which afterwards hatches into a white grub and passes all its stages inside the fallen bud, eating out the centre and forming a round cocoon or pupa-case of the frass, and then turns into a beetle within the same bud where the egg was laid.

For some years entomologists have been trying to discover whether the Strawberry Weevil actually passed through its stages inside the buds which the females sever from the plants, or whether this injury was mere wanton mischief,

similar to that done by the Red-thighed Locust in biting off the flowers of oats. During the past season, with the assistance of Mr. W. A. Hale, of Sherbrooke, I have succeeded in breeding several of the beetles from the buds, and find that an egg is deposited in each at the time it is cut off from the flower-stem. In February, 1889, Mr. Hale wrote to me as follows, giving the true life-history: "For several years I have been suffering from the ravages of some sort of insect which attacks the buds of all the staminate varieties of strawberries; a small puncture is made through an unopened sepal of the calyx, and an egg is deposited. The stalk is then partially or entirely cut through, and in about ten days the grub makes its appearance, and feeds upon the pollen in the still unopened bud. It soon assumes the chrysalid form. Though I was successful last summer in hatching out a number of the grubs, I never carried them beyond the chrysalis state. A remarkable thing about this depredator is its cleverness in selecting only those varieties which produce pollen. In a large field of strawberries, in which 80 per cent. of the rows were pistillate varieties, not a single bud was touched, while the remaining rows of strawberries were almost denuded of buds, the cutting process extending over a period of about ten days. This same trouble was noticed in Staten Island and in Hamilton, Ont., in 1886, but the insect was said to destroy the buds from mere wantonness, which was an error. I tried equal parts of air-slaked lime and sifted hardwood ashes; also ammonia in the form of fermenting hen manure, put on between the rows, powerful enough to wither the foliage, but with little or no effect * * * One of our most profitable and growing branches of horticulture is being threatened, unless some preventive can be suggested."

Mr. Hale again writes on 18th June, 1890: "I am sending you a number of strawberry buds, cut off by some insect, in each of which you will doubtless find an egg. Whatever the depredator is, she is knowing enough to attack only the bisexual varieties, so that the larva is ensured pollen for its sustenance. So marked is this, that I have seen a single staminate plant in a bed of thousands of the Crescent (pistillate) entirely stripped of its buds, while not a single injured plant could be found amongst the Crescents. Last year, I was comparatively free from the pest, but in 1888 I suffered heavy loss."

On 31st December, 1890, Mr. Hale writes again: "I am sorry that I am not able to report any very marked success in coping with the strawberry weevil. Heavy dressings of air-slaked lime and wood ashes, twice applied while the dew was on, gave no appreciable results. 'Dissolved bone', possessing a very strong odour, checked to a certain extent the depredations, but left upon the hulls its pungent smell, even perceptible when the fruit was ripe, and this last fact has deterred me from making any experimental applications of Paris green or London purple."

Upon examining the buds sent by Mr. Hale, 18th June, I found that a hole had been bored through the calyx and closed corolla, and one small white egg pushed in to the base of the anthers. The buds were enclosed in a glass jar upon some slightly moistened earth. The beetles began to emerge about a month later. The larvæ had entirely consumed the contents of most of the buds, and had then made a thin cocoon of the agglutinated frass, inside the calyx which retained its shape. This cocoon is very similar to that of *Anthonomus rubidus*, which breeds inside the fruit of white currants, which ripen prematurely and generally drop from the bunches just before the main crop changes colour. I have never observed injury to strawberries at Ottawa, either upon wild or cultivated varieties, although the perfect beetle is frequently taken on bushes and low shrubbery during the month of June.

Remedies.—A practical remedy for this insect is difficult to devise. I had suggested spraying the vines with a weak mixture of Paris green and water (1 lb. to 300 gallons), but Mr. Hale was unwilling to try it. Kerosene emulsion would probably kill all the beetles upon the vines at the time, and might deter others from coming for a short time. What is required is something which will keep the weevils away until the buds are open, but will not keep away the fruit-growers' friends, the bees and other flying insects, after the flowers are expanded. The beetle does not lay its eggs in the flowers after they have opened. I have suggested the plan,

for next year, of covering the beds liable to attack with old newspapers, held down at the edges with a few handfuls of earth, and overlapping at the ends; or with strips of any fine cloth, as cheese cloth, muslin &c., &c. These would have to be put on at the first appearance of the beetles, and kept on until the flowers expanded, after which time they could be left off.

The little beetle which gives all this trouble is a minute species, only about $\frac{1}{16}$ of an inch in length, oblong-oval in shape, with a beak which folds down beneath its body. The colour and markings are very variable, but are modifications of the following. The beak is dark-coloured as well as the thorax; the wing-cases are reddish-brown, with a large, dark, irregular, sometimes double, blotch, bordered with white just behind the middle, and bear between them at their bases, where they join the thorax, a small white shoulder-plate or scutellum. They vary so much that Prof. Riley, in his 1885 report, has characterized no less than eight varieties.

The Vancouver Island Oak-looper (*Ellopia somniaria*, Hulst.)

Attack.—Slender caterpillars of a pale-brown colour, mottled with black—when full-grown about $1\frac{1}{2}$ inches in length—which have only five instead of the usual eight pairs of legs—three pairs on the fore part of the body and two pairs behind—for which reason the middle part of the body is looped up, as the posterior part is drawn up to the front part in walking. On this account caterpillars of this structure are called "geometers" or "loopers." Feeding in large numbers upon oaks.

Every three or four years the oaks in some districts in the vicinity of Victoria, Vancouver Island, are seriously disfigured by being defoliated by the caterpillars of a geometric moth. I have frequently received descriptions of these depredations; but it was only during the past season that, through the kindness of Mr. W. H. Danby, of Victoria, I received specimens of the insect in all its stages, together with a note upon its ravages. In 1887 Rev. G. W. Taylor wrote to me: "This year has been pre-eminently a caterpillar year. The Clisiocampas stripped the forest trees, *Halisidota sobrina*, Stretch the firs and other conifers, and *Ellopia somniaria* the oaks. These last were very numerous, and were most disagreeable pests, dropping from their food-plant and hanging by threads, so that even in walking through the trees it was almost impossible to keep them out of ones eyes and mouth. The threads and larvæ were so numerous that it was most unpleasant to walk through the oak groves, and the sound of the falling excrement was suggestive of gentle rain. The moth is probably only a very slight variety of the well known *Therina fervidaria*, Hubn.; although Mr. Hulst, judging from a limited series, has thought it sufficiently distinct to deserve a new name."

Mr. W. H. Danby, who was good enough, at my request, to make careful notes on the spot, has sent me a long account of his observations, which I regret I cannot reproduce *in extenso*. The following is an abstract. He says: "On 17th August I was struck with the great numbers of the larvæ of a geometer from 10 to 12 lines in length, which were feeding on the oaks in the vicinity of Victoria. After a few days I saw that it was going to prove a very destructive pest. Upon trees which a week ago were beautifully green not a perfect leaf could be found, and the trees had the appearance of having been burned. Millions of larvæ were hanging in festoons from tree to tree, suspended by strong silken webs. They were everywhere—on trees, fences, and in vast numbers in the dusty roads, which they were attempting to cross in search of food, having devoured all behind them, and, finding none, were dying from starvation by thousands, their extenuated bodies hanging to fences, grass. &c.*

"They now averaged 15 lines in length ($1\frac{1}{4}$ inches), and those in good condition seemed ready to pupate. About 20th August pupation began, the caterpillars generally descending to the trunk or to the ground and hiding amongst dead leaves, &c., at the base of the tree. They also pupate in crevices, under projections on

* NOTE.—I rather suspect that some of these may have been attacked by parasitic fungi.—J. F.

fences, in old spiders' webs, and occasionally lie exposed on the ground. On 24th August many pupæ were found under cattle manure, and on 3rd September, 113 were collected within the space of 18 inches square at the base of a large oak, some being under leaves and others exposed. They have a very slight, silken web, to which they are attached by the well-developed cremastral hooks. When the perfect insects emerged the full force of this invasion was most perceptible. On 20th September the moths were emerging in every direction and crawling up the trees to find a favourable spot to expand their wings. I had visited one tree the day before and found none. I now counted 127 and this was the beginning of one of the most wonderful entomological sights I have ever seen. By 5th October the moths were in myriads, the trees being literally covered, not only on the trunks but on every limb and branch, as far up as the eye could discern, so close together that the wings overlapped. On shaking a branch they would fly off in such numbers that you could positively hear them fly. When the moths first appeared the males averaged 90 per cent. of the whole, but on 24th October the females bore the same proportion to the whole. About this time heavy fogs set in, and the ground around was strewn with dead bodies. The districts which suffered most were the woods to the north, south and west. The east was affected somewhat but the north-east seemed to be exempt from their ravages, although oaks are abundant.

"About the 8th October the trees in districts which were first defoliated put forth a fresh covering of beautiful foliage; those trees which were injured later also put out new leaves, but did not make such good growth as the former.

"The egg is beautifully blue when first laid, oval in form, with one end slightly flattened, it adheres to the bark where it is deposited, generally scattered, though occasionally a dozen will be found side by side in an upright position. As a rule, however, they are deposited separately upon or in crevices of the bark.

"The moths vary from 14 lines to 24 lines in expanse, some males being very large and the females occasionally very small. They also differ greatly in the shade of colouring, ranging from a pale ochreous to a dark fuscous brown, antennæ of the male plumose; wings angulated, with a broad band transversely across. When disturbed during daylight they fly with a sluggish motion for a few yards and drop to the ground. Occasionally only do they fly up to the trees.

"It now remains for some means to be devised to stamp out, or at least reduce the numbers of this pest, and no doubt the Park Commissioners would be only too glad to have some plan suggested to them."

Amongst the moths Mr. Danby forwarded were well-marked examples, which agreed with Mr. Hulst's description (Ent. Am. I. 208), and all confirmed the differences between *somniaria* and the Eastern *fervidaria*.

Notwithstanding the fact that Mr. David Bruce identified the species as *fervidaria* and that Dr. Packard states in his monograph of the Geometridæ, p. 494, as below, I am inclined to consider *somniaria* a western representative of *fervidaria*, which should receive a distinctive name. Dr. Packard says: "The five males and one female from Vancouver Island are larger, but do not differ so much from eastern examples as the latter among themselves. They are more yellow, with coarser, dark speckles, and the lines are more broadly shaded with yellow." Now, it is on these very characters that Mr. Hulst has separated it, and I find them, with the exception of size, uniformly present in all the western specimens I have seen. The moth is pale brown, densely dotted with dark points, expands about $1\frac{3}{4}$ inches, wings acutely angled, crossed by two distinct dark lines, "the outer of which are broadly edged outwardly, and the inner ones inwardly with orange." The inner line on the primaries is situated $\frac{1}{3}$ of the way from the base, and is bowed out in the middle towards the apex, so as to form a segment of a circle. The outer line, which starts from the front edge or costa of the wing, $\frac{3}{4}$ of the way from the base, is zigzag, and runs a quarter across the wing, sloping slightly out to the outer margin, where it is sharply angled opposite the angle of the wing, and runs at an angle of 45 degrees to within a quarter of the distance to the inner margin. Here it is obtusely angled, and slopes outwards again at the same angle as the upper portion

of the line. On the lower wings only the outer line is continued, and this is angled in the middle of the wing, opposite the hind angle of the wing. There is a distinct discal spot on each wing, sometimes faint on the lower wings.

Two caterpillars sent from Victoria were cream-coloured or pale brown, mottled very irregularly, with black, and could not be said in any way to resemble the description given by Dr. Packard from Abbott's MS. drawing. "Body yellowish-green above, pale purplish below. Two fine, blackish, lateral lines, with a pale line above." Although the two specimens received from Mr. Danby were comparatively fresh, and had only been in alcohol a week when received, they differed so extremely from each other that no good purpose would be served by giving a description, until a larger series was examined and described from living material. This opportunity I hope to secure next season from eggs sent by Mr. Danby.

These are for the most part of a reddish bronze colour, of a smooth and shining appearance; but when magnified are found to have the surface finely netted with pentagonal cells. Length 0·75—0·90 m m. ($\frac{1}{34}$—$\frac{1}{28}$ inch) of an ovate form slightly flattened on the sides and abruptly flattened at the upper end. In the centre of this apical area is a distinct conical protuberance. Most of the eggs were pushed beneath flakes of bark or into tufts of moss to which they adhered by their lower ends or sides. From these eggs I have several young caterpillars. They are slender, very elegant and active little creatures. The head black, general colour of body gray, with slender lateral and sub-stigmatal lines, and ringed with velvety black. The bands on segments 4 to 9 particularly the last four very conspicuous. Length at birth 3½ m m.

The chrysalis is a very pretty object. It is slender, clear white, lined on the wing and leg cases with black. The rest of the body is also dotted and blotched with black. The cremaster or hook at the end of the body by which it is attached to the slight cocoon consists of about six small and two large hooks. The abdominal rings bear several short stiff bristles pointing backwards.

Remedies.—The important points in the life-history of this insect, gleaned from the above, are that it passes the winter in the egg state; that young caterpillars are found on the trees in July, and that the chrysalids are usually in crevices of the bark or under leaves on the ground. As a remedy, if it be found that the eggs are chiefly laid on the trunks of the trees, spraying these in early spring before the buds burst, with a kerosene emulsion, would destroy large numbers. Pupation takes place from the middle of August until September, during which time many pupæ are on the ground or on the trunks of the trees. Of the former, many would doubtless be destroyed by pigs and chickens if they could be turned in at that time, and sweeping the trunks would dislodge many more. Probably the most successful remedy for the Park Commissioners to adopt, in future, will be a systematic spraying of the trees with a very weak mixture of one of the arsenical poisons, about the time the young larvæ are appearing. At that time a very weak mixture would suffice (1 lb. of Paris green to 300 gallons of water). The difficulty of throwing a spray over high trees has now been solved by attaching the spray nozzle to a thin tube and then fastening this to a light pole, by which, and with the help of a ladder, it can be carried to any reasonable height. The small cost of a suitable force-pump with the necessary labour is a small matter, compared with the pleasure secured for the frequenters of a public park by the banishment of such a grievous pest as this.

Parasites.—Mr. Danby sent me specimens of an Ichneumon fly which was taken in numbers amongst these geometers, and which he thought might be a parasite. This has been identified for me by Mr. W. H. Harrington as *I. cestus.* Upon one of the alcoholic specimens of larvæ sent I found the egg of a Tachina fly. I have also bred from a pupa sent by Mr. Danby, a *Pimpla* with a red abdomen which Mr. Harrington tells me is undescribed. This whole subject is one of great interest, and I hope the Victoria Natural History Society will work it up. Besides knowledge of the parasites, animal and vegetable, information is wanting as to how it passes the time from the opening of spring until August. Is it possible there are two broods?

DIVISION OF BOTANY.

RED LEAF OR BLIGHT OF OATS.

During the past season, as well as to a certain extent last year, a peculiar disease was noticed upon oat plants from about the 1st June until winter set in, and all volunteer or chance plants were destroyed by frost. This disease manifests itself by the tip of the leaf taking a purplish-red tint, and there are also semi-translucent blotches on the leaf. Although it has not been very virulent or destructive in Canada, it has been a serious tax in some parts of the United States. It has been carefully studied in the United States Department of Agriculture, and we have no doubt that before long some practical remedy will be suggested. The following memorandum upon this disease has been specially prepared by Mr. Galloway at my request.

"*The Blighting of Oats.*

"One of the diseases which has been under investigation the present year (1890) by the Division of Vegetable Pathology in the United States Department of Agriculture, is the so-called Blight of Oats. Complaints of this trouble began to arrive as early as the middle of May, and by the middle of June correspondents in nearly all the principal oatgrowing States had written us about it. Later it was reported as occurring destructively in various parts of Canada. So far as we are aware, it caused little or no damage in Michigan, Minnesota, Nebraska, Kansas and the States further west. East of Kansas, however, the loss from it, in several of the States, was from 50 to 80 per cent. Briefly summing up the results of our investigations, it may be stated that the disease is caused by a minute parasitic organism belonging to the group known as bacteria. The bacteria are extremely minute plants, and as is now well known, some of the most destructive diseases in the animal and vegetable world are caused by them. In the case of the oat disease, a bacillus swarms in the juices of the leaves, and by its action upon them produces the sickly yellow or reddish color of the foliage. As a result of this, the oats remain almost at a standstill, and in consequence the heads, if they appear at all, are small, while the grain is comparatively worthless.

"The germ has been repeatedly obtained from diseased oats and grown in various artificial culture media, such as nutritive gelatine, oat broth, hay infusion, etc. Inoculations with this material have produced the disease in every case. In shape, the organism is sometimes nearly round, although, as a rule, it is several times longer than broad. So very minute is it that when magnified a thousand times it is little larger than the head of a pin.

"Such problems as how this organism passes the winter, how it infects the young oats, together with questions as to treatment, are now being worked out. It is hoped that in the near future we shall be able to publish a full report on the subject, in the event of which we will gladly send it to anyone applying for it."

GRASSES.

Few agricultural products are of more importance to farmers than the various grasses which provide food for their live stock. Notwithstanding this, there are few branches of their business concerning which the generality know so little. In addition to over 300 different kinds of grasses* found wild or naturalised in Canada, there are many valuable foreign grasses from other countries suitable to our climate, which can be sown to great advantage in pastures in mixtures or alone. There is, however, amongst these a very large proportion of varieties which are useless or unsuited to most parts of Canada. Many of these are in the market, and are sold to farmers in high-priced mixtures by seedsmen, who sell them on their European reputation, without having ever tested them in this country. The following experiments have been undertaken to test the value of all available grasses for this locality, and

* Macoun, J. M. Check-list of Can. Plants, Ottawa 1889.

seed has been distributed to our branch Farms as well as to various other points in the Dominion, where they will be grown and the results recorded, so that before long we hope to be in a position to say definitely, the locality and circumstances being given, what are the best grasses to cultivate. Not only are there many different grasses varying in quality, but the price also differs widely, and it is not always the highest-priced varieties which are best to grow. Amongst the seeds examined, large numbers of injurious weed seeds have been found, and hardly a sample examined was free from seeds of other grasses than those for which they were sold. In addition to this a large percentage of some samples was found to be useless, owing to the fact that the seeds of many grasses lose very quickly their germinating power. In view of the above, the importance is evident of having grass seed examined and tested, both to see that it is true to name and up to the standard of vitality. We are now prepared to do this at the Experimental Farm, and farmers would do well to avail themselves of the opportunity. In the experiments recorded below, each promising variety has been grown separately on plots of one square rod each. To save time the seeds were sown in the forcing house, and as soon as large enough to handle were first pricked out in boxes and then planted out in the grass plots in rows 9 inches apart and the plants 8 inches apart in the rows. Weeds were kept down by hoeing. The soil is not very rich and no artificial protection has been given during the winter. Up to the present, 112 different kinds have been cultivated, besides 17 others of which the seed was sown last autumn A few packets of seed were distributed last spring, but none have yet been reported upon.

(All the plates of grasses used in this Report have been kindly lent by Dr George Vasey the U. S Botanist.)

I.—GRASSES GROWN IN PLOTS OF 1 SQUARE ROD.

A.—Native Grasses.

1. *Agropyrum caninum*, R. & S. (Bearded Wheat Grass). Seed from Brandon, Man., sown in house February, 1888. Pricked out May, 1888. Transplanted to present bed May, 1889. In 1890, speared June 24. Flowered, July 12. A tall grass, 4 feet high, growing in tufts, of a strong odour when bruised, but well liked by cattle. Cut for hay July 15; 80 lbs. green grass to the rod.

2. *Agropyrum divergens*, Nees. (Awned Blue stem). Seed from Dr. G. Vasey, the United States Botanist. Sown in the open in spring of 1888. Transplanted to present bed June, 1889. Speared, June 17, 1890. Flowered, June 30. Seed ripe, July 21. Height, 2 feet. This grass, spoken highly of in the West, made a poor showing at Ottawa. Both in 1889 and 1890 it was badly attacked by *Meromyza Americana*, the Wheat-stem Maggot, and *Oscinis variabilis*, the American Frit Fly. Leaves and stems slender and sparsely produced.

3. *Agropyrum glaucum*, R. & S. var. *occidentale*, V & S. (Colorado Blue-stem). (PLATE I.) Brandon, Man. Sown in house Feb., 1888. Pricked out May, 1888. Transplanted to present bed June, 1889. Speared, June 24, 1890. Flowered, July 12. Cut for hay, July 15; 72 lbs. grass to the square rod. Height, 2½ feet. Probably the most valuable grass on our western plains, where it is the chief grass of the cattle ranches. It produces an abundance of fine leaves from running root stocks and seeds freely. By the end of the first season plants pricked out 8 inches apart had made a solid mat of sod.

4. *Agropyrum repens*, L. (Quack Grass. Twitch. Scutch. Couch Grass). Transplanted from roadside May, 1890. Speared, June 20. Flowered, July 3. Ripe, Aug. 1. By some highly praised as a fodder plant; but undoubtedly a most pernicious weed. After the first year it fills the ground with underground stems and roots, and only produces a small quantity of feed. It is very subject to the attacks of rust and ergot.

5. *Agropyrum tenerum* (Western Bunch-Wheat-Grass). Seed from North-West Territories. Sown, February, 1889. Transplanted into present bed June, 1889. Speared, June 18. Flowered, July 3. Seed ripe, July 21. This is a true bunch grass and a

valuable hay and fodder grass from Manitoba west to the Pacific. Dr. Vasey says: "Like *A. glaucum*, it is one of the best grasses for hay." It has not succeeded well at Ottawa, having been nearly exterminated by the American Frit Fly and other insects. I have received magnificent specimens from Indian Head, N.W.T., 4 feet high.

6. *Agrostis vulgaris*, With. var *alba*, Vasey. (White Top. Creeping Bent Grass). Found at Ottawa, growing by the side of a spring. Transplanted to present bed June 10, 1890. Speared, June 24. Flowered June 28. Ripe, August 6. A fine-leaved, delicate green grass, starting early in spring and lasting green until late in autumn. Essentially a low-ground grass, frequently running out and forming floating mats on water. Valuable for swampy meadows and low lawns.

7. *Agrostis vulgaris*, With. (Red-top). Seed collected by Dr. G. M. Dawson along the Fraser River, B. C. Seed sown March 14, 1890. Pricked out May 24. Made a vigorous growth, forming a deep, soft, mat of foliage by August. This is a most valuable grass for sowing with timothy in low meadows. It occurs from Atlantic to Pacific.

8. *Beckmannia erucæformis*, Host, var *uniflorus*, Scrib. (Slough Grass). Seed from Brandon, Man. Sown March 13, 1890, in house. Transplanted June 9. Speared July 3. Flowered July 22. Ripe August 5. A tall, coarse grass, making remarkably soft hay. It grows naturally in wet sloughs or low ground. In many parts of Manitoba and the North-West Territories it is abundant, and forms valuable fodder, much relished by cattle.

9. *Bouteloua oligostachya*, Tor. (Gramma Grass). (PLATE II.) Seed from Brandon. Sown, 1888. Planted in present bed May, 1889. Speared June 20, 1890. Flowered, July 3. Ripe August 1. Plants cut July 15. Flowered second time August 6. This small but highly nutritious grass is much relished by cattle. Dr. Vasey says "On the arid plains of the West it is the principal grass, and is the main reliance for the vast herds of cattle which are raised there."

10. *Bromus ciliatus*, L. (Fringed Brome Grass). Seed from Rush Lake, Man. Sown April, 1889. Transplanted June, 1889. Speared, July 12. Flowered, July 29, Ripe, September 1. Of no value for agricultural purposes as it grows here. Specimens however grown at Brandon and Indian Head indicate that it is of value there. The stems are 4 feet in height, well clothed with leaves from the bottom to the top.

11. *Bromus Pumpellianus*, Scrib. (Western Brome Grass). Seed from Banff. N.-W. T. Sown March, 1889. Transplanted into present bed June, 1889. Speared June 10. Flowered, June 20. Ripe, August 5. Another bed of the same, cut for hay July 19, after the anthers had dropped, gave 82 lbs. grass to square rod. This is a very valuable grass, producing an abundance of leafy stems, continuing in flower for a long time and giving a heavy aftermath. It spreads rapidly from the root and closely resembles the European *Bromus inermis*.

12. *Cinna pendula*, Trin. (Wood Reed Grass). Seed from the Rocky Mountains Sown spring of 1889. Nearly all winter-killed during winter of 1889-90. Remainder speared July 4. Flowered July 20. Ripe August 23. Of no agricultural value.

13. *Deschampsia atropurpurea*. Scheele, var. *latifolia*, Scrib. Seed from Rocky Mountains. Sown March 14. Nearly all died during the summer.

14. *Deschampsia cæspitosa*, P. B. (Tufted Hair-grass.) Seed from Glacier, B.C. Sown spring of 1889. Transplanted into present bed June 1889. Speared 10th June. Flowered 28th June. Ripe 16th July. A most beautiful grass; but of no agricultural value.

15. *Deschampsia cæspitosa* var. ? (Rocky Mountain Hair-grass.) Seed from Harrison Hot Springs, B.C. Sown in house March, 1889. Transplanted to bed June, 1889. Speared 20th June. Flowered 30th June. Ripe 30th July. This is a very ornamental grass like the last, growing in tufts, but bears fewer flowering stems and many more and longer (18 inches) dark green leaves. After cutting on 5th August new leaves were thrown up so quickly that in one week the plot was green again. Very different in habit from the last.

16. *Deyeuxia Langsdorffii*, Kunth. Seed from Manitoba. Sown 14th March, 1890. Transplanted 15th July. Has not flowered yet, but has spread much by underground stems.

17. *Deyeuxia neglecta*, Kunth. (Neglected Blue Joint.) Seed from Brandon, Man. Sown March, 1889. Transplanted to bed June, 1889. Speared 18th June. Flowered 30th June. Ripe 27th July. This valuable grass has succeeded well under cultivation, producing great quantities of very long fine leaves and flowering freely. Height 3 feet. Mr. S. A. Bedford informs me that ponies will wander long distances over the prairies cropping the dry stems and leaves of this grass in preference to many others.

18. *Deyeuxia neglecta*, Kunth var. *robusta*, Vasey. Seed from Prof. Macoun, collected in the North-West Territories. Treated as the above and closely resembling it. Heads of flowers rather shorter and the stems rougher.

19. *Elymus Americanus*, V. & S. (American Lyme Grass.) Seed from Rocky Mountains. Sown March, 1889. Transplanted June, 1889. Has not flowered yet. Growth spindly and weak, only 7 plants living October, 1890.

20. *Elymus Canadensis*, L. (Canadian Lyme Grass.) Seed from Rocky Mountains. Sown in house March, 1889. Transplanted June, 1889. Nearly destroyed by the Wheat-stem Maggot. Speared 10th July. Flowered 24th July. Ripe 16th Sept. A coarse grass found amongst bushes in low ground. Not suitable for cultivation in the open.

21. *Elymus condensatus*, Presl. (Giant Rye Grass.) Seed from Dr. G. M. Dawson, collected in British Columbia. Sown 15th March, 1890. Transplanted 25th June. Has not flowered yet. This grass is useful for holding the sand on railway banks. When cut young it makes good hay and is also a valuable winter forage plant in the west.

22. *Elymus dasystachys*, Trin. (Downy Wheat Grass). Seed from N. W. Territories, near Banff. Sown spring of 1889. Roots divided and transplanted May, 1890. Speared 12th June. Flowered 20th June. Ripe 18th July. This grass has much the aspect of an *Agropyrum*. It produces long slender leaves and wheat-like heads of downy flowers. It promises well as a hay grass.

23. *Elymus Virginicus*, L. (Lyme Grass). Seed from Brandon, Man. Sown 14th March, 1890. Transplanted 9th June. Plants weak and hardly established when winter set in.

24. *Hierochloa borealis*, R & S. (Holy Grass, Indian Hay). Seed from Brandon. Sown 1888. Transplanted to present bed June, 1889. Speared 12th May. Flowered 24th May. Ripe 20th June. Cut 5th July, after the leaves had grown to their full size. 55 lbs per square rod.

This is the earliest grass of spring, and is the scented hay made into baskets, &c., by the Indian women. Its very sweet odour makes it a valuable admixture in hay. Horses and cattle are very fond of it. When grown alone it is rather subject to rust.

25. *Kœleria cristata*, Pers. (Western June Grass). Seed from North-West Territories. Sown spring of 1888. Transplanted to present bed June 1889. Speared 15th June, 1890. Flowered 26th June. Cut for hay 1st July. 35 lbs. grass to the square rod. A poor bunch grass of the plains, not touched by cattle while there is anything else.

26. *Macoun No.* 8.—(*Panicum capillare*, variety). Seed collected by Prof. Macoun at Sprout Lake, Vancouver Island. Sown March, 1890. Pricked out 10th June. This turned out to be a useless grass, botanically it was interesting from the fact that it came true from seed. Although there were no good characters by which it could be separated from *P. capillare*, it presented a very different aspect from the Ottawa form of that species growing wild all round it. The whole plant is more glabrous, smaller, and has a contracted slender panicle.

27. *Macoun No.* 11.—Seed collected by Prof. Macoun on Mount Finlayson, Vancouver Island. Seed sown 15th November, 1890. Transplanted 25th June. This grass has not yet flowered but has a promising appearance.

28. *Muhlenbergia glomerata*, Trin. (Wild Timothy, Muhlenberg's Grass). Seed from Mr. Duncan Kennedy, of Bird's Hill, Man. Sown in open 15th May, 1890. Transplanted to bed 1st July. Speared 24th July. Flowered 6th August. Ripe 1st October. There has been more enquiry concerning this than any other native grass. I consider it and the following amongst the most promising in the collection. The plants mentioned above have not attained full growth and only grew about 1 foot in height; but I have specimens from Manitoba over 3 feet in height, branching and leafy to the top. In this part of Canada it grows in bogs and swampy meadows, but in the west it extends up on to the high lands. In Prof Beal's excellent work "The Grasses of North America" Dr. C. E. Bessey, of Lincoln, Neb., is quoted as follows: "Ten or twelve years ago I had my attention called to this wild grass as one possessing many valuable qualities, making it desirable for introduction and cultivation. I found that the liverymen of Central Iowa were in the habit of cutting those parts of the prairie which lie between the sloughs and the high land. The hay obtained from these places was of fine quality, being composed of leafy, branching stems of fine length and medium hardness. It was always cut late, but even then it was not often in seed." Chemical analysis shows it to be very nutritious, and cattle eat it greedily. It is very hardy, and although thriving best in low ground will grow almost anywhere. Mr. Duncan Kennedy says: "As to the Muhlenberg grass it will grow anywhere no matter how it is abused." Mr. Bedford says: "This grows on level prairie and meadow, is excellent feed, and is doing well under cultivation."

29. *Muhlenbergia Mexicana*, Trin. (Satin Grass) (PLATE III.) Roots collected in low pasture, Nov. 1889. These were divided and planted in present beds 2 days before continuous frost set in. Every one of these roots lived and flowered 20th July. Seed collected at same time was sown in the open in May, 1890. Transplanted 30th June. Speared 1st August. Flowered 20th August. Ripe 30th Sept. The plants grown from seed sown this spring gave almost as heavy a crop as the old plants. This species is more leafy and produces finer hay than the last. The stems branch at every joint. It seems to have every character of a good hay grass. The following extract will indicate that it may help to fill the great need for good hay grasses in the far west. In Prof. Beal's "Grasses of North America," p. 185, is the following: "Dr. Bessey also speaks well of this grass for Iowa and Nebraska. He writes: 'When I called Prof. Budd's attention to it he said that he grew a three-acre lot of it for four years, and that it yielded from 2½ to 3 tons per acre of hay of the highest quality. This agrees with other testimony.'" Mr. Bedford says: "This makes extra good feed." A special value of these Muhlenberg Grasses is that they will bear more shade than most species.

30. *Muhlenbergia sylvatica*, T. & G. (Bearded Satin Grass.) Plants collected in dry wood at Ottawa in autumn of 1889. Roots divided and planted in present bed 16th October, 1890. This species resembles the last closely; but has stouter stems and grows in drier localities. The flower panicle is looser and bears slender bristly awns.

31. *Panicum virgatum*, L. (Switch Grass.) Seed from Dr. Vasey. Sown spring of 1888. Transplanted to present bed June, 1889. Speared 10th July, 1890. Flowered 5th August. Cut for hay while in flower 11th August. 132 lbs to sq. rod. Height 5 feet. This is a late grass and must be cut young to make good hay, as it becomes very hard when the seeds are ripe. It thrives in low ground and comes in like the Muhlenbergias, when many other grasses have passed their prime. Dr. Vasey says: "It is a good and prolific grass if cut when young." One drawback is that it matures few good seeds, this however, Mr. John Craig informs me is not the case in the Western States.

32. *Phalaris arundinacea*, L. (Reed Canary Grass.) (PLATE IV.) Seed from Germany. Sown spring of 1887, did not flower until 1890. Transplanted to present bed June 1889. Speared 12th June. Flowered 24th June. Ripe 11th July. Height 4 feet. Although the actual plants mentioned here were grown from European seed, this valuable grass is found wild in low ground and along streams in all parts of Canada from

the Atlantic to the Pacific. It is very early and very prolific, having been cut three times in the season. On 4th June the bed was covered with a growth of delicate green succulent and very leafy shoots 3 feet 3 inches in height, which weighed 120 lbs. to sq. rod. On the same day fall rye was only 2 feet 6 inches in height.

On 5th August the same plot was cut again and gave 50 lbs. to the square rod. On 16th October it was cut again and gave 23 lbs. of grass. Another plot of the same grass left until the seed was ripe on 11th July was over 5 feet high and gave 160 lbs. of grass. This plot did not recover so soon after cutting, but was well covered with green shoots by September. This I believe will be found a valuable grass under cultivation and in low meadows. The root is perennial and extends by running root stocks.

33. *Phleum pratense*, L. (Timothy. Herd's grass.) Seed from Major Walker of Calgary, N.-W. T. Sown spring of 1889. Speared 16th June 1890. Flowered 1st July. Ripe 29th July. This well-known and valuable grass is familiar to all farmers. It is not indigenous in Canada; but is now well established wherever roads or railways have penetrated. It is hoped that the above form from the Rocky Mountains may prove hardier for the North-West than the ordinary form.

34. *Phleum alpinum*, L. (Alpine Timothy). Seed collected by Dr. G. M. Dawson on Mount Tod, B. C. (Alt. 5,500 feet). Sown April, 1889; transplanted May, 1889. Speared 12th June. Ripe, 3rd July. Nearly the whole of this bed flowered and then died off. Some few plants however threw up one or two weak shoots in September 1889, and flowered again in 1890 before dying. It is a smaller and less valuable grass than *P. pratense*.

35. *Poa compressa*, L. (Wire grass. Flat-stemmed meadow-grass). Plants collected on rocky pasture in 1889. Divided in autumn of 1890 and planted in present bed. This hardy and nutritious grass, although it starts early in the spring and keeps green longer than most native grasses in the autumn, does not produce enough fodder to make it worth cultivating except upon dry and rocky pastures where few grasses will grow. For such localities it is one of the best.

36. *Poa Nevadensis*, Vasey. (Nevada Bunch Grass). Seed from Whitewood, N.-W. T. Sown March, 1888, flowered freely in 1889. Young plants transplanted from old to present bed 15th June, 1890. Nearly all destroyed by Aphides, and did not flower. Plants began to recover about 1st September. This species seems to be peculiarly susceptible to attack by Aphides. When grown in the forcing house in 1888 it was the only grass attacked by them, and in the open air last year it was again the only plot injured by these insects. This is probably a grass of no agricultural value. Height of leaves 3 inches, stems 1 foot.

37. *Poa pratensis*, L. (June Grass. Kentucky Blue Grass) Form 1. (PLATE V.) Seed from Major Walker, of Calgary. Seed sown March, 1889; speared 2nd June, 1890. Flowered 12th June. Ripe 4th July. This is a tall form with wide leaves. The original plants from which the seed was taken measured 3 feet 5 inches in height.

38. *Poa pratensis*, L. Form 2. Seed from Glacier, B.C. Sown 15th March, 1890. Transplanted June, 1890. A leafy free-growing form, very dark green. By the end of the season the plot was a close sod which continued growing until winter.

39. *Poa pratensis*, L. Form 3. Seed from Forres. N.W.T. Sown spring of 1888. Flowered June, 1889. Roots divided and planted in present bed 1st June, 1890. Speared 12th June. Flowered 20th June. Ripe 4th July. Cut down 21st July. Did not spring up again till September. This is a wide-leaved coarse variety with dark leaves and very wide-spreading and few underground stems. It was severely attacked by the American Frit Fly and Wheat-Stem Maggot, and mildewed badly in October. I cannot separate this botanically from other forms of *Poa pratensis*, but agriculturally this is a poor grass of no value, while the others are all very good. This difference between varieties of the same species grown under the same conditions, may explain the various opinions so often expressed concerning Kentucky Blue Grass.

40. *Poa pratensis*, L. (White form.) Seed collected in North-West Territories. Sown spring of 1888. Flowered June, 1889. Transplanted into present bed May, 1890. Speared 14th June. Flowered 20th June. Ripe 4th July. This is a very handsome form with wide, slightly pale leaves and conspicuously glaucous panicles. It is almost a bunch grass producing very few and short runners. It is not unlike some forms of *Poa cæsia*; but has been pronounced *Poa pratensis* by most of the botanists to whom I have submitted specimens. Height 2 feet; leaves 1 foot. This variety was also badly attacked by the American Frit Fly.

41. *Poa serotina*, Ehrh. (Fowl Meadow Grass.) (PLATE VI.) Seed from Griswold, Man. Sown spring of 1889. Transplanted June, 1889. Flowered twice in 1889. Speared 12th June, 1890. Flowered 3rd July. Ripe 21st July.

Another bed grown from Rocky Mountain seed, but identical with above was cut for hay when in flower 8th July, and gave 44 lbs. grass to square rod. This shrunk in curing to 20 lbs. of excellent hay or $1\frac{3}{5}$ tons to the acre. This excellent grass has been sparingly cultivated for 150 years. The fine branching stems are abundantly produced and remain green long after the seed is ripe. It grows well in low ground and bears almost as heavy an aftermath at the end of August as the first crop, flowering stems being thrown up from the lower joints. In Manitoba this grass sometimes covers large areas to the exclusion of nearly all other species. The Indians about Griswold prefer it to all other grasses and travel long distances to cut it.

42. *Sporobolus heterolepis*, Gray (Strong-scented Drop-seed Grass). Seed from Brandon, Man. Seed sown spring of 1888. Transplanted to present bed, June, 1889. Speared, 8th July, 1890. Flowered, 20th July. Ripe, 27th August. This is a bunch grass with long fine leaves. It will grow in almost pure sand or in stiff clay. Mr. Bedford credits it with being good feed. The quantity, however, is small.

Plots of the two following North American grasses have also been grown. *Bromus segetum* is a Mexican species, but *Buchloe dactyloides* will probably be found along the southern border of our western prairies.

43. *Bromus segetum*. Seed from Dr. Vasey. An annual which bears twice cutting and will then seed itself for the next year. Ths yield of hay is not heavy enough to give it much agricultural value.

44. *Buchloe dactyloides*, Engelm. (Buffalo Grass). Seed from Dr. Vasey. Sown 1889. Transplanted to present bed, June, 1889. Began to flower, June, 24th, and continued till end of season. This is the true Buffalo Grass. It is of a remarkable habit. It starts very late in spring, not showing a sign of life until June, when it throws out vigorous shoots which branch at each joint and take root, so that it soon forms a thick mat about 3 inches in depth, of fine stems and hair-like leaves. It is said to be a most nutritious and attractive grass to all kinds of stock.

B.—*Foreign Grasses.*

A.—In addition to the above, the following foreign grasses have been grown in plots to test their value for this climate. The seed was in all cases received from English or German seedsmen, and almost every sample contained many seeds of weeds and other grasses.

45. *Agrostis capillaris*. Resembles *A. vulgaris*.

46. " *dispar*. The same as *A. vulgaris*, With. Cut for hay, July 23; 76 lbs. of grass to sq. rod.

47. " *vulgaris*, var. *alba*. This is not the same as No. 6 above, which seems to be identical with *A. stolonifera*, Sm. of English authors.

48. *Alopecurus agrestis* (Slender Foxtail). A slender annual grass of doubtful value, far inferior to the perennial Meadow Foxtail (*A. pratensis*).

49. *Anthoxanthum odoratum* (Sweet Vernal Grass). A very sweet grass with the same scent as Holy Grass. Sown, May, 1890. Has not flowered yet. Seed

sown in the spring of 1888 was all killed the next winter. It may, however, possibly have been the annual *A. Puelli* which is sometimes sold for this, which is a perennial.

50. *Avena elatior* (Tall Meadow Oat Grass).—Seed sown in open 1st July. Transplanted 5th August. Made good growth before winter; no flowers, but ground well covered.

51. *Avena flavescens* (Yellow Oat Grass).—Seed sown June, 1890. A few plants flowering 5th October. Highly spoken of for mixtures, but of small size and slow growth.

52. *Brachypodium sylvaticum* (Wood False-Brome-Grass).—Seed sown in open September, 1889. Transplanted 25th May, 1890. This grass is a free grower and produces an abundance of wide leaves 12 to 18 inches in length, which stand up well, giving the bed the appearance on 1st November of a heavy mat of green foliage. It has not flowered yet. If it endures our winter it should be a valuable grass. It grows naturally in woods and stands shading.

53. *Bromus giganteus* (Tall Brome-Grass).—This closely resembles the above and I suspect is not true to name.

54. *Bromus inermis* (Awnless Brome-Grass). Seed sown spring of 1888. Transplanted to present bed June, 1889. Speared 10th June, 1890. Flowered 26th June to 4th July. Cut for hay 5th July. 104 lbs. grass to the square rod. Cured hay 47 lbs. or 3¾ tons to the acre. This is an extremely hardy and very valuable Russian grass. It comes up early in spring and produces a heavy aftermath of succulent leafy shoots. It is one of the most valuable introduced grasses we have grown.

55. *Ceratochloa australis* (Southern Brome-Grass).—This is a coarse and succulent annual, which produces a large amount of fodder. It shoots up again quickly after cutting and continues growing until killed by winter.

56. *Cynosurus cristatus* (Crested Dog's Tail).—Seed sown 14th March. Transplanted 10th June. Has not yet flowered.

57. *Dactylis glomerata* (Orchard Grass).—This higly esteemed grass, which thrives well in many parts of Canada, has not succeeded well at Ottawa. Seed sown in 1889 produced by the autumn a bed of most vigorous plants. In the spring of 1890 only 17 plants were living, many of which were weak. Although included in all permanent pasture mixtures it is rarely found here two years after sowing. I have now plots in dry and in rich soil planted from seed sown last June.

58. *Festuca duriuscula* (Hard Fescue).—A hardy fine-leaved grass which has stood our winters well. Suitable for rocky pastures. It is taller than Sheep's Fescue. Seed sown 13th March, 1890. Transplanted 6th July.

59. *Festuca rubra.*—The plants I have growing are closely like the above and may prove to be that species. Seed sown 13th March. Transplanted 8th June. On 1st November these plants were cushions 6 to 10 inches across of fine hair-like leaves of an intense green.

60. *Festuca elatior* (Tall Fescue).—Seed sown spring of 1888. Transplanted to present bed 10th May 1890. Speared 15th June. Flowered 21st June. Ripe 24th July. This grass does not appear to be so hardy as the Meadow Fescue. It has wider leaves and a larger panicle of flowers. It is stated to be a valuable grass for a permanent pasture mixture.

61. *Festuca pratensis*, (Meadow Fescue). Seed sown spring 1888. This is undoubtedly the most valuable of all the European grasses for this district. It is perfectly hardy matures two crops of hay and produces a very heavy autumn growth of rich fodder. It should always be included in mixtures for permanent pastures. Flowered 21st June. Cut for hay 11th July. 70 lbs to the square rod.

62. *Festuca pratensis* var *loliacea*, (Slender-spiked Fescue). Seed sown spring of 1890. Transplanted 25th June. Flowered 6th August. This proved to be ordinary *F. pratensis*. It is doubtful whether the var *loliacea* would come true from seed, as it appears to be an accidental variety.

63. *Holcus lanatus*, L. (Velvet grass). Seed collected at Harrison Hot Springs,

B. C. Sown March 1889 in the house. Transplanted 22nd May. This is a handsome but useless perennial grass. It made a heavy growth and flowered sparingly in 1889; but every root was killed in the winter.

64. *Lolium Italicum*, (Italian Rye Grass). Seed sown spring of 1890. Transplanted May 20. Speared 30th June. Flowered 26th July. Ripe 20th Aug. This seed was much mixed with Perennial Rye Grass. The two species may be separated when not in flower, as pointed out to me by Mr. John Speir, of Glasgow, by the fact that the young shoots of Italian Rye Grass are round while those of Perennial Rye Grass are flat. This grass makes a heavy growth of green leaves the first year in rich land; but is not hardy enough for the Ottawa climate.

65. *Lolium perenne*, (Perennial Rye Grass). (PLATE VII.) Seed sown in open April, 1890. Transplanted 10th June. Did not flower, but produced an extremely heavy crop of long tender foliage which kept green till the snow came. This is hardier than Italian Rye grass and makes a valuable addition to permanent pasture mixtures for this district.

66. *Poa nemoralis*, (Wood Meadow Grass).

67. *Poa trivialis*, (Rough-stalked Meadow Grass.) I have experienced great difficulty in procuring these grasses true to name. Thanks to the kindness of Mr. H. de Vilmorin of Paris, I have now true seed of both, and hope to report on them next year. They are reputed to be valuable grasses suitable to this climate.

II. ASIATIC GRASSES.

A small collection of grasses was received from India. Most of the seed was mouldy and very few grains would germinate. This collection consisted of the following:

Andropogon pertusus and *A. annulatus*, (Mixed) *Panicum colonum*, and *P. ciliare*. None of these germinated. *Setaria glauca* (not sown, it being a common weed throughout the country).

68. *Eragrotis megastachya*.—This is a wild plant in western Canada. Sometimes grown as an ornamental grass.

69. *Apluda aristata*.—One plant germinated, but was killed by frost before the seed ripened.

70. *Cynodon dactylon*.—(Bermuda grass).

71. *Eleusine Indica*.—(Yard grass). Half a dozen plants of each of these grasses grew; but they were destroyed by frost before the seed was ripe.

72. *Eragrostis Abyssinica*, (Teff.) Seed received from the Government Botanic Gardens at Bangalore, India, and from Mr. Alfred Boyd, of Toronto, and grown on separate plots. Sown in house 15th March, 1890. Transplanted into beds 28th June. Speared 24th July. Flowered 5th September. Some seed ripe 12th October. One plot was cut for hay 10th September, and gave the remarkable crop of 170 lbs. to the square rod. It was eaten by the cattle, but was not apparently very palatable. The packets were labelled as Red and White Teff; but both produced similar plants.

73. *Panicum miliaceum*, (Common Millet) Annual. Seed from Prof. Beal. A valuable soiling crop, but not in any way equal to Indian corn. Seed ripe in September.

III. MISCELLANEOUS GRASSES.

The following are being tested in small quantities, either for want of more material, in which case all seed is being carefully saved; or because they are only of botanical interest and are not deemed worthy of more extensive cultivation than will serve for study or the distribution of herbarium specimens to botanists. In addition to those enumerated below, a few plants of several of the species mentioned in list I. are being grown for comparison, from seed collected in widely separated localities, or upon different soils. These names are not repeated here.

A.—NATIVE GRASSES.

Agropyrum caninum, R. & S. Glaucous variety.

Agropyrum tenerum ? From Ottawa.

Agropyrum unilaterale. From Michigan Ag. Col.

Agrostis perennans, Tuck. (Thin grass).

Agrostis perennans, Glaucous variety.

Agrostis scabra Willd. (Tickle grass).

Andropogon scoparius, Mx. (Little Blue Stem). This is a valuable grass in the West where it will grow in pure sand. It makes excellent feed for horses, (S. A. Bedford).

Andropogon provincialis, Lam. (Turkey foot). "Good feed. Cattle and horses very fond of it. Grows on high land." (S. A. Bedford).

Briza media, L (Quaking grass) from Vancouver Island. Of no agricultural value.

Bromus Kalmii, Gray. (Wild Chess).

Chrysopogon nutans, Benth. (Indian grass). Considered valuable in the West. A tall coarse grass. Very late in starting in spring. It will grow in pure sand.

Danthonia spicata, Beauv. (White Top. Old Fog.) This forms a large proportion of the herbage in dry upland and mountain pastures. It is a small grass, but improves much under cultivation.

Deyeuxia Canadensis, Hook. (Blue-joint Grass.) This common but valuable grass grows in all low meadows. It produces an abundance of leafy stems which are eaten greedily by stock. Height 3 to 5 feet.

Elymus americanus, V. & S. (Long-awned form.)

Elymus americanus, (Short-awned form.)

Eatonia obtusata, Gray. (Early Grass.) Seed from Brandon, where Mr. Bedford says it is the earliest grass to ripen its seed.

Eatonia Pennsylvanica, Gray. (From Ottawa.)

Festuca microstachya, Nutt. var. *divergens*, Thurb. A small annual grass from Vancouver Island, of no value.

Festuca ovina, L. (Sheep's Fescue, Plate VIII.) This is the type of a division of the Genus *Festuca* in which the root leaves are short and bristle-like. They are small but very valuable grasses for upland pastures. Reported to be doing well under cultivation at Indian Head, N.W.T.

Hordeum jubatum, L. (Squirrel-Tail Grass.) Seed from Manitoba. A pernicious weed in pastures. Mr. J. Craig tells me that in dry regions it makes a beautiful lawn grass, and bears cutting well. He has seen it used for this purpose in the State of Iowa, and it should be tried in the arid portions of our North-West.

Macoun No. 4. From Langford's Lake, B.C. This is possibly *Glyceria pauciflora*, Presl.

Macoun No. 6. From Qualicum, Van. Isd.

Macoun No. 10. From Barclay Sound.

Macoun No. 12. From Cameron Lake, B.C. Probably a Deyeuxia.

Orizopsis——? From Kananaskis, Rocky Mountains.

Pennisetum longistylum. Seed from Prof. W. J. Beal. A very ornamental grass.

Poa cæsia, Smith. Seed from Indian Head. A short-leaved, slender and weak grass.

Poa tenuifolia, Nutt. (Slender-leaved Meadow Grass.) A small but valuable species in mountain pastures. It grows in bunches with long fine glaucous leaves and loose panicles. Seed from Harrison Hot Springs, B.C. Sown spring of 1889. Flowered July, 1890.

Stipa spartea, Trin. (Northern Buffalo Grass. Porcupine Grass.) Seed from Indian Head. Sown 1889. Flowered and ripened seed 1890.

Trisetum subspicatum, P.B. From Ottawa.

Trisetum subspicatum, P.B. From Rocky Mountains. A small grass not likely to be of much value.

B.—EUROPEAN GRASSES.

Agrostis——? Interloper in other seed. A very fine Bent-grass, suitable for lawns.

Aira flexuosa, (Heath Hair-grass.) Very dissimilar from what I am growing as *Deschampsia flexuosa* from the Rocky Mountains.

Arrhenatherum avenaceum (Tall Oat Grass). Young plants doing well.

Bromus mollis, (Soft Brome Grass.)

Elymus arenarius, (Sea Lyme Grass.) Seed from Mr. John Mather, who imported it to grow to arrest drifting sand. It is used for this purpose in some parts of the United States and Holland, together with Beach Grass (*Ammophila arundinacea*).

Festuca heterophylla. (Various leaved Fescue.) A fine-leaved grass of the *ovina* type.

Festuca ovina var. *angustifolia*, (Sheep's Fescue.) Leaves very fine and of a delicate green.

Holcus mollis (Perennial Velvet Grass.) A beautiful but useless grass.

Poa sudetica.—A small species.

Stipa Lessengerianum. } From Dr. Vasey.
Stipa Sareptana. }

Both of the above are fine-leaved grasses suitable for dry localities, but of little agricultural value.

IV.—Besides the above, a large collection of seed was sown last September including many of the above as well as the following not before mentioned.

A.—NATIVE GRASSES.

Ammophila longifolia, Vasey, from Manitoba.
Aristida purpurea, Nutt., from British Columbia.
Andropogon provincialis, Lam., from Manitoba.
Bedford No. 25, from Manitoba.
Danthonia Californica, Boland, from British Columbia.
Elymus Virginicus, L. var. *submuticus*, Hook, from Manitoba.
Ericoma cuspidata, Nutt., from British Columbia.
Festuca tenella, Willd., from British Columbia.
Glyceria grandis, Kunth, from Manitoba.
Glyceria Canadensis, Trin., from Ottawa.
Phleum pratense, var. *alpestre*, Vasey, from Idaho.
Stipa viridula, Trin., from Manitoba.
Zizania aquatica, L. Sown in the Lake.

B.—FOREIGN GRASSES.

Avena pubescens. (Downy Oat Grass).

Bromus pratensis. (Meadow Brome Grass).

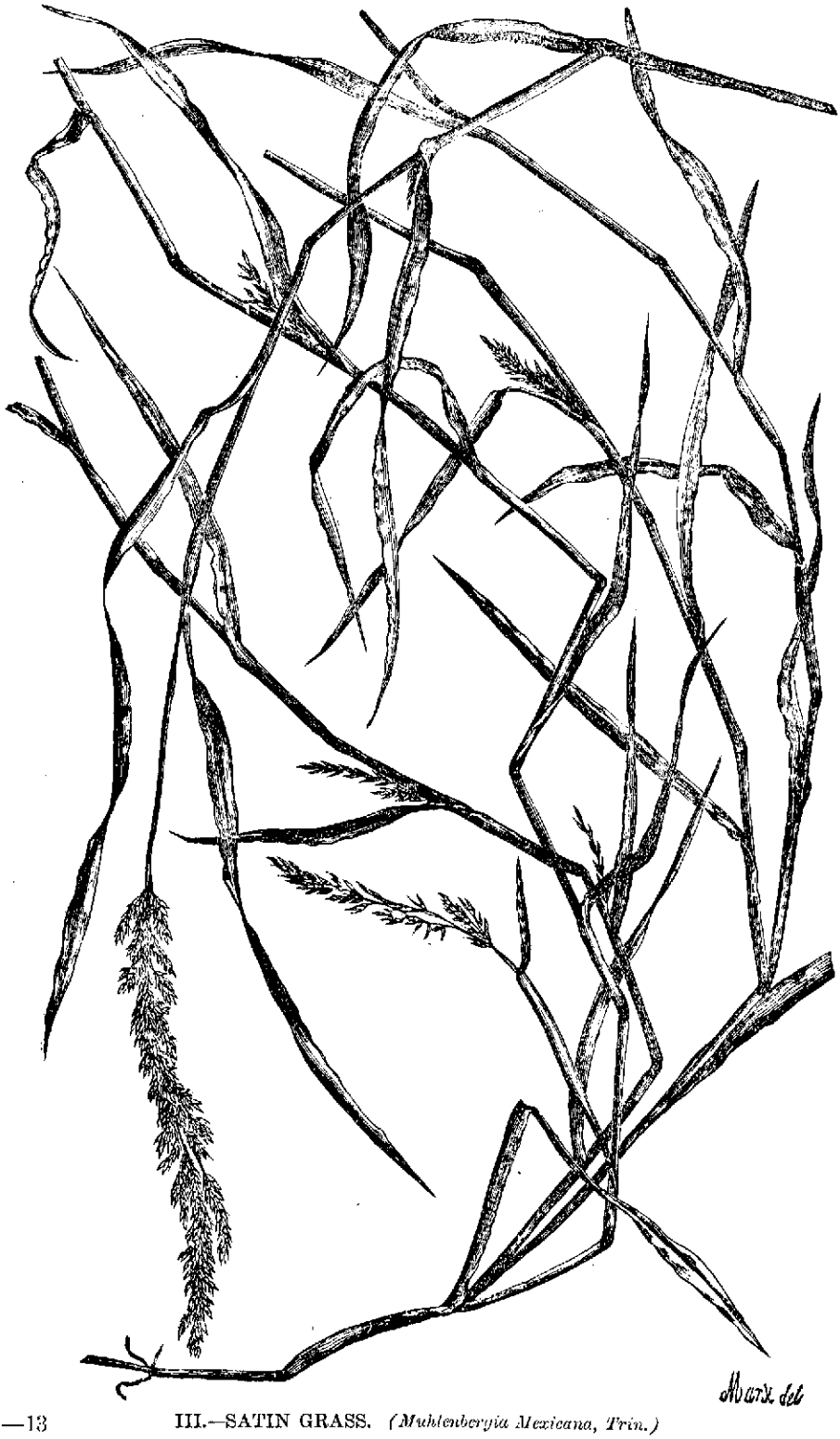
Bromus secalinus. (Chess. Plate IX.) A useless grass concerning which some farmers hold the remarkable and utterly erroneous opinion that it is degenerated wheat, with which, however, it is in no way related.

Molinia cœrulea. (Purple Melic Grass.)

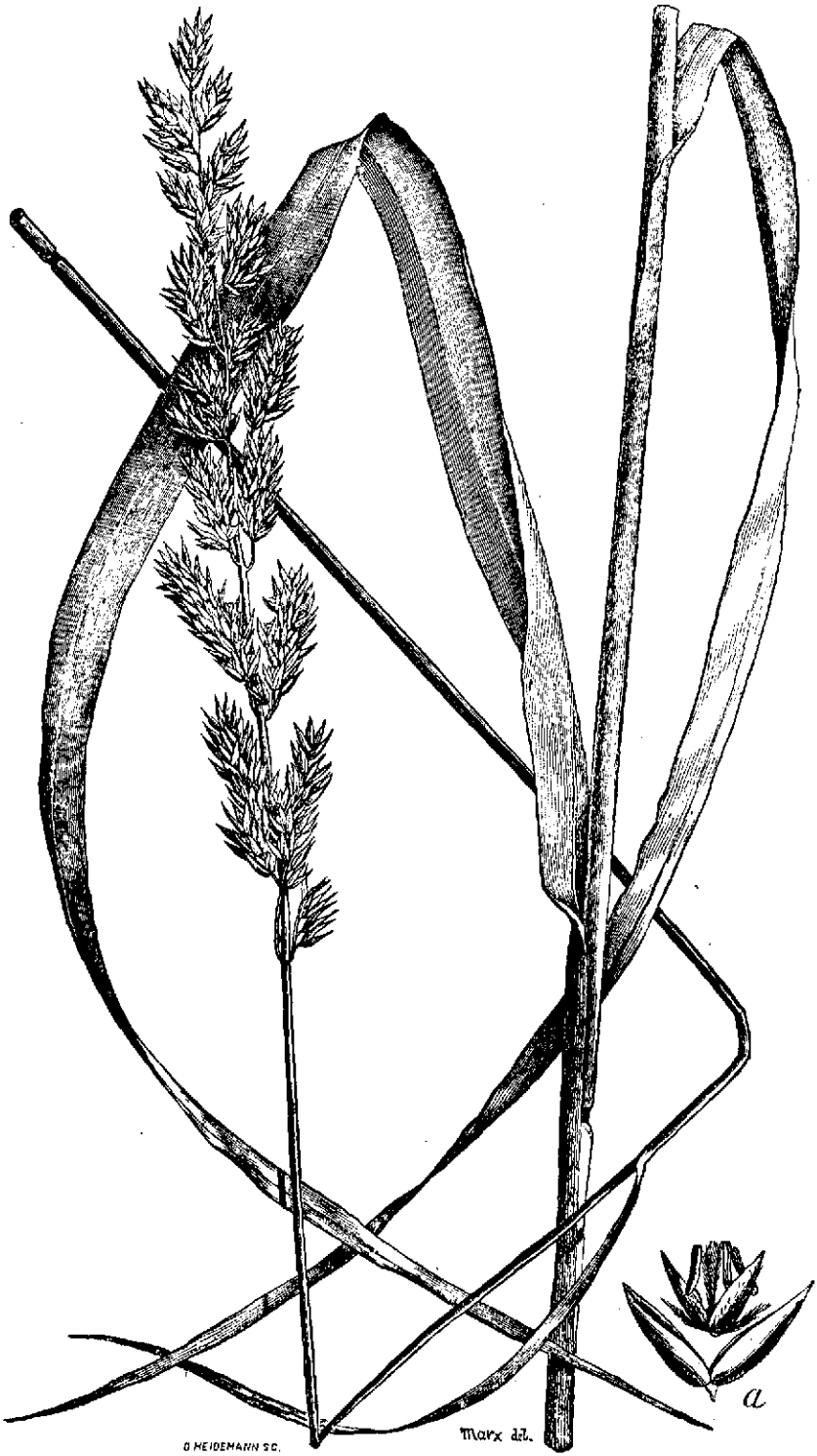
In conclusion I would add that seed or plants of any grasses not included in the above lists will be thankfully received and their qualities examined and reported upon.

I. COLORADO BLUE-STEM. *(Agropyrum glaucum, R & S.* var. *occidentale* V. & S.*)*

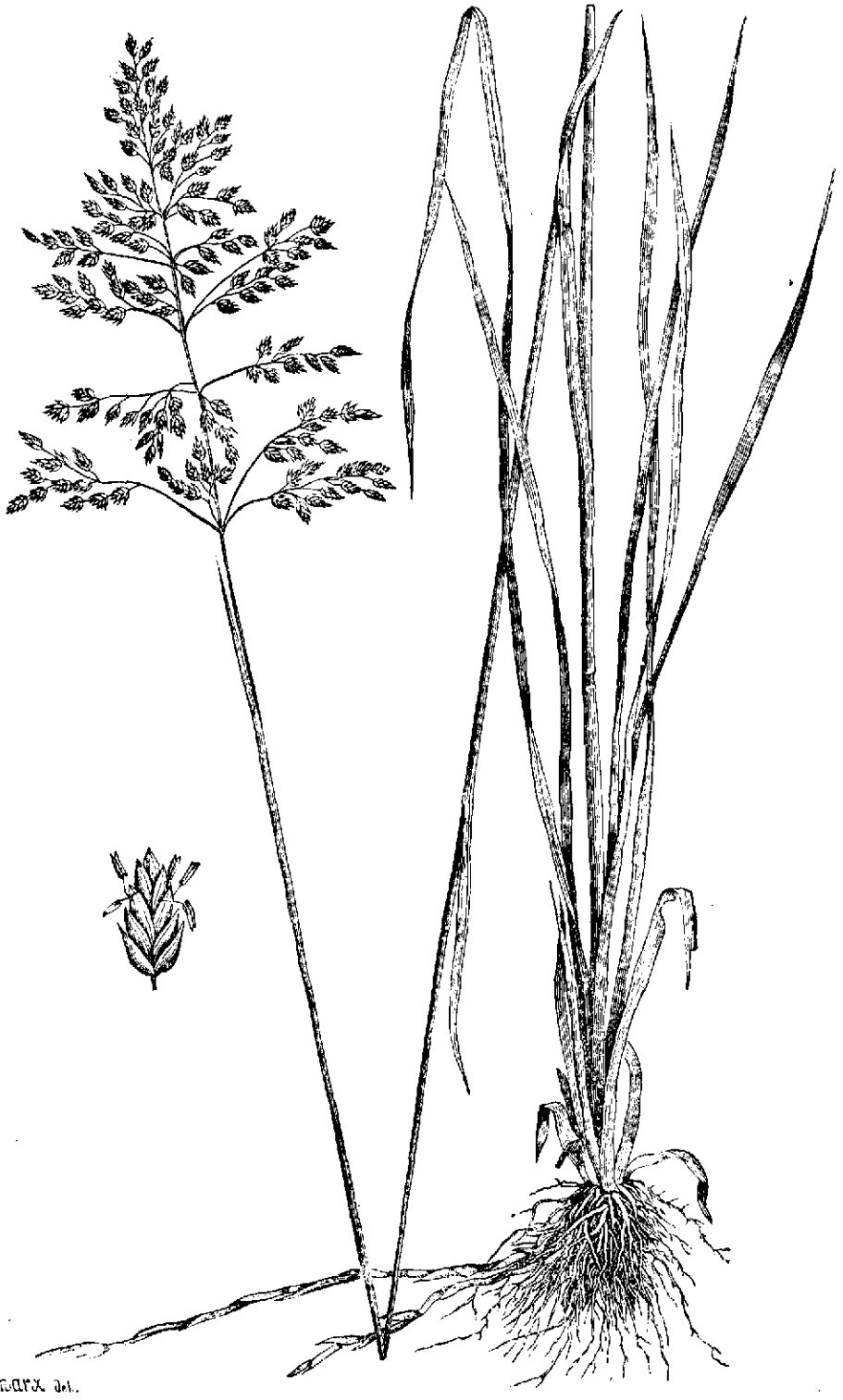
II.—GRAMMA GRASS. *(Bouteloua oligostachya, Tor.)*



III.—SATIN GRASS. *(Muhlenbergia Mexicana, Trin.)*



6c—13½ IV.—REED CANARY-GRASS. (*Phalaris arundinacea, L.*)

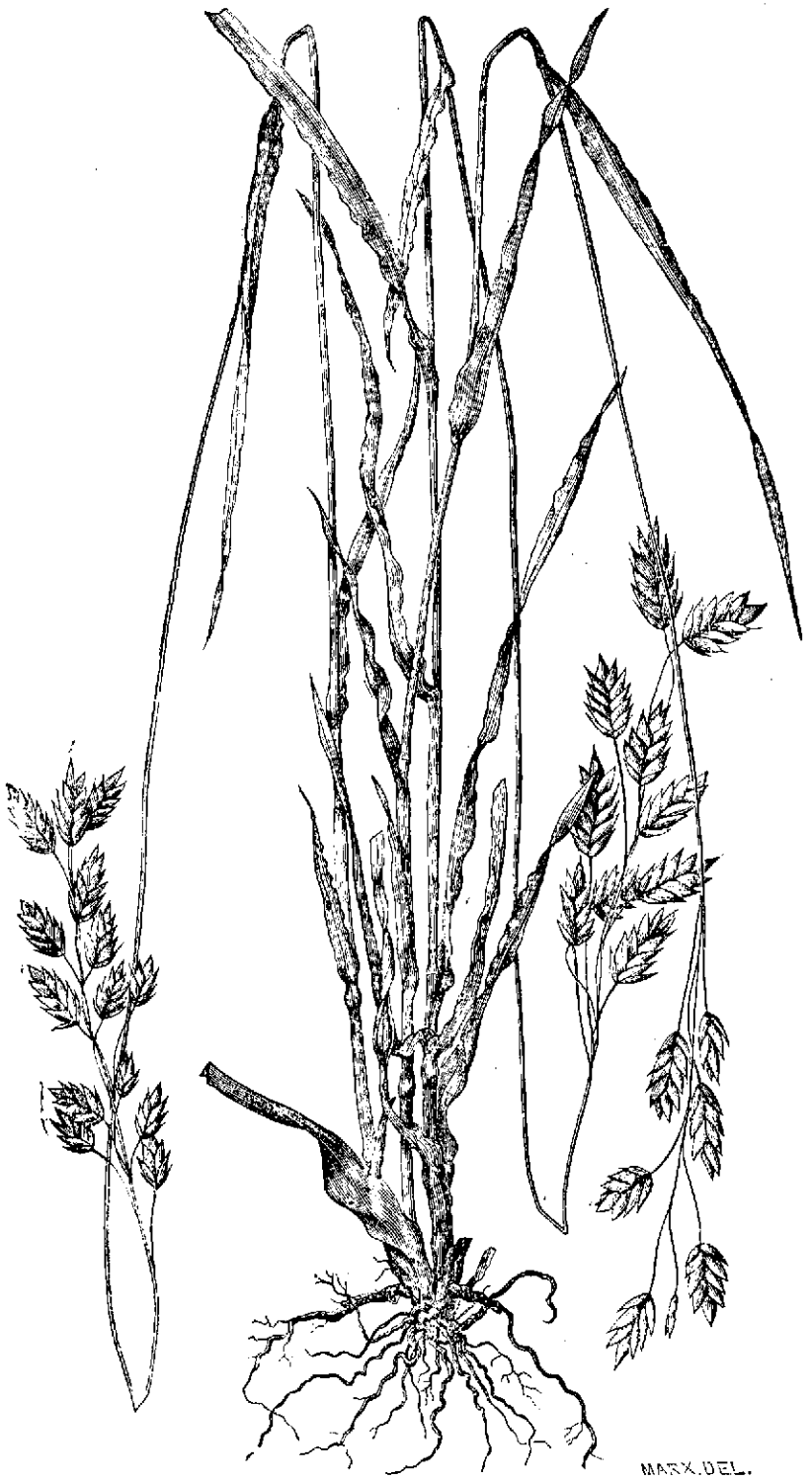


V.—KENTUCKY BLUE-GRASS. *(Poa pratensis, L.)*

VI.—FOWL MEADOW-GRASS. *(Poa serotina, Ehrh.)*

VII.—PERENNIAL RYE-GRASS. *(Lolium perenne, L.)*

VIII.—SHEEP'S FESCUE. *(Festuca ovina, L.)*



IX.—CHESS. *(Bromus secalinus, L.)*

REPORT OF THE POULTRY MANAGER.

(A. G. GILBERT.)

To WILLIAM SAUNDERS, Esq.,

Director Dominion Experimental Farms,

Ottawa.

SIR,—I have the honour to submit to you the third annual report of the working of the poultry department of the Central Experimental Farm, since 3rd January, 1890, the date of last report. During the winter season of 1889–90 careful notice was taken of the effect, on the various breeds, of the different sorts of ground meal composing the hot or stimulating food, given in the morning as an incentive to winter laying. These warm messes were made more or less stimulating by the addition or omission of ground meat and red pepper, the latter being entirely omitted when egg laying had fairly commenced. This experience, coupled with that of the previous winter, has shown,—

1. That the stimulating and fattening foods which go to eggs in the Spanish family, such as Leghorns, Minorcas, Andalusians, &c., make the Asiatics, viz.: Brahmas, Cochins, Langshans, &c., so fat as to lay soft shelled eggs or not to lay at all.

2. That Plymouth Rocks and Wyandottes—breeds of American origin and not to be properly classed with either of the foregoing—are to be treated as Asiatics in the matter of feed.

3. That it is best, when possible, to keep the pullets of late hatch from the two year old hens, for the reason that the latter are at their best for egg production and the fattening food that is suitable to pullets is likely to make the hens too fat to lay. The importance of having pullets hatched as early as possible will thus be apparent.

What is the proper treatment of the different breeds in winter?

WINTER TREATMENT OF DIFFERENT BREEDS.

1. Brahmas, Cochins, Langshans, Plymouth Rocks, &c., &c., require more oats, less wheat, little or no Indian corn, soft or stimulating food in moderation and a generous supply of vegetables. Lean meat twice or thrice a week and plenty of exercise.

2. Leghorns, Minorcas, Andalusians, Hamburgs, &c., &c., will take more soft or stimulating food, more wheat, Indian corn with meat and vegetables in liberal supply.

3. It is essential to success that lime, grit, gravel, &c., &c., should be before the layers at all times, and that the hens be kept in activity by throwing the grain fed to them in chaff, straw or dry leaves scattered on the floor.

Soft or stimulating food is generally fed in the morning and is composed as follows:—

HOT MORNING FEED.

A warm morning mess for the heavy breeds may be made of shorts, ground oats, bran, and lean meat scraps mixed with boiling water. This can be varied by giving cooked vegetables instead of the ground oats or bran. Clover hay cut in small pieces, steamed and mixed with the morning feed, is one of the best of green foods and cannot be given too often.

For the Spanish family a more stimulating morning mess may be made of shorts, cornmeal, ground oats or barley with ground meat or meat scraps in judicious quantity every morning, with a modicum of black or red pepper. Vary by mixing boiled potatoes or other vegetables in lieu of the ground oats or barley. Steamed clover hay at any time.

In cold weather Indian corn may be fed to the fowls for the last meal.

It is taken for granted that the fowls have comparatively comfortable quarters, with pure water to drink in regular supply; the chill taken off the water; the grain warmed in cold periods and the other directions, as given in detail in report of last year, carried out.

Should the foregoing treatment be found too forcing, the soft feed may be curtailed and more green stuff and oats fed. It is quite likely thin shelled eggs may be laid and it is a sign that the hens are getting too fat. As a preventative mix fine ground oyster shells, or sand, or both in the morning soft feed.

A QUESTION AS TO FEED ANSWERED.

A correspondent in the North-West Territories asks, "What kind of feed am I to use when I want to give my hens a rest after laying all winter and previous to breeding from them?" In reply it may be stated that a cessation of the stimulating soft feed and a gradual change from wheat to oats will, in most cases, have the effect of stopping production. Care must be taken that grit is regularly supplied, (as it should always be) to aid digestion, or else the change to oats may result in some of the hens becoming crop bound. The change from a generous to a non-stimulating diet, or *vice versa*, should be gradual. Should the hens have a run out, meanwhile, the latter is not likely to occur.

THE FARM LAYERS.

Owing to lack of room, some of the male birds remained with the laying stock during the winter. When the additional building, in course of erection, is completed it is intended to keep the laying and breeding stock apart. In cases where the hens had laid all winter, and were used as breeders in spring, they were allowed a rest and the eggs for hatching were saved, after laying recommenced.

BREEDING PENS MADE UP.

The breeding pens were made up as follows:—

Breed.	Number in Pen.	When Mated.
Wyandottes	1 cock, 2 hens	Feb. 26
Black Minorcas	1 cockerel, 7 hens	do 26
Plymouth Rocks	1 do 11 do	
Brahmas	1 do 9 do	
White Leghorns	1 cock, 11 do	
Houdans	1 do 11 do	
Buff Cochins	1 do 9 do	
Black Hamburgs	1 do 11 do	

Where no dates are given the male birds remained in the pens all winter.

CROSSES.

Plymouth Rock, with White Leghorns	1 cockerel, 5 hens	Mar. 27
Black Java, with mixed hens	1 cock, 11 do	April 7
B. B. R. G., with White Plymouth Rock	1 do 5 do	do 28

Later in the season the mixed pen was broken up, owing to the death of the Black Java cock.

The table below will show the number of eggs given to hens and the chickens hatched :—

NUMBER OF CHICKENS HATCHED.

When Eggs were set.	Number of Eggs set.	Description of Eggs.	Number of Chickens hatched.	When Chicks were hatched.
1890.				
Mar. 29	6	Plymouth Rocks	3	April 19
April 5	9	4 White Leghorns, 5 Houdans	6	do 26
do 5	9	4 do 5 do	6	do 26
do 16	9	4 White P. R., 5 B. Minorcas	3	May 7
do 22	13	Plymouth Rocks	8	do 13
do 23	11	do	10	do 14
do 25	13	Langshans, purchased in Ottawa	12	do 16
do 28	13	do do	10	do 18
May 1	15	8 Buffs, 7 Wyandottes	10	do 22
do 3	11	Plymouth Rocks	8	do 24
do 7	13	Black Minorcas (From London, Ont.)	10	do 28
do 7	13	7 do 6 Brahmas do	10	do 28
do 7	11	7 do 4 do do	9	do 28
do 7	11	Brahmas do	8	do 28
do 12	11	7 do 4 Wyandottes	7	June 2
do 16	11	8 White Leghorns, 3 Plymouth Rocks	8	do 6
do 30	13	Plymouth Rocks	11	do 20
June 13	13	B. B. R. Game	9	do 20
do 17	13	Buff Cochins (Imported. Eggs shaken)	5	July 4
July 9	13	Plymouth Rocks	12	do 30
do 19	13	7 White Leghorns, 6 Game Crosses	7	Aug. 9
			172	

HOW THE SITTING HENS WERE MANAGED.

As in previous years care was taken to rid the sitting hens of lice by dusting their bodies and the nests well with carbolic powder. China eggs were placed in the nests and the broody hen allowed to sit on them for two days. The imitation eggs were then taken away and the genuine placed in their stead. It is of the utmost importance that the sitting hen should be rid of all vermin before the eggs to hatch, often of great value, are given to her. When the sitter is not so rid of lice she is apt to leave the nest for long periods and frequently will not return to it. When a hen is noticed standing on the nest, as if in distress and loath to sit on the eggs, the trouble is caused by lice. The heat of the *embryo* in the shell and the high temperature of the hen's body, tend to make the parasites so active as to become unbearable. As before said, although against the natural instinct, some hens leave their nest and the hatch is lost. During last summer a visiting farmer said: "I have not got a chicken this year. What was the matter with my hens? They all left their nests." He was informed of the reason, and although surprised that the cause was so easy to find, remarked that it was worth the price of the journey to get the information. As a matter of fact, a great many of the so-called diseases of poultry may be traced to the presence of lice.

EARLY SITTERS.

There was a remarkable demand for sitters in the early hatching season, and it was noticed that the sitting varieties were unusually tardy in becoming broody. In the case of the farm fowls, the majority of the mixed breeds, kept for sitters, did not become broody at any period of the season, and the thoroughbred Buff Cochins had to be used as early sitters. The first hen to be put on eggs was a coloured Dorking, on the 29th of March, followed by two Buff hens, on the 5th of April, and four others on the 16th, 22nd, 25th and 28th of the same month, consecutively. In the next month, four Buff Cochins, with five Brahmas, six Plymouth Rocks, one Black Russian, two Wyandottes and three mixed breeds were used as sitters. It will be seen that of the total number of sitters, three only were not thoroughbreds. Apart from their fair laying qualities, the Buff Cochins, in two successive seasons, have proved invaluable as early and reliable sitters. Had their services not been required for hatching out chickens they would have been broken up and made to lay again. For an early sitter, when it can be had, a light hen is to be preferred, for at that time egg shells are apt to be thinner than at a later date.

BREAKING UP A HEN.

By breaking up a sitter, it is meant to get her rid of the incubating fever and laying again as quickly as possible. The best way to accomplish this is to put the broody hen in a coop, or compartment without a nest, where she cannot sit, feed her generously, and in a few days she will cease to be broody, and if the good feeding is kept on will soon be laying again. The practice of ducking the broody hens in water, tying them to a stake, swinging them by their legs, is simply cruel and unnecessary. Some hens, Wyandottes, for instance, are much more easily broken up than others. A broody member of the Spanish family should not be used as a sitter. Occasionally an exception may be found, but, as a general rule, although very fussy, they are not reliable.

EXPERIMENT 1.—HATCHING RESULTS FROM EGGS SET ON DRY BOARDS AND ON DAMP GROUND.

In conformity with the intention expressed in last year's report, an experiment was tried by setting a number of hens on eggs placed in nests on the dry boards of the attic floor of the central portion of the poultry building, and others placed in nests, directly on the damp earthen floor of the cellar. The eggs in all the nests were tested on the seventh day of incubation. The following will show that the eggs were fertile to a very satisfactory extent, and that there was very little difference in the result:—

UPSTAIRS ON BOARD FLOOR OF ATTIC.

Date when set.	Number of Eggs set.	Kind of Sitters.	Result of Test.	Number of Chickens hatched.
April 5..	22	2 Buff hens.....	7 unfertile, 2 addled, 1 broken	12
do 22..	13	1 Buff hen.....	1 unfertile egg, 2 did not hatch out, 2 broken by hen...	8
do 23..	11	1 P. Rock hen.....	1 egg did not hatch.....	10
do 25..	13	1 Buff hen.....	1 chicken died in hatching.....	12
May 1..	15	1 Brahma hen.....	2 eggs broken, 3 unfertile.....	10
do 7..	13	1 Buff hen.....	2 eggs broken, 1 did not hatch out.....	10
do 16..	11	1 Wyandotte hen....	3 eggs unfertile	8
	98			70

IN NESTS ON DAMP FLOOR OF CELLAR.

Date when set.	Number of Eggs set.	Kind of Sitters.	Result of Test.	Number of Chickens hatched.
April 28..	13	Buff hen.....	3 eggs unfertile.....	10
May 3..	11	Russian hen.....	3 eggs unfertile.....	8
do 7..	13	Buff hen.....	2 unfertile eggs, 1 chick killed by hen.....	10
do 7..	11	P. Rock hen.....	1 addled, 1 chick dead in shell.....	9
do 7..	11	Brahma hen.....	1 chick died in hatching, 2 unfertile eggs.....	8
do 12..	11	Wyandotte hen.....	4 unfertile eggs.....	7
do 30..	13	Brahma hen.....	1 chick died in shell, 1 unfertile egg.....	11
June 13...	13	P. Rock hen.....	1 chick killed by hen in nest, 3 addled eggs.....	9
	96			72

Both of the above methods have their earnest advocates. The contention, on one side, is that eggs to hatch out well should be placed on damp ground, or, on some substance calculated to retain moisture, and the opposite on the other side. It would appear from the above experiment that the fertility of the eggs had more to do with the result than the location of the sitter. As remarked in previous report it is quite possible that early in the spring season, when the weather is yet cold, the dry floor may be the best because it is likely to be warmer. In the hot season of July, or August, no eggs are hatched out that can possibly be placed under hens at an earlier date. Should there be no alternative, the cool damp cellar would be preferable.

Mr. A. W. Morton, of Deloraine, Manitoba, gives his experience in hatching on the ground in a letter dated 10th of April, 1890, from which the following is an extract. He says: "Last year ('89) I set four hens on the ground in the stable, having no proper hen house. The first hen hatched 14 chicks from 14 eggs; the second hen hatched 9 chicks from 14 eggs; the third 14 chicks from 14 eggs and the fourth 13 chicks from 14 eggs. Every time I found a sitter off her nest I sprinkled the eggs with water. I am going to try the experiment again. My experience in hatching eggs with the hens placed in comfortable boxes, in quiet places, was not nearly so good. I may say that it is my intention to construct and equip a suitable place for my poultry, following many suggestions given in the farm report, which seem to be excellent."

SHIPMENT OF EGGS AND STOCK.

The demand for eggs, during the hatching season of last year, was far greater than could be supplied. Numerous orders were received from Manitoba and the North-West Territories. Frequent enquiries were made as to the sort of fowls considered most suitable for those portions of the Dominion. Should poultry departments be established on the branch Experimental Farms, they would be valuable distributing centres for the districts in which they are situated. Eggs sent from them would have less distance to travel to surrounding country and be likely to give better hatching results. As an instance of the demand for eggs, it may be stated that in April, last, there were on the list for delivery in one week, 26 sittings of Plymouth Rock eggs and 21 of White Leghorns. As there was only one pen of Plymouth Rocks, composed of 1 male and 9 females, and one pen of White Leghorns with 1 male and 11 females, it was not possible to comply with all demands. Of the Plymouth Rocks, some would get broody and some time would elapse before they could be broken up and laying again. All the hens did not lay every day, so that the percentage of eggs obtained per diem was not large. The same remarks will apply to Brahmas, Cochins and others of the sitting varieties. It will be evident that to supply a demand such as that mentioned, several breeding pens of the popular sorts would be required and a large establishment necessary to contain them. As

long as there is a limited number of breeding pens, there will be a limited number of eggs to dispose of after those required for home experimental purposes are reserved. Stock was shipped to the branch experimental farms at Indian Head, North-West Territories, and Nappan, Nova Scotia.

HOW THE CHICKENS WERE CARED FOR.

While the chickens were hatching care was taken that the sitters were not disturbed. This is most important, for if the sitters are disturbed after the eggs are "pipped," the young chicks just coming into the world are apt to be chilled; if the hen is irritated or frightened she is likely to become restless and crush the young ones to death. After the chickens were hatched the broken egg shells were removed to make the nest more comfortable. But this should not be attempted by any but an old hand. It is best to leave the hen alone if she is a reliable sitter. Occasionally it happens that a hen will become so nervous or excited at the "peeping" of the chicks in their efforts to break out of the shell, that she will trample them to death. Such a hen should be marked and not set on eggs again, as she is not reliable. One case occurred, in which the hen was discovered eating the egg shells before the chicks were properly disengaged from them, the result being the loss of four chickens. A spare sitter was fortunately at hand and the remaining half-hatched eggs were at once placed under her and the lives of the chickens saved. After being hatched out the chicks were allowed to remain under the hens for 18 or 24 hours, until thoroughly dried. With the mothers they were then placed in coops outside in the sunshine. If hatched before the grass had grown they were kept indoors, the bottom of the coop being covered with sand. The dry board floor would soon have used the little ones up, literally put them off their legs. Previous to being put into the coop with her brood, the hen was fed and allowed to drink apart from the chicks, otherwise she would have greedily eaten up the dainty food intended for the tender youngsters. It must be remembered that for two or three days or nights the careful mother has not left her nest, for had she done so while the chickens were hatching (except in very warm weather) there would have been no chicks, as a result she is so hungry and thirsty that she will voraciously eat and drink what is placed near her.

HOW THE CHICKS WERE FED.

As in previous years the bread and milk system of feeding was adopted and proved highly satisfactory. The bread was soaked in milk, squeezed dry and so fed. Dry bread crumbs were also given. As the chickens progressed, their bread and milk diet was gradually changed to the less expensive one of shorts, cornmeal, bran, table scraps, ground meat, with all the wheat or crushed corn they could eat for their last ration. When very young the chicks were fed about once every hour, a little at a time, but often, so as not to allow them to get hungry. As they grew older, they were fed once every two hours, and as they increased in size the rations were gradually made more substantial, but reduced in number. It is important that the chickens should be sent to rest with their crops full. A critical part of the chicken's life is the first five weeks, while it is getting its feathers. At this period all the resources of the system are drawn upon to supply the growing feathers, besides flesh, bone, muscle, &c., &c., and it is necessary that the chickens should be generously fed on a variety of the most nourishing food. A chicken stinted of food, or allowed to hunt for its living, as is too frequently the case, at this period of its growth, will never make a large fowl, indeed, if allowed to become stunted from either of the causes named, no subsequent care will make amends for past neglect. To have poultry of large size for table use, it is imperative that they should be pushed from the earliest date of their existence. This is well understood in Great Britain and France, where raising choice poultry for market is made an important source of revenue to the farmers. If easily procured, milk, sweet, skimmed or sour, given as a drink, or mixed in their food, or left in open

dishes to take as they please, is one of the best incentives to vigorous growth that can be given. If not milk, then pure water should be regularly furnished and put into shallow pans. The water should not be allowed to get hot from exposure to the sun. The first chickens to be placed in the coops outside were Plymouth Rocks, White Leghorns and Houdans. They were exposed for the first two or three weeks of their existence to the bitterly cold north-west winds which marked the last week of April and the first two weeks of May. Being well fed and cared for, they not only stood the trying ordeal well, but made good growth. Had they not been generously and frequently fed they would have been "dwarfed," or if they had been left to shift for themselves, as the majority of early chicks are, they would have quickly succumbed. Where effort of any kind has been made to secure a brood, or broods of chickens, it will pay well to see to their future growth.

The progress of the chickens, although satisfactory, was not equal to that of the year previous. Three reasons may be assigned for this, the absence of the large quantities of sour milk supplied the year before, limited quarters and ground used the year before. Some of the weights, as compared with those of the previous season, are given as follows:—

Plymouth Rocks.—Again led the other breeds in making weight. A cockerel five months and two weeks, after being hatched, attained a weight of 6 lbs. 2 ozs. as compared with 5 lbs. 2 oz. of a Houdan, hatched a week later but weighed on the same day. At the same age, as the one above, a Plymouth Rock cockerel, the season previous weighed 8 lbs. 4 ozs.

Brahmas.—Were hatched from imported eggs at the end of May. Rather late to give them a fair chance as they had to stand the brunt of midsummer heat before attaining any size. They showed an average development of 12 ozs. per month as compared with 15 ozs. per month of the season previous.

Houdans.—Hatched at the end of April weighed, on 1st of October, 5 lbs. 2 ozs. averaging a development of 1 lb. per month.

Wyandottes.—At first made slow and almost discouraging progress. This was no doubt owing to their being crowded. The pullets, however, picked up in the fall, turned out to be very fine ones and were laying by end of December.

Langshans. This breed was tried for the first time. Two settings of eggs were purchased in Ottawa and 22 chickens were hatched. Of this number 18 grew up to maturity. They proved hardy chickens, grew well and the pullets began to lay by middle of December. In their growth they displayed the characteristics of the Asiatic family as to large frame and slowness to put on flesh, until maturity.

Black Minorcas.—Two sittings of eggs were purchased, from which 18 chickens were hatched. Their progress was very satisfactory, the chickens proving hardy and vigorous growers.

Crosses.—Chickens of a cross between a B. B. R. Game cock and White Plymouth Rock hens were hatched on the 9th August, Their progress was not satisfactory, probably owing to their late hatching. Many of them succumbed to the cold of the first winter month.

A good deal of space has been given to the care and management of chickens, for the reason that a frequent cause of complaint is the great mortality among the young stock. In the majority of cases, want of care and proper food have undoubtedly been the cause of death. In the case of many farmers, inbreeding has resulted in weak chicks, and weaklings as a rule seldom last long. Perhaps it is as well they do not, for they would never, in the event of their maturing, make stock fit to breed from. It may be added to the general instructions given above, that as the chickens grow large, they should be removed from the smaller ones. If they are not, they will not allow the little chicks to have the proper quantity of

food they require to make rapid progress. In chicken life the weak has to go to the wall. Where chickens are raised in large numbers and are placed in small coops, the latter must be frequently cleaned, or sickness will surely result.

WHEN THE PULLETS LAID.

The first pullet to lay was a Plymouth Rock, on the 24th November, hatched 19th April; the second a White Leghorn, on the 28th November, hatched 26th April; the third, a Black Minorca, on the 1st December, hatched 7th May; fourth, a Langshan, on the 12th December, hatched on the 16th May.

COMMENCEMENT OF WINTER LAYING.

The fowls were allowed full liberty to run in the fields, in rear of the poultry house, as soon as the grain was harvested. As the result of this freedom (which, owing to the fine open fall, they enjoyed until the 25th November) and nutritious feeding during moulting, they went into winter quarters in excellent health, and were in full lay for the winter season by the 10th December. The White Leghorns, Black Minorcas, Andalusians and Plymouth Rocks, were the first to lay, a few days after going into winter quarters, followed soon after by the Black Hamburgs, Mixed breeds, Brahmas, Buff Cochins, Houdans, Red Caps and Wyandottes, in the order named. Six days after being closed in, the winter commenced in earnest, the thermometer on the 1st December going down to zero, and the next day showing 14 degrees below that figure. The weather continued unusually cold during the month of December, the temperature in the poultry house several times going to 10 and 15 below freezing. Notwithstanding, the Leghorns, Andalusians and Minorcas laid steadily through the month, responding to the stimulating food with satisfactory results.

EGGS LAID BY DIFFERENT BREEDS.

Owing to the fowls running at large, promiscuously, for so many weeks in the fall, it is impossible to give a table of the eggs laid during the whole year; but the following figures will show what has been done by a certain number of the different breeds, since going into winter quarters. It is to be remembered that the laying and breeding stock were kept together, and that some old hens, though past their prime as layers, were kept for their superior points as breeders. Thus, in a pen of 20 Plymouth Rocks, several may be old hens for breeders, others may be late hatched pullets. It is only fair in such a case to give the number of actual layers. When there is room, the aim will be to keep a certain number of fowls of the same age for layers.

EGGS LAID IN DECEMBER AND JANUARY.

Date.	10 White Leghorns.	10 Plymouth Rocks.	5 Black Minorcas.	8 Langshans.	3 Andalusians.	5 Brahmas.	6 Black Hamburgs.	16 Mixed Hens.	5 Buff Cochins.	9 Houdans.	2 Redcaps.	4 Wyandottes.	Remarks.
1890.													
Dec. 1	.....	2	2	....	1	....	....	....	....	....	....	....	
do 2	2	.....	.....	....	....	1	....	....	....	....	....	....	
do 3	1	1	1	....	1	....	....	1	....	....	....	....	
do 4	1	2	1	....	....	1	....	....	....	....	....	....	
do 5	1	1	2	....	....	....	....	2	....	....	....	....	
do 6	2	1	1	....	1	....	....	....	....	....	....	....	
do 7	.....	2	2	....	....	....	....	2	....	....	....	....	
do 8	2	1	2	....	....	....	....	1	....	....	....	....	
do 9	2	.....	1	....	....	....	....	1	....	....	....	....	
do 10	1	2	2	....	....	....	....	2	....	....	....	....	
do 11	3	2	2	....	....	1	....	....	....	....	....	....	
do 12	1	2	.....	1	....	....	....	3	....	....	....	....	
do 13	3	1	2	1	....	....	1	1	....	....	....	....	
do 14	1	2	2	....	....	1	....	....	....	....	....	....	
do 15	4	2	1	1	....	1	....	2	....	....	....	....	
do 16	2	2	2	1	2	....	1	1	....	....	....	....	
do 17	4	1	1	....	....	....	....	....	....	....	....	....	
do 18	2	2	1	2	2	....	3	....	....	....	....	....	
do 19	5	3	2	1	....	1	1	1	....	....	....	....	
do 20	3	2	1	2	2	1	2	1	1	1	....	....	
do 21	4	3	2	2	1	2	....	....	....	....	....	....	
do 22	2	3	1	2	2	....	2	....	1	....	....	....	
do 23	5	3	2	1	....	2	....	....	1	....	....	....	
do 24	3	2	2	3	2	1	2	....	....	1	1	....	
do 25	3	5	2	2	1	1	1	....	1	....	1	....	
do 26	5	3	2	2	1	....	2	1	2	....	....	1	
do 27	5	2	2	2	1	1	....	3	....	1	1	1	
do 28	4	3	2	....	1	1	1	....	2	1	1	....	
do 29	4	3	2	2	1	1	2	1	1	....	....	1	
do 30	4	2	2	4	1	1	1	2	....	1	1	2	
do 31	4	3	2	1	1	2	1	3	1	....	....	1	
1891.													
Jan. 1	5	3	2	4	1	....	1	....	1	1	1	1	
do 2	2	1	2	....	....	1	1	3	....	....	....	1	
do 3	5	4	2	2	2	1	1	1	1	....	1	1	
do 4	5	2	2	3	....	1	1	1	1	....	....	2	One Andalusian sick.
do 5	4	2	.....	....	2	1	....	1	2	....	....	....	
do 6	4	3	2	2	1	1	2	....	1	....	1	2	
do 7	7	3	2	2	....	1	1	1	1	....	....	1	
do 8	2	3	1	....	2	1	1	1	3	....	1	2	
do 9	7	3	1	1	....	1	1	....	3	....	1	2	
do 10	2	3	.....	3	2	....	....	....	2	....	1	1	
do 11	6	4	2	1	2	1	1	....	2	....	1	3	
do 12	1	2	1	2	1	1	1	2	3	....	....	1	
do 13	9	5	2	4	2	....	1	....	2	1	1	1	
do 14	2	3	3	2	3	1	....	2	2	....	....	2	
do 15	8	2	3	4	3	....	1	1	4	....	....	2	
do 16	3	2	1	2	....	1	1	3	3	1	1	1	One Buff hen broody.
do 17	8	3	1	3	2	....	1	1	2	....	1	3	
do 18	4	1	2	2	....	1	....	2	4	2	1	1	One Buff hen died.
do 19	4	3	3	3	1	1	2	....	4	1	2	1	One Wyandotte broody.
do 20	2	1	3	1	....	....	2	1	2	1	....	2	
do 21	5	2	1	3	....	1	2	2	2	2	2	1	Two Langshans removed.
do 22	1	2	3	3	1	2	....	2	2	1	....	3	
do 23	1	2	1	2	....	1	....	2	2	1	2	3	
do 24	2	2	3	2	....	1	2	2	....	2	....	2	
do 25	.....	3	4	1	1	1	....	2	....	....	2	1	
do 26	.....	2	2	2	1	1	2	2	1	2	1	2	
do 27	.....	5	4	1	....	2	3	3	1	1	2	3	
do 28	1	.....	3	2	2	1	1	2	....	....	1	1	
do 29	.....	5	3	2	....	1	1	5	1	2	2	2	
do 30	1	.....	3	1	1	1	2	3	....	....	1	1	
do 31	2	4	3	1	1	2	3	2	1	....	2	1	
	186	143	114	91	52	47	55	74	63	23	33	56	

DISEASES OF POULTRY.

THE EPIDEMIC OF LAST YEAR EFFORTS TO FIND OUT WHAT IT WAS.

The description given in last report of the disease which was general in the district, with such fatal effect, attracted wide attention. Many letters were received giving various opinions as to its nature, and every effort was made to arrive at a correct conclusion. With this object in view, the remains of one of the farm fowls, which had died from the disease, was sent to Professor Wesley Mills, of the Physiological Laboratory of McGill University, Montreal, a gentleman well known not only as a skilled physician and lecturer, but as an authority on the diseases of animals and the philanthropic interest he takes in the same. Dr. Mills was given a full description of the disease, and was requested to give his opinion as to its nature. In the kindest manner possible he at once expressed his interest in the matter and expressed his intention, with Dr. Johnston, Demonstrator of Pathology of McGill, to have a *post mortem* made of the body of the fowl sent and to report on the same. At the same time he asked to have any live fowls which were suffering from the disease sent to him. Fortunately no other of the farm stock was sick at the time, nor did others become so afterwards from the same ailment. The following will show that the examination by Dr. Mills had a negative result:—

"PHYSOLOGICAL LABORATORY, MCGILL UNIVERSITY,

"MONTREAL, 19th Dec., 1890.

"Manager of the Poultry Department,

"Experimental Farm, Ottawa.

"DEAR SIR,—A *post mortem* examination of the P. Rock fowl you were good enough to forward, showed extreme emaciation, and pronounced pallor of parts generally. There were no evidences of any organic or zymotic disease. Dr. Johnston, Demonstrator of Pathology, inoculated some animals, including fowls, with the blood of this bird, but with negative results.

"Taking everything into account, I am inclined to think that the symptoms, &c., of the affected birds are indicative of a profound alteration in nutrition, to be explained by something in the conditions under which the bird lived.

"Truly yours,

"WESLEY MILLS, M.D."

In connection with the foregoing and as instance of the interest taken in the subject, the following extract from a letter received from Dr. J. Fitz Mathew, of Dauphin, Dauphin Co., Pa., author of the "British Colonist in America," is given. He says: "I am interested in your report of the chicken disease in the Ottawa district. I should suspect tuberculosis from the symptoms. Numbers of fowls die of it. In France, on one occasion, forty died (about) of tuberculosis from eating the *sputa* of a consumptive man, the attendant. I would advise an examination of the lungs and stomach." Dr. Mathew was informed of the result of the investigation by Professor Wesley Mills and in return wrote:—"I only made the suggestion of a diagnosis of the fowls, for the case is most interesting, especially at a time when tuberculous affections are occupying the attention of the medical faculty throughout the world. I enclose a few remarks on tuberculosis in fowls, which may be thought of service. I would suggest that the next case of this disease—which I believe to be tuberculous—you can get hold of, you submit to the McGill University experts for examination for the 'bacilli of tuberculosis,' slender bodies from $\frac{1}{17000}$ to $\frac{1}{7000}$ of an inch long.

"REMARKS ON 'TUBERCULOSIS' IN DOMESTIC FOWLS.

"'Johne'—Deutsche Zeitschrift fuer Thiermedizin, ('84), 155—describes the appearance of tuberculosis among fowls fed by a consumptive woman. Her sputum was thrown upon the manure pile, where the fowls had access to it. The symptoms were 'great emaciation' and debility.

"Nocard—Recueil de Méd. Vét (1885) annexe, 93—reports that ten fowls of a yard attended by a consumptive man died of tuberculosis of the abdominal organs. The fowls were seen eating the sputum.

"Nocard (Compt. Rend. Soc. Biologie (1885), 601), subsequently found the disease among the fowls of a slaughter-house, 'which were being fed on the diseased organs of cattle which could not be sold in the market.'

"Zürn, in an examination of six huudred hens found sixty-two affected with tuberculosis—turkeys, pheasants and partridges, &c. are subject to tuberculosis.

"The tubercular lesions are limited to the intestines and the liver; or they may involve the 'ganglia' and the ovary.

"In the case of the disease affecting the fowls in your district (in one case a dairyman losing 45,) assuming it to be tuberculosis—which can only be determined by microscopical examination for the 'bacilli' of tuberculosis the question is: 'In what way was it communicated?' Two ways may have already been noticed. Authorities are well agreed that the milk from an udder (tuberculous) is infectious. Sputum of tuberculous patients is so infectious, that even when diluted with 100,000 times its bulk of water, it is still infectious. Even although the disease may not be recognized, the symptoms being often very obscure, it may exist in animals slaughtered and sold for consumption. It is more prevalent among dairy cows subjected to unsanitary conditions and may exist also in the udder without being suspected. In France the percentage of meat found tuberculous at the various abattoirs varies from 1·43 to 14·5 per 1,000; observations extending over a period of 5 years. In England (Cope, Vet. Journal, 1889, 398) it varies from 1 to 26 per cent.

"Animals, such as dairy cows, subject to special feeding, brewery and distillery waste, &c., are specially liable to a tuberculous condition. Finally, it may be concluded that since the neglect of sanitary precautions, generally, undoubtedly gives rise to tuberculosis, it follows that fowls crowded together in roosting houses without 'proper ventilation,' &c., may generate tuberculosis. In cold winters in order to maintain heat it is a custom with many to 'exclude all air,' and no provision is made to permit foul odours to pass off."

ANOTHER DISEASE WHICH CAUSED GREAT LOSS TO FARMERS.

During the first week of September a letter was received from M. André Bertrand, a farmer of St. Esprit, P.Q., stating that a disease had broken out among his poultry and that a number of turkeys, chickens and fowls had died. The remaining birds he feared would be lost. A brief description of the disease was given.

A reply was sent asking him to forward a detailed description of the disease, and expressing the fear that cholera was the ailment. A statement of how his poultry was housed, extent of premises, &c., was also asked for, as it was intended to submit the correspondence to Prof. Wesley Mills, of McGill University, for his opinion.

In response the following letter was received from M. Bertrand:—

"SIR,—You ask me to give you a description of my place and of the disease which has broken out among my fowls. I live on my farm, which is a large one. My farm buildings are extensive and commodious, with the hen-house in the corner of the stable. The buildings are situated near the river. When I noticed that my fowls were getting sick I closed the hen-house and then the fowls went to roost in the trees, in the barn or under the gallery. They all died one after another, until, now, I have only nine chickens out of one hundred. Ten turkeys have died out of thirty-six. The symptoms of the disease are as follows: The fowls commence at once to fail and to appear broken down, although they eat until the last day. The

head becomes of a blueish colour, but is not swollen, as in roup. The droppings are thin, of a white, yellow and greenish tinge. Some contain what looks like coagulated blood. The disease seems to be epidemic, as all my neighbours fowls are suffering from it. This is about all the explanation I can give you.

"Yours very truly,

"ANDRÉ BERTRAND,

"St. Esprit, P.Q."

This letter was at once sent to Professor Wesley Mills, of McGill University, asking the favour of his opinion as to the nature of the disease. In reply the following opinion and advice was received:—

"PHYSIOLOGICAL LABORATORY, MCGILL UNIVERSITY,

"MONTREAL, 19th December, 1890.

"DEAR SIR,—The symptoms and results described by Mons. Bertrand seem to point to chicken cholera or some closely allied disease as the one that has played such havoc among his birds. It would be well that every bird showing the first symptoms of the malady should be killed at once if it cannot be isolated, and the bodies of all the dead burned. The well birds should be isolated and the buildings in which the others have been, thoroughly disinfected, All excrement should at once be burned. The food must be carefully examined as well as the water. It might be well to boil the latter and feed the flock for a while on soft food, prepared by pouring boiling water over meal of various kinds. In medical treatment little, I fear, can be done. I should give at once a compound cathartic pill and follow it in a few hours by a good dose of castor oil. A gelatine capsule containing powdered charcoal and a little cayenne pepper might also be of use, if given every three or four hours. However, in such a disease it is better to kill the sick than try to cure them, it seems to me.

"Truly yours,

"WESLEY MILIS, M.D."

Immediately following this letter came the request from Dr. Mills, to have two birds suffering from the disease, but alive if possible, sent to him at the University.

Accordingly a note was sent to M. Bertrand, asking him to comply with Dr. Mills' request. A few days after, M. Bertrand wrote to say that he had sent two fowls, one dead from the disease and another alive, but sick from it. He had obtained the fowls from a neighbour as his own had all died. It was learned afterwards that the fowl, which was alive when shipped, was dead when it reached its destination.

A request was sent to Professor Mills to kindly forward the result of the examination to be published for the benefit of farmers and others who kept poultry. In answer Dr. Mills said, that "the investigation was in progress, but that it would be premature to make a diagnosis yet. He would like M. Bertrand to send one or two more fowls alive, and just as soon as they are decidedly ill." M. Bertrand was written to accordingly.

It may be remarked here that the importance of having such authorities as Professor Mills and Dr. Johnston to refer to, will be evident at first glance. The uniform promptness and willingness of Professor Mills to give his opinion, as to cause and advice as to remedy, cannot be too much appreciated.

OTHER AILMENTS REPORTED AND REMEDIES ASKED.

On the 25th April, Mr. Munro, of Almonte, Ont., wrote, "that he had a Leghorn hen which had a large lump growing on one side of her face below the eye. The lump came on the year before, disappeared but was again coming on." He was

answered that the lump was probably of a scrofulons nature, and that the fowl was not fit to breed from.

Later in the year, Mr. J. Riach, of Hamilton, Ont., wrote that he had some valnable fowls which were so tronbled with worms as to make them very sick. He was advised to soak Indian corn in tnrpentine and water, and feed to the fowls (if the worms were in the intestines) once or twice and follow with a compond rhnbarb pill. If the worms were in the throat—as in gapes—to pnt a few drops of tnrpentine in the drink water. He snbsequently wrote to say that as he had not the pills, he had given castor oil after the turpentine, and that the treatment had been successful.

Many other diseases were described and remedies asked for. In all cases information was at once given. It may be nseful to others to know that in some instances a remedy for lice was asked, and dusting the hen with carbolic acid powder was recommended; others stated their hens were sneezing and wheezing, and injection into the nostril of coal oil and a few drops of carbolic acid liqnid was advised, with care that the hens were not exposed to dranghts; others had fowls with swelling at leg-joint, when painting with iodine was snggested. In some cases chickens were reported as having died in nnmbers, when enqniry discovered that feeding wheat at too early an age was cause of death.

EXPERIMENTS WITH EGGS AT DIFFERENT TEMPERATURES.

With the object of ascertaining how long newly laid eggs will keep fresh in different temperatures a number of experiments were made, the resnlts of which are given below. The eggs were laid by the farm fowls and were snpposed to be fertilized. They were assorted as follows: Twelve were placed in an incnbator and kept at a temperatnre of 78 to 84; twelve others were placed in a basket kept on a shelf in the cellar, at a temperature of 46 to 48; twelve were kept in the incubator part of the day at 78 to 84 and the remaining portion were placed in a basket and kept in the cellar at a temperatnre of 46 to 48, the object being to snbmit them to alternate variations of temperatnre; twelve were packed in bran in a basket and kept in the cellar and twelve others were greased with lard and packed in salt and also kept in the cellar. The notes were taken when examination of the eggs were made by yourself, with the exception of the first.

7th November, 1890.

Examination No. 1.—An egg laid on the 29th October, and another laid on 31st of same month were placed in the incubator with others on the latter date. The incubator was kept at a temperature of 78 to 84 degrees. No. 1 egg was examined on November 7th as mentioned above, and showed a faint dark mark on one side, but when broken into a sancer was found qnite sweet and fresh. No. 2. ditto

20th November, 1890.

Examination No. 2.—Examined two Andalusian eggs which had been in drawer of table in office of poultry building since the first week in Angust. The eggs were placed on their sides on bran and when laid were supposed to be fertilized. No. 1 egg was found clear and bright; quite sweet and good; entirely free from any odonr or mnsty taste. No. 2 egg—ditto.

Examination No. 3.—Examined two eggs which had been kept in incnbator since 31st October at a temperature of 78 to 84°. No. 1 egg—Yolk somewhat soft and easily broken np. Both yolk and white qnite sweet to taste and free from everything objectionable. No. 2—In similar condition to No. 1. Both these when examined through egg tester looked as if some change was going on.

Examination No. 4.—Examined eggs stored in open basket in cellar, at temperature of 46 to 48, on 29th October. Eggs were fonnd perfectly fresh and sweet; yolk firm; white, clear and bright.

Examination No. 5.—Examined an egg, which with others was packed in bran in a box in cellar at a temperature of 46 to 48 on 29th October. Found perfectly fresh and sweet; yolk firm; white, clear and bright.

5TH DECEMBER, 1890.

Examination No. 6.—Examined 2 eggs, which with others had been constantly kept in incubator at a temperature of 78 to 84, since 31st October. No. 1 egg, yolk easily disintegrated, breaking up when egg was opened; air space much enlarged; contents perfectly sweet. Egg laid on 30th October. No. 2 egg in similar condition to No. 1, but air space not so large.

Examination No. 7.—Eggs placed in basket and kept part of time in incubator and part in cellar. Yolk hangs well together; air space small; contents perfectly sweet.

Examination No. 8.—Eggs kept in plain basket in cellar, at temperature of 34 to 46 since 29th October. One egg opened; perfectly sweet; yolk hangs well together; has every appearance of fresh egg; air space small.

Examination No. 9.—From the number packed in bran, in a box and kept in cellar at temperature of 34 to 46 since 29th October. Result same as in plain basket, examination No. 8.

Examination No. 10.—From the lot greased with lard and packed in salt contained in a box and placed in cellar on 10th November. Yolk hangs well together; air space small; perfectly sweet; every appearance of a fresh egg.

Examination No. 11.—From the eggs placed in the drawer of the table in office in first week of August previous. (See No. 2.) Egg quite sweet; yolk rather tender; not so easily broken up as those from incubator.

DECEMBER 31ST, 1890.

Examination No. 12.—An egg from those kept in incubator since 31st October, at a temperature of 78 to 84. Egg quite sweet; air space very large, occupying one-fourth of shell; yolk partly thickened and partially adhering to side of shell. Egg laid on 31st October.

Examination No. 13.—Egg part of time in incubator and part of time in cellar. (See No. 7). Yolk of egg easily broken up; air space large, occupying about one-sixth of shell. Egg laid 5th November; quite sweet.

Examination No. 14.—From eggs kept in plain basket in cellar at temperature of 34 to 46 (see No. 8) since 29th October. Egg perfectly sweet; every appearance of fresh egg; yolk solid; white clear; air space small. Egg laid 27th October.

Examination No. 15.—From eggs packed in bran in a box in cellar. (See No. 9.) Same as in No. 14. Egg laid on 26th October.

Examination No. 16.—From eggs greased with lard and packed in salt and kept in cellar. (See. No. 10.) Egg perfectly sweet; every appearance of fresh egg; yolk firm and sound; white clear; air space small. Egg laid 2nd November.

Examination No. 17.—One egg from those placed in drawer of the table in office of poultry building in the first week of August. Yolk slightly adherent, and breaking up easily; air space large; contents perfectly sweet.

From the above experiments, it will be seen that fertilized eggs, if fresh when placed in the shippers hands, should reach the British or any other market, in good condition and flavour at the end of several weeks, even if exposed to the high temperature of midsummer weather.

EXPERIMENTS WITH NON-FERTILIZED EGGS.

On the 30th of October, 20 hens of different sorts were placed, without a male companion, in one of the compartments of the poultry house. They were so placed in order to secure non-fertilized eggs, with which to try a series of experiments similar to those described above. It was five weeks before any of these hens began to lay, so that there can hardly be any doubt as to the non-fertility of the eggs. On the

23rd December, 12 of these eggs, each one marked with the date of laying, were placed in the incubator to be kept at a temperature of 80 degrees, and to be examined from time to time and notes taken of their condition. These experiments are being continued.

[NOTE.—A further examination was made as the report was going through the press as follows :—]

24TH FEBRUARY, 1891.

Examination No. 18.—Two eggs were taken from those which had been in the incubator from the 31st October, 1890, till the 11th February, 1891, at which date the incubator tests ceased. In No. I egg, the white was found evaporated. Tho yolk was hard and granular, the two occupying about one-third of the space in the shell; contents quite sweet; no musty odour; no evidence of decay. No. 2 specimen had the yolk semi-solid, with about a teaspoonful of the white still fluid; contents quite swoet and free from all odour.

Examination No. 19.—One egg from those kept part of each day in incubator and part out. About one-third of egg occupied by large air space; yolk easily broken up; small proportion of white; contents quite sweet, both to smell and taste and free from all mustiness. Egg laid 2nd November.

Examination No. 20.—An egg from the lot packed in bran and kept in the cellar. Yolk round and firm; white fairly clear; contents perfectly sweet; has every appearance of a fresh egg; air space not very large. Egg laid 29th October.

Examination No. 21.—An egg from those greased and packed in salt. Yolk round and firm; white nearly transparent; contents perfectly sweet; has every appearance of fresh egg; air space small. Egg laid on the 2nd November last.

Examination No. 22.—An egg from those laid in first week of August last and kept in drawer of table in office. Air space occupied fully one-third of egg-shell; yolk fairly round and firm; white nearly transparent; contents perfectly sweet and free from mustiness.

UNFERTILIZED EGGS.

Examination No. 23.—An egg laid on the 11th December and placed with eleven others in the incubator (at a temperature of 78 to 84°) on the 28th December, and kept there until the 11th February, after which they were kept in the cellar at from 38 to 40°. Yolk nearly round and solid; white slightly opaque; air space large; contents perfectly sweet and free from mustiness.

Examination No. 24.—An egg from twelve unfertilized ones kept in an open basket in cellar at a temperature of 38 to 40. Egg was laid on 9th of January last. Yolk round and firm; white transparent; air space medium; contents perfectly fresh; has every appearance of fresh egg.

Examination No. 25.—An unfertilized egg from a dozen packed in a box in bran and kept in the cellar. Egg laid on the 30th December. Yolk round and firm; white transparent; air space medium; centents perfectly sweet; has every appearance of fresh egg.

Examination No. 26.—An unfertilized egg from a dozen others greased and packed in salt and kept in cellar. Egg laid on 21st January. Yolk round and firm; white transparent; egg perfectly sweet.

Owing to one of the tanks of the incubator starting to leak on the 8th of January it was stopped for repairs for a week and the incubator tests were finally discontinued on the 11th February.

FEEDING HENS FOR EGGS OF FINE FLAVOUR.

To have eggs of fine flavour the hens should be fed on clean food. Fowls fed on putrid meat, decayed or decaying animal substances, will lay eggs not fit to eat. Proof of how the food affects the egg may be had by feeding a number of hens on onions for a certain period. The eggs will become so strongly tainted with the onion flavour as to be unpalatable. Where the farmer allows his fowls unlimited

range, it may be said that it is impossible to control their feed, but under no circumstances should the fowls be allowed access to filthy substances. Even the practice of allowing the hens to scratch in the dunghill, as some of the old school of farmers think is necessary for the production of eggs, is not to be recommended. Where fowls are kept for the purpose of money-making, they will be found systematically arranged in certain numbers in pens and their actions under control. Good care, clean food, and clean quarters will be found hand in hand. System and intelligence is as necessary in the management of poultry as in other lines of business.

WHITE OR DARK-COLOURED EGGS.

Should the production of dark or brown-coloured shells be desired for a particular market, either of the following breeds will be found to lay them, viz: Cochins, Brahmas, Wyandottes, Plymouth Rocks or Langshans. Where eggs with white shells are wished, they will be produced by Leghorns, Minorcas, Andalusians, Polands, Hamburghs, Games, Houdans or Dorkings. Where both are required, Plymouth Rocks or Wyandottes, with the Leghorn or Minorcas, will be found to fill the demand most satisfactorily.

RAPID FLESH FORMERS FOR EARLY MARKET.

Experience with twelve of the leading varieties so far has proved that the Plymouth Rock (see report of last year) is the most rapid flesh former, making a good market chicken between three and four months of age. All who try will find this result, provided, the young bird is properly cared for and pushed from time of hatching. (See care and management of chickens.) The Wyandotte matures rapidly, making a round plump market chicken at from four to five months of age. Brahmas do not take on flesh quickly while growing, but after seven or eight months make a fine large bird. Either of the two first named will be found to make early chickens for market.

WEIGHT OF EGGS.

The following figures will give the weights of eggs laid by pullets and hens singly and by the dozen:—

——	Single Egg.	Per Dozen.
	Ozs.	Lbs.
White Leghorn pullet	$1\frac{9}{10}$	1·09
do hen	$2\frac{1}{4}$	1·11
Black Minorca pullet	2	1·07
do hen	$2\frac{3}{8}$	1·11
Andalusian pullet	.....	.....
do hen	$2\frac{1}{7}$	
Plymouth Rock pullet	2	1·09
do hen	$2\frac{1}{4}$	1·11
Brahma pullet	.....	.....
do hen	$2\frac{1}{4}$	1·12
Buff Cochin pullet	.....	1·08
do hen	.....	1·11
Houdan pullet	2	1·08
do hen	$2\frac{1}{2}$	1·12
Wyandotte pullet	2	1·07
do hen	.....	1·09

The following is the list of poultry at present :—

LIST OF POULTRY.

Breeds.	Males.	Females.
Langshans	10	11
Brahmas	6	15
Plymouth Rocks	10	24
Buff Cochins	2	12
White Leghorns	8	21
Black Minorcas	10	13
do Hamburgs	3	13
Houdans	2	12
Andalusians	6	6
Mixed	3	25
Wyandottes	3	9
Redcaps	.....	2
Coloured Dorkings	.....	1
Russians	.....	2
Golden Polands	.....	1
B. B. R. Games	1	4
	64	171
		64
		235
Wild geese from Gulf of St. Lawrence	.....	4
Hitchins geese from Hudson Bay	.....	2
		241

ANSWERS TO CORRESPONDENTS THAT MAY GIVE INFORMATION TO OTHERS.

The following letters from a few of the many received during the year, are published in condensed form with the hope that the replies may anticipate information desired by others :—

CALGARY, N.W.T., 17th March, 1890.—A correspondent states that he has taken up land 15 miles from the town and desires eggs from breeds suitable to that climate. He thought money could be made out of eggs and poultry, as the price in winter for the former was 50 to 60 cents per dozen, and the latter 22 to 25 cents per lb. In summer eggs did not sell below 30 cents.

REPLY.—Eggs from Plymouth Rocks, White Leghorns and Houdans were sent. Fear was expressed that the eggs would receive too much shaking *en route* to hatch well.

FORT MACLEOD, N.W.T., 21st March.—The correspondent desires a sitting each of Wyandottes, Silver Pencilled Hamburgs, Black Minorcas, White Leghorns, Black Hamburgs and Plymouth Rocks, as he is going extensively into breeding poultry. He thought the climate suitable, being dry and cool.

REPLY.—It was stated that it would be impossible to send all the eggs wanted. What could be spared would be sent. A request was made to report what success attended his efforts.

ASHCROFT, B. C., 31st March.—The correspondent asks how the Experimental Farm poultry house is built and how it is heated? He is going to erect a house for poultry, and although the climate is genial, it is sometimes necessary to have a stove going. Average price of eggs the year round in his district 25 cents per dozen.

REPLY.—Full particulars as to construction of poultry house were sent as given in report of 1889.

WHITEWOOD, N.W.T., 20th April.—The correspondent is about to erect a poultry house and sends his order for eggs a season ahead. The maximum price of eggs in his neighbourhood is 40 to 50 cents per dozen, and minimum 20 to 25 cents.

REPLY.—It was stated that eggs would be sent if at all possible.

TORONTO, Ont., 18th April.—The correspondent had bought a sitting hen and was afraid that a week or ten days would be too long to keep her waiting for eggs ordered.

REPLY.—That if the hen is rid of lice and placed on imitation eggs, in comfortable nest, with feed and water near her (see Farm Report, 1890), that she will sit well when genuine eggs are given her.

OTTAWA, 24th April.—The correspondent is about to put up a poultry house; would like it to cost as little as possible, and yet be modern and practical.

REPLY.—Suggests battened boards, tar paper, four or six inches of dry sawdust, then boards to be whitewashed; false ceiling of boards, which could be removed in summer; space above ceiling in winter could hold chaff, straw, hay or dry leaves, to be let down as required, for hens to scratch in; board floor, platform and roost, dust bath, nest and box for gravel, grit, &c.; windows not too large.

TORONTO, Ont., 14th April.—The writer desires a sitting of White Leghorns to be sent to his brother, who is a farmer. He thinks the breed suited to a farmer, as it is hardy and lays well.

REPLY.—That eggs will be sent; that his conclusions are justified by the experience of the breed on the Experimental Farm.

MELITA, Man., 12th May.—The correspondent would like to improve his fowls. Desires to know if he can have eggs sent by mail, as he is 25 miles from the nearest express office.

REPLY.—The eggs cannot be sent by mail. If they could they would be too much shaken up to hatch.

WAPELLA, N.W.T., 27th May.—The writer has been informed that eggs are distributed from the farm, and would like a sitting or two of some variety.

REPLY.—That a moderate charge per sitting is made for eggs sent to farmers.

WENTWORTH, N.S., 30th May.—The correspondent desires to know the proper temperature at which to keep his incubator; (2) should the thermometer be left in tray while eggs are being turned? (3) will it hurt the eggs to leave them out till temperature falls to 70? (4) is the incubator to be treated in the same manner for ducks as chickens?

REPLY.—To No. 1 query, 102 to 103 degrees. (2.) Yes. (3.) No. (4.) Yes; but the ducks will take a week longer to hatch than chickens.

LANGENBURG, ASSA., 15th May.—Asks how he is to know fertile eggs from others.

REPLY.—By looking at egg held in front of tester placed before strong light on seventh day, when the dark outlines of the chick will be seen. The clear ones are unfertile.

HILLHURST, Que., 25th July.—The correspondent would like to exchange two cockerels of large size for a cockerel of the Brahma-Minorca cross, as she has seen

by Farm Report that the females of this cross lay very large eggs. Her own fowls (crosses) laid eggs during winter 3½ ozs. each.

REPLY.—That all the Brahma-Minorca crosses turned out hens.

NORTH LANCASTER, ONT., 26th July.—The writer asks if a Buff Cochin and Plymouth Rock would make a good cross. (2) Are the White Plymouth Rocks superior to the barred?

REPLY.—(1) Not much, if anything, to be gained by the cross. (2) Hardly any difference. The barred are to be preferred for farmers, as they do not show the dirt so easily.

NEWCASTLE, N.B., 6th August.—(1) Would like to purchase 6 Leghorn pullets and the same number of Plymouth Rocks.

REPLY.—That the pullets are not disposed of. They are kept for layers.

WALTER'S FALLS, ONT., 29th August.—Desires to know how to distinguish between the gander and goose in his wild geese.

REPLY.—Very hard to distinguish except by size, the female being smaller. They will likely pair in spring, and will breed only in pairs.

SASKATOON, N.W.T., W.T.C., 19th September.—Asks will the White Plymouth Rocks breed true to type and markings.

REPLY.—Yes.

ERINVIEW, P.O., MAN., 8th October.—(1) Desires to know if a log poultry house, well plastered, roofed, floored and well ventilated with windows of one thickness only would be sufficiently warm to keep fowls in, provided with plenty of short straw, hay or chaff, and fed as recommended in Farm Report, 1889. (2) Would like some suggestions, or plan, to keep eggs from freezing going a distance of 45 miles to market, with the thermometer 20, 30 and 40 below zero.

REPLY.—That house should be warm enough with double windows on; but hard to say until size and number of hens to be kept were given. (2) A plan (drawn by Prof. J. W. Robertson, Dairy Commissioner) of an outside case was sent.

CAMPBELLFORD, ONT., 27th November.—(1) Would like to know what kind of poultry was best for a farmer. (2) Which kind of Dorkings is the best?

REPLY.—(1.) Plymouth Rocks and White Leghorns for reasons given on page 108 of report of 1889. (2.) All are good, but the coloured is considered the hardiest.

CALGARY, N.W.T., 15th December.—The correspondent had an incubator made in accordance with instructions given in a poultry book. The eggs were placed on flannel spread over ½ inch of sand on top of a tank, which was heated by a lamp underneath it. The eggs were turned once a day, and sprinkled, slightly, twice *per diem*, with lukewarm water. The day the chicks should have hatched, some of the eggs were broken. The chickens were alive, but did not seem ready to come out. The incubator was kept going as usual, and two days afterwards one chick came out of its own accord and two others with a little help. The next day the eggs were broken, and the great proportion of the chicks seemed to have come to the hatching point, their bodies being covered with down and the yolk taken up, but all were dead in the shell. The incubator was tried again with the same result, except that no chickens were found alive. Temperature first time 105, second time 103, evenly kept up. Would like to have some explanation as to cause of failure of the chicks to hatch out when they had lived so long.

REPLY.—That the incubator was open too often at the hatching period, and probably the chicks were chilled to death. (See management of sitting hens.) The hen sits closely from the 20th day till the chicks are ready to leave the nest. The bottom heat does not seem natural. The hen sits on the top of the eggs. She does not have them on her back. The temperature of 105 seems to be very high, if the thermometer is correct. The most modern incubators are run at a temperature of 102 to 103, and instructions are explicit not to exceed the latter figure. Top heat is used in the latest made incubators and brooders.

SOME GOOD RESULTS.

As showing what a small number of poultry will do, when well cared for and fed, the following from Mr. William Feeley, residing on the Gatineau Road near Hull, P.Q., will be read with interest.

NUMBER OF EGGS LAID BY 15 PLYMOUTH ROCK HENS.

January	214	
February	144	
March	283	
April	280	
May	240	
June	211	one hen killed.
July	197	
August	187	
September	130	
October	75	hens moulting.
November	4	hens moulting.
December	37	
	2,002	

Total cost of feed for the year $17.90.

Four of the hens raised 39 chickens. The cost of the chicken's feed is included in above amount.

One of the pullets began to lay when five months and three days old.

THE POULTRY SHOW AND POULTRY MEETING AT THE TORONTO INDUSTRIAL EXHIBITION.

During the third week of September a visit was paid to the poultry exhibit, one of the features of the Industrial Fair at Toronto. Advantage was taken of the opportunity to attend a special meeting of the Ontario Poultry Association. The exhibition of poultry was very fine and well arranged in a building erected for the purposes of the annual show of fowls. The building is constructed in the most modern style, embracing all latest improvements as to lighting and arrangement of coops. The fowls were exhibited in classes with large cards distinguishing each breed, a method instructive to visitors and highly to be commended. The arrangement by which food and water were always kept before the birds was a great improvement on previous methods, as it prevented the birds from over eating or drinking, as they are apt to do if neglected until very hungry or thirsty. By another ingenious device the entry card was kept in good view but beyond reach of the fowls to pick it to pieces. At the meeting of the Poultry Association, upon invitation, a few remarks were made explaining the methods in operation in the poultry department of the Central Experimental Farm, and the efforts made to instruct the farmers and enlist their interest in poultry, a department of their farms which could be made a paying one by intelligent and systematic management. A vote of thanks expressing the sympathy of the association in the good work being done at the farm, was unanimously carried.

A VALUABLE PRESENT.

During the month of October last, two large and handsome Langshan cockercls were presented to the poultry department of the farm by Mr. W. H. Doel, of Eglinton, North Toronto, a gentleman well known as a veteran fancier and breeder of poultry. The birds are a valuable acquisition to the farm stock, and a splendid instance of skill in mating and the benefit of early hatching.

THE INCUBATOR.

So great was the demand for eggs during the hatching season that it was impossible to save enough to fill the incubator at the early period it was desirable to have it in operation. An effort will be made to hatch out a number of chickens in it during the approaching spring.

THE WILD GEESE.

The wild geese mated in early spring, but did not breed, probably owing to limited quarters and water supply. When removed to a new and more extensive run and pond accommodation they may do better.

VISITORS.

During the year a large number of persons visited the poultry department. Many of them were farmers who sought information as to the best breeds for layers and market fowls, care of chickens, appliances, and the most suitable kinds of food.

RECAPITULATION OF INFORMATION GIVEN IN PREVIOUS REPORTS.

The following summary of information, previously given, may be found useful for reference:—

HOW TO SET A HEN.

Make a comfortable nest on floor or ground.
Place the sitter where other stock cannot annoy her.
Dust the sitter and nest with lice-destroying powder.
Put three or four imitation eggs in nest.
Allow hen to sit on these eggs for two days.
Then give her the valuable eggs.
Give a small hen nine eggs in spring.
A large hen may have eleven eggs, later in season thirteen.
If possible choose a light sitter to put on early eggs.

TREATMENT OF A SITTING HEN.

Have food, drink and dust bath convenient.

In cold weather see that sitter is not off nest more than seven to nine minutes.

In early spring Indian corn is the best food, as the crop can be quickly filled with it.

Do not disturb the sitter, particularly when the chicks are hatching out.

Choose hens that have proved reliable sitters and good mothers.

Should an egg be broken in nest, gently wash remaining ones in luke-warm water and return to nest.

TREATMENT OF CHICKENS.

After hatching leave them in the nest for 24 hours.

Take hen apart and feed her well and give water to drink, or she will eat all the chicken food.

On coming out of nest, feed chicks on bread soaked in milk and squeezed dry, or give dry bread crumbs.

After a few days give chicks all they can eat, as often as they will eat, of bread and milk, or bread-crumbs.

After second day give milk or water in shallow pans for drink.

Be careful bread is not fed too sloppy or looseness will follow.

If chicks appear sick or drooping look for lice. Dust with insect powder carefully.

After two weeks feed wheat sparingly at first, afterwards all they can eat, particularly at night. Vary with crushed corn.

Be careful the chicks are not stinted of food or they will become stunted.

Remember that a chick stunted in first five weeks of its life will never make a plump fowl.

If the hen and chicks are placed in small coops the latter should be cleaned every day, or second day. As the early chicks grow large they should be removed from the younger ones, or the latter will be crowded and make no progress.

HOW TO MATE THE DIFFERENT BREEDS.

Brahmas.—One male with seven females. A cockerel with two year old hens if possible.

Plymouth Rocks.—One male; nine females. A young bird with two year old hens preferred.

White Leghorns.—One cockerel with eleven two or three year old hens.

Houdans.—One male, nine or eleven females.

Black Minorcas.—Same as Leghorns.

Langshans.—Same as Brahmas.

Mixed Fowls.—One male with nine or eleven females.

Wyandottes.—One male with nine females.

The above embraces the best known breeds. Where only one sort is kept and the fowls have unlimited run, a greater number of females may be allowed. Eggs are fertile after fowls have been mated about ten days.

TREATMENT OF LAYING STOCK.

Keep hens warm enough so that their combs will not freeze.

Take chill off water and warm the grain in cold weather.

Keep hens active by throwing grain among straw on floor.

Give meat in regular supply, warm mess in morning and regular supply of grit, gravel, &c.

Supply what the hens can pick up for themselves when outside.

Send layers to roost with their crops full to carry them over night.

Do not give layers soft feed enough to gorge them, or make them lazy.

MISCELLANEOUS.

For layers choose White Leghorns; for general purposes, Plymouth Rocks; for both Wyandottes.

Do not continue to inbreed, or the stock will decrease in size, stamina and value.

Get rid of the three and four year old hens; keep the pullets; eat or sell the cockerels.

Give the poultry as fair a trial as would be given a new kind of seed, vegetable, breed of horses or cattle.

Utilize the grain, vegetable and meat waste of the farm by converting it into poultry and eggs.

REMARKS.

The information sought in the greatly increased correspondence of the past year, goes to show that the farmers are taking a greater interest in their poultry as a source of revenue and an article of food. As to the former, with intelligent and systematic management it will certainly prove satisfactory. As an article of diet it is well known to be both wholesome and delicious.

I have the honour to be, Sir,

Your obedient servant,

A. G. GILBERT,

Manager Poultry Department.

CENTRAL EXPERIMENTAL FARM,
OTTAWA, 31st January, 1891.

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES.

REPORT OF W. M. BLAIR, SUPERINTENDENT.

To WILLIAM SAUNDERS, ESQ.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the following report of the operations on the Experimental Farm for the Maritime Provinces at Nappan, N. S., during the year 1890:—

WEATHER.

The year has been beset with difficulties for farm work. The winter was mild with much rain and occasional short periods of extreme cold, and, as the ground was bare at those periods, the frost penetrated very deep, in many places four feet. The spring was wet, with cold east winds extending into June. Farm work commenced on 6th May, seeding on 17th May, and continued at intervals as the land could be got ready and the weather would permit, until 16th June, during which time there was a continuation of cold which lasted until 1st July. It was then fine with occasional showers until 9th August. Then followed an almost continuous rain for two weeks, which was succeeded by fair weather, with some rain, until 9th September. After this commenced what is called the warm rain, which continued nine days with very warm weather, and which terminated in a flood that destroyed large quantities of grain as well as the late Marsh hay. This was also destructive to potatoes, causing them to rot badly. From that time until October, there was fine weather, with wet again until the ground was frozen 1st December.

MANURE.

450 loads of marsh-mud was drawn from the marsh flats during the time there was sleighing. A dressing of this mud at the rate of 100 loads per acre, usually gives a strong growth of straw, free from rust, with the heads well filled and heavy. The manure from the cattle and horse stables was drawn to the fields during the winter, and either spread directly on the land, or, when the litter was long and coarse it was piled up to rot. Care was taken to have the horse and cattle manure well mixed when piled, so as to insure more rapid decomposition.

In addition to this, special fertilizers were used, manufactured by the Provincial Chemical Fertilizing Co., of St. John, N. B., "Ceres" Superphosphate, manufactured by Jack & Bell, Halifax, and bone-meal and phosphate manufactured by Samuel Archibald, Truro, N. S. There appears so far to be very little difference in the quality of these different kinds. In each case we found the grain more plump and heavy in the kernel where it was used, while there was little difference in the growth of straw, indicating that the profit for this expenditure is to be found mainly in the weight and quality of the grain, rather than in the stouter growth of the straw in the field, which is often taken as the chief indication of the value of special fertilizers.

MARSH LANDS.

The English hay in the marsh was heavy and of good quality, and was saved in good condition. The Broad-leaf hay was much winter-killed by the frequent freezing and thawing during the winter, more particularly on the lower portions of the marsh, thus suggesting the necessity of more thorough drainage. This hay is not usually far enough advanced to be cut before 1st September, and was in consequence much damaged by the long wet weather of September. When "Broad-leaf" hay is harvested in good weather, it is of excellent feeding quality, but it requires to stand ten days to make properly before it is ready for the barn or stack.

In order to protect the marsh from being wern away by the action of the tides, and freshets, it was found necessary to build two small break-waters. 40 loads of brush and 20 loads of stone were used for this purpose. The weak places in the dykes were also repaired. Six acres known as the Mines and Forest Marsh, were ploughed and partially levelled. We hope by another year to get these rough pieces in good shape for a seed bed for grass.

WHEAT.

Twenty-eight varieties of wheat were sown. A statement of the date of sowing time of harvesting, number of days from sowing to maturing, quantity per acre and weight per bushel is given below of the most promising kinds.

——	Date of Sowing.	Date of Harvesting.	Number of Days to Mature.	Yield per Acre.	Weight per Bushel.
				Bush.	Lbs.
Green Mountain	May 20	Sept. 11	114	21	60
Hungarian Mountain	do 20	do 11	114	20½	60¾
White Fife	do 20	do 6	109	29¾	59¾
Wellman's Fife	do 20	do 11	114	40	60½
Indian Red Karachi	do 20	Aug. 27	99	21	61
do Hard do	do 20	do 27	99	20	61¼
Judket	do 20	Sept. 5	108	20	59½
Pringle's Champlain	do 20	do 4	107	41	61
White Russian	do 20	do 4	107	31	59¾
Magyar	do 20	do 11	114	20	60½
Campbell's Triumph	do 20	do 5	108	30	60½
do White Chaff	do 20	do 3	106	32	60
California White	do 20	do 4	107	21	59½
Carter's Cross-bred, Selection I	do 20	do 19	121	29¾	56¾
Indian Hard Calcutta	do 20	Aug. 27	99	24¼	62½
White Delhi	do 20	do 30	102	13	62
Ladoga	do 20	do 30	102	19	62
Defiance	do 20	Sept. 19	121	22	60¼
Rio Grande	do 20	do 19	121	28½	61½
Red Fife	do 20	do 19	121	19	60¾
Red Fern	do 20	do 19	121	12½	61¼

OATS.

Twenty-five varieties of oats were sown. A statement showing the best varieties, time of sowing, date of harvesting, yield per acre and weight per bushel is given below.

It must be borne in mind, however, that much of the grain suffered severely with the continuous rain storms which prevailed during harvest-time, causing it to

shell badly which reduced the yield in many cases, but just how much cannot be determined.

—	Date of Sowing.	Date of Harvesting.	Number of Days to Mature.	Yield per Acre.	Weight per Bushel.
				Bush.	Lbs.
Victoria Prize	May 17	Aug. 19	94	31	42¾
Waterloo	do 19	Sept. 3	107	16	32
Early English White	do 19	do 21	125	28	42
American Triumph	do 21	do 10	112	37½	31½
Banner	do 21	do 3	105	47½	33
Bonanza	do 21	Aug. 28	99	28	43½
White Tartarian	do 21	Sept. 19	121	51	33
Early Blossom	do 21	do 4	106	45	35½
Prize Cluster	do 21	Aug. 27	98	22½	40
Imported Black Tartarian	do 21	Sept. 10	112	33¾	32¾
Cream Egyptian	do 21	do 4	106	39	37¾
Egyptian	do 22	do 4	107	39¾	38
Flying Scotchman	do 22	do 2	105	39¾	36½
Welcome	do 24	Aug. 25	93	26¼	40¾
Early Racehorse	do 26	Sept. 1	98	26⅛	42¼
Poland White	do 26	do 1	98	21	42½
August do	do 26	do 1	98	23½	38¾

Thirty-four varieties of barley were grown. A table giving the names, date of sowing, date of harvesting, yield per acre and weight per bushel is given below of the more valuable varieties.

—	Date of Sowing.	Date of Harvesting.	Number of Days to Mature.	Yield per Acre.	Weight per Bushel.
				Bush.	Lbs.
Petschora	May 23	Aug. 19	88	35	45
Large Two-Rowed Naked	do 23	do 27	96	14½	60
English Malting	do 23	Sept. 3	103	21½	48½
Early Minting	do 23	do 3	103	19	48
Peerless White	do 23	do 3	103	32	48½
Selected Chevalier	do 23	do 3	103	44	46¾
Goldthorpe	do 23	do 3	103	29¾	49½
Baxter's Six-Rowed	do 23	Aug 19	88	20	47¾
Rennie's do	do 23	do 19	88	40	49½
Odessa do	do 23	do 19	88	40½	48½
Bhagarmany Hills (India)	do 23	do 19	88	15½	57
Carter's Prize Prolific	do 23	do 30	99	25	49½
Sharp's Improved Chevalier	do 23	do 30	99	31	48½

CORN.

Thirty-one varieties of corn were sown for ensilage.

These were all sown on the 6th of June and cut on the 28th and 29th September. The weight per acre and stage of growth when cut are given below. The size of the plots from which the yield has been calculated was one-twentieth of an acre.

The season was much against the growth of corn, being cold and damp, resulting in a light crop.

	Weight per Acre.		Condition when Cut.
	Tons.	Lbs.	
Golden Dent	23	.....	In tassel; no ears.
Marblehead	9	500	Glazed.
Extra Early Adams	8	1,000	do
Pee and Kay	12	1,000	In milk.
Golden Beauty	16	1,400	In tassel.
King Phillip	13	1,600	In silking.
Leaming Yellow	17	1,500	Tasseling.
Mammoth Early	17	500	Commencing to silk.
Amber Cream	11	500	Silking.
Thoroughbred White Flint	19	500	Tasseled.
Cinquantine or Fifty-day Corn	12	200	Silking.
Blunt's Prolific	19	500	No tassels.
Hickory King	4	1,000	Tasseled.
Early Concord	11	500	Silked.
Minnesota	11	1,400	In milk.
Long White Flint	17	400	do
Narragansett	10	1,400	Ears glazed.
Extra Early Cory	7	1,000	Full grown ears.
Chester County Mammoth	14	500	Tasseled.
Virginia Horse-tooth	15	1,200	Tasseling.
Perry's Hybrid	11	500	Glazed.
Long Yellow Flint	17	200	In milk.
Mitchell's Extra Early White	7	500	Glazed.
Early Adams	11	1,400	Silked.
Longfellow	13	200	do
Crosby's	12	500	In milk.
Stowell's Evergreen	12	200	Silked.
Queen of the Prairie	13	1,500	Tasseled.
Nova Scotia Yellow	5	500	Well glazed.
Red Cob Ensilage	16	.....	No ears; some tassels.

BEANS.

Twenty-five varieties of Beans were planted. Of these only eight varieties, as named below, matured, the others grew well but there was not enough sunshine to ripen them and they rotted.

Ne Plus Ultra	Ripened.
Schirmer's	do
Emperor William	do
Black Speckled	do
Negro Black Long-podded	do
Golden Butter, Wax Black	do
Sugar Pearl	do
Flageolet Purple-seeded	do

MANGELS, CARROTS.

Mangels were a poor crop but stood in the following order:—

Mammoth Long Red	1st.
do Prize Yellow	2nd.
Warden Prize Yellow Globe	3rd.
Golden Intermediate	4th.

In carrots the Orange Giant gave the best return.

TURNIPS.

Four acres of turnips were grown of the varieties given below.

			Yield per Acre.
Queen of the Swedes,		June 13th	780 Bush.
Skirvings Purple Top Swede,		do	860 do
Bangholm,	do	do	850 do
Lord Derby,	do	do	920 do
Elephant,	do	do	910 do
Purple Top,	do	do	875 do

POTATOES.

Sixty-nine varieties of potatoes were planted, twenty-one of which were seedlings. The majority yielded a good crop, but many of them rotted badly. The dates of planting, character of the tubers and yield are given below.

——	Date of Planting.	Character of Tubers.	Yield.
Experimental Farm seedlings—			
Number 2	May 29	Large long white	Good.
do 10	do 29	do rough	Fair.
do 27	do 29	do do white	Small.
do 73	do 29	Small round	do
do 49	do 29	Long large white	Fair.
do 123	do 29	Small long blue	do
do 153	do 29	Long blue	Good.
do 231	do 29	Small long blue	Small.
do 5	do 29	Long rough white	Fair.
do 15	do 29	do white	Good.
do 53	do 29	do large blue	Fair.
do 80	do 29	Large blue and white	Large.
do 98	do 29	Small round white	Small.
do 120	do 29	Long white	Good.
do 136	do 29	Small round pink	Small.
do 170	do 29	Long blue, medium size	Large.
do 188	do 29	do white	Small.
do 209	do 29	Medium size, round white	Good.
do 116	do 29	Long blue	do
do 122	do 29	Medium long blue	Large.
do 141	do 29	Long blue	Fair.
Rural New Yorker	do 27	Large round white	Good.
Dakota Red	do 27	do pink	do
Rural Blush	do 27	Medium size round pink	Fair.
Stray Beauty	do 27	Small round pink	Small.
Rosy Morn	do 27	Large pink	Fair.
Crown Jewel	do 27	do with white eyes	do
Clark's No. 1	do 27	do	Good.
Late Goodrich	do 27	Round white, deep eyes	do
Rose's New Giant	do 27	Long flat white	do
Empire State	do 27	Round white	do
Thorburn	do 27	Pink and white	do
Rothrant	do 27	do	do
Conqueror	do 27	Round and light, pink eyes	do
Centennial	do 27	do do	do
Jackson's Improved	do 27	White flat	Medium good.
St. Patrick	do 27	Small white	do
Richter's Elegant	do 27	do pink	Small.
Early Callao	do 27	Round white	Fair.
White Star	do 29	Long do	do
Richter's Gem	do 29	Round small white	Small.
Sukreta	do 29	Small white	Fair.
Jumbo	do 29	Long round white	Large.
Richter's Schneerose	do 29	Small white	Good.
Silver Skin	do 29	Long do	Fair.
May Queen Early	do 29	do pink	do
Acadian	do 29	Round smooth purple	Good.

——	Date of Planting.	Character of Tubers.	Yield.
Early White	May 29	Round white	Good.
Burpee's Extra Early	do 29	Smooth round pink	Fair.
Snowflake	do 29	White	Good.
King of the Earlies	do 29	Large white	do
Six Weeks Round White	do 29	Small round white	Poor.
White Elephant	do 29	White	Good.
Black Montana	do 29	Large round black	Large.
Wonder of the World	June 2	Long white	Good.
Great Eastern	do 2	Round white	do
Sugar	do 2	Flat white, rough skin	Fair.
Early Rose	do 2	Long pink	Good.
Richter's Imperator	do 2	Large round	do
Manhattan	do 2	Dark blue	do
Chicago Market	do 2	Pink	do
Brownell's Superior	do 2	Red	do
Fidelia	do 2	Long blue and white	do
Thorburn's Late Rose	do 2	do pink	Fair.
Beauty of Hebron	do 2	White	Medium.
Burbank s Seedling	do 2	Long white	Fair.
Prolific	do 2	White	Good.
Compton's Surprise	do 2	Blue	do
Gleason's Late	do 2	Long late round blue	do
Early Ohio	do 2	Light pink	do

Among those in which no rot was observed were Rural New Yorker, Dakota Red, Rural Blush, Stray Beauty and Acadian, all the other varieties rotted more or less.

The following results were obtained by planting whole potatoes and different cuts in plots of 30 hills each.

	Yield.
Whole potatoes, smooth and even lots, fair size	54 Lbs.
Half split from seed-end, an average lot	51 "
Seed-end, smooth and even, medium size	52 "
But-end, rough and uneven, some large and some small	55 "
Three eyes, smooth and even, all small	40 "
Two " many small	37 "
One " rough and uneven, all small	29 "

PLOTS FOR TESTING FERTILIZERS $\frac{1}{10}$ OF AN ACRE EACH.

The testing of fertilizers was continued this year on the same plots as last year, of $\frac{1}{10}$ of an acre each—an explanation of which is given on page 118 of Report of 1889—with the addition that one bbl. of "Ceres" Superphosphate was applied to the whole eleven plots, being at the rate of 50c. worth per plot or $5.00 per acre, each of the plots receiving the same amount. The plots were then sown with oats on May 31st. A comparative statement of the yield of last year and this year is given below. The small dressing of special fertilizer this year was given to these plots because the land was poor and the spring was so late.

	Proceeds.				Lbs.
No. 1, Barn Yard Manure	100 lbs oats	—	yield for	1889	88
2, Mussel Mud	92 "	—	"		47
3, Bone Meal	117 "	—	"		54½
4, Fine Ground Phosphate	72 "	—	"		44
5, Guano	76 "	—	"		49
6, Corn Fertilizer	115 "	—	"		62
7, Sup. of Lime	98 "	—	"		70
8, Nitrate of Soda	128 "	—	"		61
9, Archibald Fertilizer	93 "	—	"		69
10, "Ceres" Superphosphate	77 "	—	"		68
11, No Fertilizer	79 "	—	"		42

DRAINAGE.

About five acres have been drained this year, making in all 55 acres drained since possession was had of the farm in May, 1888.

The land drained has given entire satisfaction, and it is hoped that this much needed work will be pushed vigorously forward next year.

BUILDINGS.

The Superintendent's residence has been completed. A rain-water cistern and a wood furnace were built therein this summer, both of which are giving good satisfaction. The house has been occupied since Nov. 5th.

A silo was built this summer in the barn that will hold 40 tons of ensilage. Two of the old buildings which were much dilapidated have been taken down, the two which still remain are used for storing carts, waggons, implements, etc.

ROADS.

On account of the sticky nature of the soil, it was found necessary to make some permanent roadways to the barns and other buildings, and, as gravel cannot be had in this district, they were made of broken stone. This stone was drawn into an old barn and broken by the men in wet weather. In this way some 60 rods of good road have been made, and the work will be continued another year.

CATTLE.

The cattle bought last fall, were fed during the winter on hay, straw, turnips and meal, and were sold in April for the St John N.B., market, at a good price. By this means all the coarse food and a large proportion of the English hay was converted into beef, and a valuable lot of manure for this years crop secured. Another lot of two and three year old steers are now being fed and a record of the food consumed kept. This consists of English and Broadleaf hay, straw, ensilage, turnips and smashed oats, peas and barley.

During the month of November, ten thorough-bred cattle were brought to the Farm, some of which came from the Central Farm at Ottawa, and the others were purchased in Ontario. They consist of

Four Short Horns, one bull and three females.
Three Holsteins, one do and two do
Three Ayrshires, one do and two do

This selection was made with a view of laying the foundation here for a herd of the three breeds named. The following are the pedigrees of the different animals.

SHORTHORNS—FEMALES.

Countess of Darlington 12th.—Born 19th July, 1885; bought from Richard Gibson, Delaware, Ontario; dam, Countess of Darlington 8th, by Marquis of Kirklevington; 2nd dam, Countess of Darlington by Duke of Airdrie.

Wildame 2nd.—Born 8th Nov., 1886; bought from James Graham, Port Perry, Ontario; dam, Wildame by Prince Victor 5th; 2nd dam, Blossom by Royal Prince.

Columbine.—Born 24th Nov., 1888; bought from Richard Gibson, Delaware; dam, Wild Flower by Duke of Wellington; 2nd dam, Hermosa by Wild Eyes Laddie

Nappan's Fashion bull.—Born 14th May, 1890; bred by George Johnstone, Ashburn, Ontario; dam, Fashion 7th, by Warfare; 2nd dam, Fashion of Maple Hall, by Lancaster; 3rd dam, Fashion 2nd, by K.C.B.; 4th dam, Fashion by Duke of Airdrie.

AYRSHIRES—FEMALES.

Eva.—Born 15th Sept., 1884; bought from Jas. Drummond, Petit Côte, Quebec; dam, Bell by Promotion; 2nd dam, Juno by Lorne.

Count of Ottawa, bull.—Born 23rd Dec., 1889; bred on Experimental Farm, Ottawa; dam, Countess by Rob Roy; 2nd dam, Victoria by Promotion.

Ida.—Born 10th March, 1884; bought from Thos. Guy, Oshawa, Ontario; dam, Mary by Lord Lorne; 2nd dam, Martha by Carluke.

HOLSTEINS.

Nina Rooker.—Born 3rd April, 1884; imported by Smith Powell and Lamb; dam, Mina by "Pieter" by de Ruiter.

Netherland Dorinda of Ottawa.—Born 24th Aug., 1890; bred on Central Experimental Farm, Ottawa; dam, Netherland Dorinda 2nd, by Netherland Pythias; 2nd dam, Netherland Dorinda by Sir Henry 2nd, of Aaggie.

Abi's Netherland of Ottawa, bull.—Born 21st Feb., 1890; bred on Central Experimental Farm, Ottawa; dam, "Abi" by Netherlands Clothilde; 2nd dam, Snowie by Oatka 3rds Neptune jr.

WATER.

The water supply is not as good as it should be. That from the well at the barn is not uniform in quality, as the surface water sometimes fills it up during a heavy rain and makes it turbid. The supply at the house is obtained from the cisterns in the cellars. A better and more uniform supply is needed and some provision should be made for this during the coming summer.

FRUIT TREES.

An orchard was planted last spring, consisting of 144 apple trees of 54 varieties; 12 crab apple trees of 4 varieties; 5 cherry trees of 2 varieties; 30 plum trees of 14 varieties; 46 pear trees of 21 varieties.

Nearly all have made good growth. A few of the pear and apple trees have died; but on the whole the results so far are quite encouraging.

STRAWBERRIES.

The strawberries were badly winter killed. Some had a small quantity of fruit. We allowed them to run to vines and make plants for another year's setting

RASPBERRIES.

Raspberries wintered well and made good growth. Nearly all fruited well.

Blackberries appear to stand the climate well. The winter did not injure them, and they produced good fruit, but not in such abundance as the raspberries.

Gooseberries do well in this district, the Houghton being the most vigorous. The Downing did well; also Smith's Improved. The Red and White currants yielded but little, but Black currants did well

"EXHIBITIONS" AND "FARMER'S INSTITUTES."

Some of the products of the Farm were shown at the exhibition held at St. John, N.B., commencing 24th September, also at Yarmouth on 9th October, and at Sackville, N.B., on 15th October.

The exhibits consisted of the following varieties:—68 of grain in straw and glass; 84 of potatoes; 31 of corn; 13 of grasses. These were all distinct.

At Yarmouth and Sackville the exhibits consisted of the grains and grasses only.

I also attended the "Farmers' Institute" of N.B., held at Fredericton on 28th and 29th January, and was at the meeting of the "Dominion Dairymen's Associa-

tion" and "Fruit Growers' Association," held at Ottawa on the 17th, 18th and 19th February.

In company with Prof. Robertson, Dairy Commissioner, the following meetings were attended:—The "Dairyman's Association" of N.S., held at Halifax on the 18th and 19th March; two meetings of farmers at Sackville, N.B., on the 20th March; two meetings of farmers at New Glasgow on the 21st, at Antigonish on the 22nd, Nappan on the 24th, and two at Fredericton, N.B., on the 26th.

Besides these named, I attended several meetings in Colchester and Cumberland County during the year. At these meetings, farming in all its branches was discussed, and much interest was manifested by those in attendance.

I have the honour to be, Sir,

Your obedient servant,

W. M. BLAIR,

Superintendent.

EXPERIMENTAL FARM FOR MANITOBA.

REPORT OF S. A. BEDFORD, SUPERINTENDENT.

BRANDON, MANITOBA, Dec. 31, 1890.

To WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the following report of the operations on the Experimental Farm for Manitoba at Brandon, during the year 1890.

WEATHER.

Although there has been a deficiency of rain throughout the south-easterly portions of the province, the past season has generally been a favourable one for all farm products. Seasonable showers fell from the 20th to the 23rd of April. During May and June the rainfall was below the average, and for a short time, fears were entertained that the drought of 1889 would be repeated, but happily these fears, so far as this portion of the province was concerned, were dispelled by the abundant rains which fell from the 5th to the 25th of July, and from that date all vegetation made rapid growth. On the 20th of August the wind shifted to the north and continued from that direction until the evening of the 22nd, when the temperature on the lower lands fell below the frost line, slightly injuring the uncut wheat in some portions of the province. Considerable rain fell from the 23rd to the 25th of August, and the first half of September was very wet, greatly delaying harvesting, and in some cases sprouting badly the shocked grain.

The following is a review of the temperature and rainfall for the province during the growing season.

In April the Temperature was 0·7 above the normal. Rainfall, 1·13 or 0·31 inches below the average.

May.—The Temperature was 8·4 below the normal. Rainfall 1·75 inches, or 0·80 inches below the average.

June.—The Temperature was 3·9 above the normal. Rainfall 2·64 inches or 1·07 below the average.

July.—The Temperature was 2·0 above the normal. Rainfall 3·28 inches or 0·24 above the average.

August.—The Temperature was 3·9 below the normal. Rainfall 3·54 inches or 0·60 inches above the average.

September.—The Temperature was 1·7 below the normal. Rainfall 2·83 inches or 1·03 above the average.

WHEAT.

Sixty varieties were sown in large plots on the Experimental Farm this year, 30 varieties on the higher portion of the farm, and 30 acres in the valley. The stronger lands of the valley averaged the largest yields, but the uplands gave the best samples, very little, if any, of the grain from the higher land was injured by the frost of 22nd and 23rd August, but its effects were plainly seen on the late varieties in the valley. A very striking difference was shown in its effects on different varieties of wheat maturing at the same time, the close and heavy chaffed varieties appear the least liable to injury from this cause. White Fife and White Connel are striking examples of this, for although neither of these varieties were much earlier than the Red Fife, the samples were much better.

Tests were made of cutting wheat at different stages of ripeness, but owing to the exceptionally cloudy and wet weather prevailing during harvest, the tests were not reliable for average years.

TEST OF WHEAT ON BACKSETTING.

Deeming it important that all varieties of wheat tested should receive similar treatment, a block of nearly uniform new upland prairie was selected and sown with

37 varieties of wheat iu half-acre plots. As it is almost impossible to find a block of land perfectly uniform, the plan of sowing every fourth plot with Red Fife was adopted, thus establishing for comparison a standard growing in close proximity to each variety, the varying yields of Red Fife as shown in the accompanying table will illustrate the necessity of this. The soil of this block was light loam. Seven pecks per acre of seed was sown with a broadcast seeder.

Among these wheats it will be noticed that in yield the Red Fife takes the lead, but it is several days later in maturing than some of the other varieties. In this field the following varieties of wheat are promising, White Connel, a bald, hard, white wheat and the next in yield to the Red Fife. Defiance, a bald, moderately hard, red wheat. Both of these ripened with the Red Fife. Eureka or Red Fern, a bearded, red wheat; Russian Hard Tag, a bearded, hard wheat, but rather ricy, both six days earlier than Fife; Red Connel, a bald wheat, five days earlier, but not as productive as Fife; Ladoga ripened six days in advance of Red Fife, but the yield was less.

In this field was sown ten varieties of wheat obtained from D. McArthur, Esq., of Winnipeg, five of them had the appearance of fall wheats, these were still living when winter set in, they were allowed to remain and some of them may possibly survive the winter and yield a crop next year. The five spring wheats received from Mr. McArthur were Soft Red Calcutta, Hard Red Calcutta, Russian Ghirka, No. 1 Club Bombay and Australian.

Below will be found a list of the wheats grown in this field with yields and other particulars.

RESULTS of Tests with Wheat, sown on backsetting on Prairie:

—	Sown.	Came up.	Headed.	Ripened.	Yield per Acre.		Weight per Bushel.	Matured in.
					Bush.	Lbs.	Lbs.	Days.
Russian Ghirka	April 14..	May 8..	July 13..	Aug. 25..	16		64½	133
Soft Red Calcutta	do 14..	do 8..	June 28..	do 17..	12	7	63¾	125
Red Fife, No. 3	do 10..	do 7..	July 11..	do 22..	25	6	63	134
Red Fern	do 10..	do 5..	do 11..	do 18..	25	24	64	130
Eureka	do 10..	do 5..	do 10..	do 16..	27	16	64	128
White Fife	do 10..	do 5..	do 10..	do 21..	26	42	61½	133
Red Fife, No. 7	do 10..	do 7..	do 11..	do 22..	27	58	62½	134
White Connel	do 10..	do 8..	do 12..	do 22..	29	14	63½	134
Red Connel	do 10..	do 8..	do 10..	do 17..	26		61½	129
Judket	do 10..	do 8..	do 10..	do 20..	25	42	61½	132
Red Fife, No. 10	do 10..	do 8..	do 10..	do 22..	26	6	60½	134
Club	do 10..	do 8..	do 7..	do 16..	24	16	61½	128
Onega	do 10..	do 8..	do 2..	do 16..	10	22	58	128
Defiance	do 10..	do 8..	do 11..	do 22..	28	22	60½	134
Red Fife, No. 14	do 10..	do 8..	do 11..	do 16..	25	38	60½	.....
Golden Drop	do 10..	do 6..	do 7..	do 16..	24	16	61¾	128
Old Red River	do 10..	do 6..	do 10..	do 18..	23	56	61½	130
Rio Grande	do 10..	do 7..	do 10..	do 25..	28	12	63¼	137
Red Fife, No. 18	do 10..	do 8..	do 11..	do 25..	30		62¼	137
California White	do 11..	do 8..	June 29..	do 25..	25	26	62	126
White Delhi	do 11..	do 8..	do 25..	do 14..	17	52	61¾	125
Summer Cob	do 11..	do 8..	July 12..	do 25..	28	26	61¾	136
Red Fife, No. 22	do 11..	do 8..	do 11..	do 22..	30	16	62½	133
Campbell's White Chaff	do 11..	do 8..	do 8..	do 19..	24	36	61½	130
Saxonka	do 11..	do 7..	do 5..	do 19..	23	56	63¼	130
Ladoga	do 11..	do 6..	do 7..	do 16..	21	20	59½	127
Red Fife, No. 30	do 11..	do 8..	do 11..	do 22..	29	12	62¼	133
Russian Hard Tag	do 11..	do 8..	do 5..	do 17..	26	48	64	128
No. 1 Club Bombay	do 11..	do 8..	do 11..	do 15..	12	16	60½	126
Red Fife, No. 34	do 11..	do 8..	do 11..	do 20..	33		62¼	131
Hard Red Calcutta	do 11..	do 8..	do 11..	do 16..	24	40	64	127
Australian	do 11..	do 8..	do 11..	do 18..	30	50	60½	129

WHEATS IN THE VALLEY.

Besides the varieties sown on backsetting, 32 varieties were sown after fodder corn in the valley.

These plots were all under half an acre, and were sown from the 7th to the 23rd of April. In this case also one plot in each block was sown with Red Fife.

Some of the noticeable wheats among these are Hard Calcutta, one of the best Indian wheats, fairly productive, and 13 days earlier than Red Fife; Wellman's Fife, a good hard variety, four days earlier than Red Fife, and a heavy cropper; French Imperial, 10 days earlier than Fife, productive but rather soft.

Two of Carter's crossbred wheats were also tested in these plots, one of them ripened with the Red Fife, and the other 26 days later. In neither case was the sample equal to Red Fife.

RESULTS of Tests with Wheat sown in valley.

—	Sown.	Came up.	Headed.	Ripened.	Yield per Acre.		Weight per Bushel.	Matured in
					Bush.	Lbs.	Lbs.	Days.
Red Fife, No. 24	April 7..	May 5..	July 10..	Aug. 22..	30		61	137
Colorado	do 7..	do 5..	do 7..	do 14..	31	15	61	129
Blue Stem	do 7..	do 2..	do 10..	do 18..	33	20	59	133
Herison's Beardless	do 7..	do 2..	do 10..	do 22..	16	40	56¼	137
Wellman's Fife	do 7..	do 2..	do 10..	do 18..	30	25	60½	133
French Imperial	do 7..	do 1..	do 9..	do 12..	31	15	61½	127
Hard Calcutta	do 7..	do 4..	June 27..	do 9..	25	25	63	124
Lahoul, from India	do 7..	do 2..	July 2..	do 16..	22	30	53⅔	131
Hueston's	do 7..	do 3..	do 9..	do 18..	29	35	60	133
Talavera	do 7..	do 5..	do 20..	do 25..	19	10	57½	140
Club Calcutta	do 7..	do 5..	do 1..	do 16..	27	5	59	131
Red Fife, No. 37	do 7..	do 5..	do 10..	do 22..	25	11	59¾	137
Hungarian Mountain	do 7..	do 2..	do 9..	do 16..	30	37	60¼	131
Indian Karachi	do 7..	do 5..	June 24..	do 16..	15	37	59½	131
Wheat, No. 1,701	do 7..	do 3..	July 9..	do 18..	23	32	59½	133
Paine's Defiance	do 7..	do 5..	do 10..	do 18..	22	17	58½	133
Magyar	do 7..	do 5..	do 20..	do 25..	20	12	61	140
Greek Summer	do 7..	do 5..	do 2..	do 15..	19	47	58	130
Simla, from India	do 7..	do 6..	do 5..	do 16..	17	42	57½	131
Campbell's Triumph	do 7..	do 2..	do 9..	do 19..	23	57	60¼	134
Green Mountain	do 7..	do 2..	do 8..	do 19..	26	33	61	134
Pringle's Champlain	do 7..	do 2..	do 8..	do 19..	29	3	61	134
Soft Red Calcutta	do 7..	do 5..	June 28..	do 12..	8	45	63¾	127
Chilian White	do 9..	do 2..	July 8..	do 22..	23	37	58	135
Spiti Valley	do 9.	do 2..	do 2..	do 9..	9	2	46¾	122
Defiance, J. A. Bruce	do 9..	do 2..	do 1..	do 20..	20	12	59½	133
Red Fife, No. 49	do 17..	do 12..	do 15..	do 22..	25	20	60½	127
Carter's Selection, I	do 17..	do 12..	do 19..	do 22..	26		.....	127
Carter's Selection, D	do 17..	do 13..	do 22..	Sep. 17..	21	37	56½	153
Red Fife, No. 52	do 23..	do 12..	do 15..	Aug. 22..	34	17	60½	121
Assinaboia	do 23..	do 13..	do 14..	do 22..	31	6	60½	121
Newton Club, Fallow land	do 24..	do 10..	....	do 16..	15	35	58	114
Red Fife, do	do 24..	do 21..	do 21..	do 30..	24	40	60½	128

FROZEN WHEAT FOR SEED.

A quantity of frozen seed from the crop of 1888 was procured and sown in adjoining half acre plots of new land, at the rate of 2 bushels per acre, sown broadcast. The soil was apparently uniform and the test complete.

Although the loss from slightly frozen grain was small, the No. 3, or badly frozen seed, gave considerably less than the No. 1 hard, and in an unfavourable season the difference would no doubt be greater.

TEST WITH FROZEN SEED SOWN ON BACKSETTING.

———	Sown.	Came up.	Headed.	Ripened	Yield Per acre		Weight per Bushel.	Matured in
					Bush.	Lbs.	Lbs.	
Red Fife, No. 1 Hard..	April 16	May 9..	July 12.	Aug. 23.	33	4	61¼	129 days.
do No. 1 Frozen.....	do 16	do 9..	do 14.	do 25.	32	40	59½	129 do
do No. 2 do	do 16	do 9..	do 14.	do 25.	32	20	62	129 do
do No. 3 do	do 16	do 9..	do 14.	do 25.	28	56	62	129 do

TEST WITH FROZEN SEED SOWN ON FALLOW LAND IN VALLEY.

———	Sown.	Came up.	Headed.	Ripened	Yield Per acre		Weight per Bushel.	Matured in
					Bush.	Lbs.	Lbs.	
Red Fife, No. 1 Hard.....	April 7.	May 2..	July 11.	Aug. 20.	24	49	61¼	135 days.
do No. 1 Frozen.	do 7.	do 2.	do 11.	do 25.	23	23	60¾	140 do

SMUT.

The aggregate loss sustained by the farmers of this province from smut is very large.

Although the majority of farmers consider that the treating of seed with preparations of bluestone, salt, &c., has a beneficial effect, reliable experiments conducted in the province to test the different methods were much needed.

During the past season a quantity of very badly smutted wheat was procured and sown in four adjoining plots, each one-tenth of an acre. Plot No. 1 was sown with wheat not treated. Plot No. 2 was sown with wheat treated with bluestone; 1 lb. of bluestone being dissolved in a pail of hot water, and applied to ten bushels of wheat, which was then left to soak for three hours. Plot No. 3 was treated with a salt brine sufficiently strong to float an egg, the seed being soaked in the brine three hours and then dried. Plot No. 4 was treated by the Jensen or hotwater method, the seed placed in a gunny sack, was immersed in water heated to a temperature of 130 degrees. Fah. then removed to another boiler of water heated to 132 deg. and soaked in the latter for 15 minutes.

All were in adjoining plots and received similar treatment during growth and harvesting; when ripe 200 heads were taken from each plot and examined. Plot No. 1 or untreated gave 6 per cent. of smutty heads. Plot No. 4 or scalded gave 1 per cent. of smutty heads while none of the 200 heads from plots No. 2 and 3, (the bluestoned and salted) were smutty.

After threshing, the grain was again examined, and the bluestoned gave two smut balls to the thousand grains of wheat, the salted gave three, and the scalded five, while the untreated gave 29.

These results would point to the conclusion that none of these methods can be depended upon to completely destroy the spores in badly smutted seed, but the bluestone treatment was one of the most successful, its application requires the least

labor and leaves the seed in the best condition for sowing. Below will be found the yield and other particulars of this experiment.

—	Sown.	Came up.	Headed.	Ripened	Yield per Acre.		Smutty Head.	Smut Balls in Grain.	Matured in.
					Bush.	Lbs.			Days.
Red Fife, Untreated.....	April 23	May 9..	July 10.	Aug. 22.	23	18	6½ per c.	29 per 1,000	121
do Bluestoned.....	do 23	do 9..	do 10.	do 22.	25	11	None.	2 do	121
do Salted.....	do 23	do 9..	do 11.	do 22.	22	9	do	3 do	121
do Scalded.....	do 23	do 9..	do 9.	do 22.	23	44	1 per c.	5 do	121

FALL SOWN SPRING WHEAT.

The Red Fife mentioned in my last report as having been sown in November, 1889 was late in appearing above ground, and was very thin all summer, the past year apparently not being favourable for fall sown spring wheat.

The spring sown grain gave 30½ bushels and the fall sown 12¼ bushels per acre, the fall sown ripened two weeks later than the spring sown.

FALL WHEAT.

One variety of fall-wheat was sown 26th of August, 1889, and two others on the 2nd of September, these germinated well and the plants covered the ground before winter set in, and were apparently uninjured when spring opened, but the changeable weather in early spring killed all, except a few plants of the Democrat variety growing in a depression, these escaped and yielded about 13 lbs of very fine wheat. This will be sown during the coming fall and may prove more hardy than the imported seed.

OATS.

Twenty varieties of oats were tested on the upland prairie, in adjoining half acre plots, soil a light loam, broken the previous year. All were sown with the Broadcast Seeder, at the rate of 2½ bushels per acre. The soil proved to be very uniform, the oats stood up well, and the test of varieties was apparently satisfactory in every respect. The varieties being all on adjoining plots, this field was a source of great interest to visitors during the season.

In addition to the above, 8 varieties were sown in the valley on fall ploughing after roots. This field being subject to injury from drifting soil, the seed at the rate of 2½ bushels per acre was sown with the Press Drill. Although the crop in this field was badly lodged, none of the grain was lost, and the experiment was in every respect satisfactory.

OATS SOWN ON BACKSETTING ON PRAIRIE.

—	Sown.	Came up.	Headed.	Ripened.	Yield per Acre. Bush.	Yield per Acre. Lbs.	Weight per Bushel.	Matured in
							Lbs.	Days.
English White Oat	April 15..	May 12..	July 12..	Aug. 16..	83	12	36¼	123
Early Blossom	do 15..	do 13..	do 17..	do 22..	82	32	37½	129
Early Calder	do 15..	do 13..	do 14..	do 22..	81		36	129
Black Tartarian	do 16..	do 13..	do 20..	do 22..	78	22	33½	128
Glenrothern	do 15..	do 13..	do 18..	do 22..	77	4	35½	129
New Zealand	do 14..	do 12..	do 17..	Sept. 9..	76	2	37¼	148
Black Champion	do 16..	do 13..	do 20..	Aug. 25..	74	4	35¼	131
Banner	do 14..	do 8..	do 16..	do 18..	73	18	39	126
White Russian	do 15..	do 13..	do 14..	do 16..	73	4	40½	123
Australian	do 14..	do 12..	do 14..	do 18..	72	2	36¾	126
Welcome	do 15..	do 13..	do 10..	do 15..	72		37	122
Flying Scotchman	do 15..	do 13..	do 12..	do 22..	71	14	39¾	129
Winter Grey	do 15..	do 13..	do 10..	do 16..	69	25	41¾	123
Rennie's Prize White	do 16..	do 12..	do 10..	do 14..	68	16	41½	120
August White	do 15..	do 13 .	do 17..	do 18..	63	18	42	125
English Potato	do 15..	do 13..	do 16..	do 21..	62	20	40¾	128
White Poland	do 15..	do 13..	do 12..	do 18..	59	24	41¼	125
Prize Cluster	do 15..	do 13..	do 11..	do 16..	54	14	42¼	123
Early Racehorse	do 14..	do 12..	do 12..	do 18..	51		42	126
Red Oats	do 16..	do 9..	do 20..	do 22..	48	30	36¼	128

OATS SOWN AFTER POTATOES IN VALLEY.

—	Sown.	Came up.	Headed.	Ripened.	Yield per Acre. Bush.	Yield per Acre. Lbs.	Weight per Bushel.	Matured in.
							Lbs.	Days.
American Beauty	April 17..	May 10...	July 15..	Aug. 23..	85	19	37	128
Golden Side	do 17..	do 15..	do 14..	do 23..	80	27	37	128
Welcome	do 17..	do 15..	do 15..	do 15..	77	8	37	120
Holstein	do 17..	do 12..	do 15..	do 30..	72	24	35¾	135
American Triumph	do 17..	do 11..	do 16..	do 22..	69	10	35¾	127
Rosedale	do 17..	do 15..	do 15..	do 20..	63	13	37¾	125
Archangel	do 17..	do 12..	do 8..	do 15..	60	24	38	120
Swedish	do 17..	do 12..	do 15..	do 28..	56	24	35¼	133

To test the comparative values of newly imported seed oats, with oats sown for a succession of years in this Province, four plots of backsetting were sown with importations from Britain, made at different dates, the plots were side by side, soil a uniform light loam, 2½ bushels per acre of seed was sown with a Broadcast Seeder.

—	Sown.	Came up	Headed.	Ripened.	Yield per Acre. Bush.	Yield per Acre. Lbs.	Weight per Bushel.	Matured in.
							Lbs.	Days.
Black Tartarian, imported prior to 1888	April 16..	May 13..	July 20..	Aug. 22..	76	2	35	128
do do in 1888	do 16..	do 13..	do 20..	do 22..	78	22	35	128
do do in 1889	do 16..	do 13..	do 20..	do 22..	69	14	34½	128
do do in 1890	do 16..	do 13..	do 20..	do 22..	77	14	34	128

A very interesting experiment, and one which may lead to good results, was undertaken in connection with our oat tests. Five pecks of Black Tartarian seed was selected, the kernels being all heavy, plump and black. This was sown alongside of unselected seed, and gave a yield of 88 bushels per acre, in comparison with 76 bushels from the unselected, or a gain of 12 bushels per acre from selection.

BARLEY.

Throughout the westerly portion of this province the season has been exceptionally favourable for the growth of barley, and the yield has been large. Owing, however, to the unfavourable weather at harvest time, the sample is not as bright as usual.

On the Experimental Farm 12 varieties of the two-rowed were sown in half acre plots on backsetting; 2 bushels of seed per acre was used; soil a light, gravelly loam; all stood up well, and the soil being apparently uniform, the test of varieties was a very fair one.

The Danish Chevalier was one of our best varieties last season, and has this year given slightly the best yield among the two-rowed, both on the high land and in the valley. This excellent variety is said to be in active demand on the English market, and appears well adapted to our climate.

BARLEYS SOWN ON BACKSETTING.

—	Sown.	Came up.	Headed.	Ripened.	Yield per Acre.		Weight per Bushel.	Matured in
					Bush.	Lbs.	Lbs.	Days.
Danish Chevalier	April 25..	May 13..	July 15..	Aug. 16..	51	36	53	113
Peerless White	do 25..	do 13..	do 13..	do 18..	49	38	54½	115
Swedish	do 25..	do 12..	do 9..	do 14..	49	30	55	111
Beardless	do 25..	do 15..	do 15..	do 15..	48	20	52¼	112
Thanet	do 25..	do 12..	do 12..	do 18..	48	10	54	115
Two-rowed Duckbill	do 25..	do 13..	do 10..	do 14..	48	12	52¼	111
Golden Melon	do 25..	do 13..	do 14..	do 16..	47	36	53	113
Danish Printice Chevalier	do 25..	do 13..	do 15..	do 16..	46	40	52⅛	113
Prize Prolific Imported seed	do 25..	do 13..	do 16..	do 16..	43	42	53	113
do do Manitoba seed	do 25..	do 13..	do 16..	do 16..	42	26	53	113
English Malting	do 25..	do 13..	do 14..	do 18..	40	40	54½	115
New Zealand	do 25..	do 13..	do 18..	do 14..	40	8	54½	111

Eleven varieties of barley were also sown in the valley, on land planted with potatoes the previous year. All were more or less lodged, but were cut without waste.

Of the two-rowed varieties in this field, the Prize Prolific gave the largest yield, and the Goldthorpe had the stiffest straw. Of the six-rowed varieties, the Odessa gave the largest yield, 68½ bushels per acre, the largest yield of any variety of barley grown on the farm. Baxter's six-rowed gave great promise when growing, but was disappointing when threshed.

BARLEY Sown after Roots in valley.

—	Sown.	Came up.	Headed.	Ripened.	Yield per Acre.	Weight per Bushel.	Matured in.
					Bush. Lbs.	Lbs.	Days.
Goldthorpe	May 5..	May 23..	July 21..	Aug. 23..	56 25	52½	111
Prize Prolific	do 5..	do 22..	do 21..	do 24..	59 43	52¾	111
Saale	do 5..	do 22..	do 21..	do 20..	40 14	51	107
Odessa Sixrowed	do 5..	do 22..	do 7..	do 14..	68 24	51¼	101
Rennie's do	do 5..	do 23..	do 8..	do 10..	54 26	52	97
Baxter's do	do 5..	do 22..	do 10..	do 7..	44 2	49½	94
Palampur, from India	do 5..	do 22..	June 28..	do 11..	60 29	43½	98
Kulu, from India	do 5..	do 23..	July 11..	do 17..	50	48	104
Seoraj do	do 5..	do 22..	June 30..	do 19..	47	45½	106
Spiti Valley, from India, Hulless	do 5..	do 22..	do 30..	do 6..	39 18	53¾	93
Bhagarmany Hills, from India, Hulless	do 5..	do 22..	July 10..	do 7..	39 14	55½	94

PEAS.

Seven varieties of field peas were grown on the farm. These were drilled in on a sandy loam soil at the rate of three bushels per acre of the smaller varieties and three and one-half bushels per acre of the larger ones.

Variety.	Sown.	Came up.	In pod.	Ripened.	Yield per Acre.
					Bush.
Multiplier	April 19....	May 12....	July 10....	Aug. 19....	24·20
Prince Albert	do 19....	do 10....	do 11....	do 15....	22
Prussian Blue	do 19 ..	do 11....	do 9....	do 13....	21·15
Early Field	do 19....	do 10....	do 10....	do 14....	18·35
Crown	do 19....	do 11....	do 9....	do 13....	18·30
Golden Vine	do 19....	do 10....	do 11....	do 15....	16·30
White-eyed Marrowfat	do 19....	do 12....	do 11....	do 19....	11·45

GRAIN SOWN ON STUBBLE LAND.

As a large proportion of the crop of this Province is sown on stubble land, it was thought advisable to test the different methods of sowing on stubble.

It will be seen by the accompanying table, that wheat plowed in on oat-stubble gave a smaller return than that drilled in, but oats on the other hand succeeded best when ploughed in, and oats following a crop of wheat yielded better than two successive crops of oats.

The plots were half an acre in area. Soil, a uniform stiff clay loam.

WHEAT ON OAT STUBBLE.

——	Sown.	Came up.	Headed.	Ripened.	Yield per Acre.	Weight per Bushel.	Matured in
					Bush.	Lbs.	Days.
Red Fife, ploughed in.....	April 21..	May 10..	July 18..	Sept. 2..	20	62½	134
do drilled in.....	do 21..	do 16..	do 20..	do 2..	22	62¼	134
OATS ON WHEAT STUBBLE.							
Welcome, ploughed in	April 18..	May 17..	July 14..	Aug. 15..	56·27	44½	119
do drilled in.....	do 18..	do 10..	do 11..	do 15..	51·16	44½	119
OATS ON OAT STUBBLE.							
Welcome, ploughed in.	April 18..	May 17..	July 14..	Aug. 15..	49·30	42	119
do drilled in.....	do 18..	do 10..	do 10..	do 15..	41·10	42	119

DIFFERENT DATES OF SOWING.

To lessen chances of error and to gain information as to the best time of sowing, it was thought advisable to continue the experiment of sowing the different kinds of grain at varying dates.

It would appear, in a season similar to the past one, that both wheat and barley succeed best when sown about the middle of April, this is about the date at which the bulk of the wheat is usually sown in the Province, but it is much earlier than it is customary to sow barley.

Oats were also included in this experiment, but owing to wet weather the harvesting of this grain was delayed until the early sown was badly shed, and the returns being inaccurate are not given.

The plots were 1 acre for wheat, and ½ an acre for barley. Soil a clay loam.

WHEAT.

——	Sown.	Came up.	Headed.	Ripened.	Yield per Acre.	Weight per Bushel.	Matured in
					Bush.	Lbs.	Days.
Red Fife, sown early	April 7..	May 2..	July 18..	Aug. 20..	24·49	60¼	135
do do medium....	do 19..	do 9..	do 19..	do 25..	25·38	.....	128
do do late.....	do 24..	do 17..	do 21..	do 30..	24·40	60½	123
BARLEY.							
English Malting, sown early	April 16..	May 8..	July 16..	Sept. 3..	45·40	52½	140
do do medium	do 24..	do 10..	do 17..	do 3..	45·32	52½	132
do do late....	May 22..	June 5..	do 23..	do 6..	43·36	52½	107

THICK, MEDIUM AND THIN SOWING.

The experiments on this line began with oats in 1889, were continued during the past year, and included oats, wheat and barley. All were sown with the common drill, the soil a strong clay loam.

As will be seen from the accompanying tables, 7 pecks of wheat per acre, 2¼ bushels of oats and 2 bushels of barley gave the best returns.

WHEAT.

——	Sown.	Came up.	Headed.	Ripened.	Yield per Acre.	Weight per Bushel.	Matured in
					Bush.	Lbs.	Days.
Red Fife, 5 pecks per acre..	April 5..	April 30..	July 8..	Aug. 19..	28·28	.....	136
do 6 do ..	do 5..	do 30..	do 8..	do 19..	29·35	.....	136
do 7 do ..	do 5..	do 30..	do 8..	do 19..	30·55	.....	136
do 8 do ..	do 5..	do 30..	do 8..	do 20..	30·5	.....	137

OATS.

Blk Tartarian, 9 pks per acre	April 16..	May 10..	July 17..	Aug. 28..	61	34¾	134
do 10 do ..	do 16..	do 10..	do 17..	do 28..	54·3	34½	134
do 11 do ..	do 16..	do 10..	do 17..	do 28..	54·12	34½	134
do 12 do ..	do 16..	do 10..	do 17..	do 28..	51·14	36	134

BARLEY.

Prize Prolific, 6 pks per acre	April 24..	May 12..	July 17..	Aug. 30..	50·36	52½	128
do 8 do ..	do 24..	do 12..	do 17..	do 30..	58·04	52¾	128
do 10 do ..	do 24..	do 12..	do 17..	do 30..	47·12	53	128

TEST OF DRILLS.

Much attention has been directed to the question of common and press drill against broadcast sowing of grain, some very satisfactory tests with oats were made on the farm last year, proving conclusively that in a very dry season drilling of oats is preferable to broadcasting, these experiments have been continued and enlarged this year by testing the sowing of wheat, oats and barley on adjoining plots, with common drill, press drill and broadcast seeder, the plots on which these experiments were carried on were a great source of interest to visiting farmers.

Although in yield the drilled grain is but little in excess of broadcast, in the tests with wheat and oats the drilled crops matured in from four to nine days in advance of that sown with the broadcast seeder, an important consideration in a season like the past one, it was also noticed that the drilled grain germinated earlier and more evenly, and that fewer immature heads were seen at harvest time than with the broadcast.

To obtain reliable data these experiments should be extended over a number of years so as to include various seasons.

Below will be found full particulars referring to this experiment.

TEST OF DRILLS.

——	Sown.	Came up.	Headed.	Ripened.	Yield per Acre.	Weight per Bushel.	Matured in
Wheat, 1 acre.					Bush.	Lbs.	Days.
Red Fife, sown with common drill	April 5..	April 30..	July 8..	Aug. 15..	30·24	60¾	132
Red Fife, sown with press drill	do 5..	do 28..	do 6..	do 15..	29·31	60½	132
Red Fife, sown with broadcast seeder	do 5..	May 2..	8..	do 19..	28·20	61	136
Barley, ½ acre.							
Danish Chevalier, sown with press drill	April 24..	May 10..	July 17..	Aug. 24..	60·14	52	122
Danish Chevalier, sown with common drill	do 24..	do 12..	do 17..	do 24..	56·10	52	122
Danish Chevalier, sown with broadcast seeder	do 24..	do 15..	do 20..	do 24..	50·46	53	122
Oats, ½ acre.							
Black Tartarian, sown with press drill	April 16..	May 9..	July 17..	Aug. 21..	72·30	34	127
Black Tartarian, sown with common drill	do 16..	do 10..	do 17..	do 21..	72·22	34½	127
Black Tartarian, sown with broadcast seeder	do 16..	do 14..	do 19..	do 30..	56·32	35½	136

SPRING VERSUS FALL BREAKING.

Although not generally recommended there are a few advocates of fall breaking, principally among new arrivals from the East. To test this question, half an acre of upland prairie was broken two inches deep in May and back-set in September, the adjoining half-acre was broken in September six inches deep, but not back-set.

The result as seen below was decidedly in favour of spring breaking.

——	Sown.	Came up.	Headed.	Ripened.	Yield per Acre.	Weight per Bushel.	Matured in
					Bush.		Days.
Red Fife, sown on spring breaking	April 11..	May 8..	July 11..	Aug. 22..	28·38	... .	133
Red Fife, sown on fall breaking	do 11..	do 8..	do 11..	do 22..	14·20	.....	133

GRAINS GROWN AS SINGLE PLANTS.

During the year the following have been grown as single plants, viz., 123 varieties of wheat, 86 of oats and 67 of barley. Fifty kernels of each variety were planted one foot apart and kept free of weeds.

These plots were convenient to the buildings, and enabled the growth of the different varieties to be studied and compared with the expenditure of very little time.

The different varieties were harvested in good order, and will be separately threshed and weighed during the present winter.

TURNIPS.

During the past season, seventeen varieties of turnips have been grown. All were drilled in on the level in rows three feet apart; soil a sandy loam.

As a number of the varieties were badly injured by a cut-worm, while others escaped, the experiment as a comparison of varieties is not accurate.

Slacked lime placed near the plants was found to destroy a large number of the cut-worms.

Swedes.	Sown.	Harvested.	Yield per Acre.
			Bush.
Queen of the Swedes	June 3 and July 19	Oct. 20	1,048
Bangholm	do 3 do 19	do 20	953
Munster	do 3 do 19	do 20	792
Lord Derby	do 3 do 19	do 20	586
Purple Top	do 3 do 19	do 20	568
Skirvings	do 3 do 19	do 20	410
Elephant	do 3 do 19	do 20	344
White and Yellow-fleshed Turnips.			
White Stone	July 3	do 20	1,320
White Sixweeks	do 3	do 20	1,305
Early Milan	do 3	do 20	1,133
Flat White Dutch	do 3	do 20	861
Orange Jelly	do 3	do 20	836
Breadstone	do 3	do 20	781
Purple Top Strap-Leaf	do 19	do 20	605
Red Top Strap-Leaf	do 19	do 20	495
Large White Norfolk	do 19	do 20	322

MANGELS AND SUGAR BEETS.

Five varieties of mangels and three varieties of sugar-beets were sown; with the exception of one variety of mangel, all were destroyed by cut-worms

Selected long red mangel gave 825 bushels per acre.

CARROTS.

Carrots have suffered severely from the attacks of cut-worms. One of the varieties was completely destroyed, and the others badly injured. All the varieties were sown on the level in rows three feet apart.

——	Sown.	Harvested.	Yield per Acre.
			Bush.
White Field Carrots	April 21	Oct. 21	381
Danvers Orange Red	do 21	do 21	256
Early Scarlet Shorthorn	do 21	do 21	231
Chantenay	do 21	do 21	224
Mitchell's Early Perfection	do 21	do 21	165

POTATOES.

The past season has been exceptionally favourable for potatoes, and the yield large. A number of varieties of potatoes planted on this farm in 1889 proving either unproductive or inferior in quality were discarded and others added. Among the new varieties tested are 29 seedlings raised on the Central Experimental Farm, Ottawa. One of these, No. 80, heads the list for productiveness. All were ploughed in on the 24th of May; soil a clay loam; field was sown with roots in 1889. Twenty-three varieties have also been raised from seed on this farm, and will be tested next season; in all, 101 different sorts were grown this year. A number of varieties were tested during winter to ascertain their cooking qualities.

Name.	Colour.	Yield per 100 Sets.	Quality.
		Lbs.	
C. E. F. Seedling, No. 80	White	315	Only fair.
Thorburn's Late Rose	Red	255	Fair, late.
Genessee Seedling	White	251	Good flavor, dry.
Jumbo	do	248	Wet.
C. E. F. Seedling, No. 120	do	243	Fair flavor, dry.
Beauty of Hebron	Red	241	Dry, good flavor.
Early Rose	do	240	do
Empire State	White	238	Fair, damp.
White Star	do	236	Medium, wet, bad.
Roses New Giant	do	234	Wet.
Richter's Imperator	do	233	Wet, yellow, poor.
Clark's No. 1	do	232	Good, dry.
Thorburn's Paragon	White, round	230	Fair flavor, damp.
Early Conqueror	White	228	Poor, soft and wet.
Wonder of the World	Light pink	228	Good, dry.
Alpha	White	223	Fair, good flavor.
Richter's Schneerose	White, long	212	Wet.
Jackson's Improved	White	210	Dry, good flavor.
St. Patrick	do	209	Damp, fair.
Sugar	do	206	Wet, good flavor.
C. E. F. Seedling No. 15	do	204	Very good, dry.
do do 225	do	205	Poor quality, wet.
Thorburn's	Pink	198	
C. E. F. Seedling No. 9	White	198	Good flavor, dry.
do do 209	do	198	Fair, dry.
Burbanks Seedling	do	197	Damp, poor.
Niagara	do	195	Very wet, yellow.
C. E. F. Seedling No. 188	do	195	Very good, dry.
Algiers	do	183	Poor, wet.
Snowflake	do	183	Dry, good, white.
Amon's Early		181	
C. E. F. Seedling No. 27	do	180	Good, dry
Brownell's Best	do	179	do
C. E. F. Seedling No. 118	do	177	Poor flavor, wet.
Giant Long Dutch	do	175	
Member of Parliament	do	173	Wet, poor flavor.
King of the Earlies	do	172	
Early Callao	do	171	Dark, poor, wet.
Brownell's Beauty	White and pink	171	Wet.
Centennial	White	170	Poor flavor, wet.
White Elephant	do	163	Fair.
Six-weeks Round White	do	162	Fair, damp.
Chicago Market	Pink	165	Very good, dry.
C. E. F. Seedling No. 122	Dark red	162	Good flavor, dry.
do do 94	Yellow	162	do
do do 21	White	162	Very good, dry.
Telephone	do	159	Good flavor, dry.
C. E. F. Seedling No. 5	do	156	Wet, poor flavor.
Patterson's Albert	do	154	Very wet, yellow.
C. E. F. Seedling No. 231	Dark red	153	Good flavor, dry.
May Queen, Early	Pink	152	Good, dry.

Name.	Colour.	Yield per 100 Sets.	Quality.
		Lbs.	
C. E. F. Seedling No. 46	Dark red	150	Fair, dry.
do do 53	do	147	Poor flavor, wet.
do do 54	White	145	Very good flavor, dry.
do do 10	do	144	Poor quality, wet.
do do 98		144	
do do 73	do	144	Fair, slightly wet.
Rosy Morn	Pink	144	Dry, very good.
Early Calico	White, red spots	142	Medium, poor.
C. E. F. Seedling No. 83	White	141	Good flavor, dry.
Eye Carpenter		140	Extra good, dry.
Pride of America	do	133	Dry, fair flavor.
C. E. F. Seedling No. 177	Dark red	126	Fair flavor, damp.
Sukreta	White	124	Good, dry.
C. E. F. Seedling No. 141	do	123	do
Bliss's Triumph	Red	120	do
Emperor William	White	119	Fair, dry.
Manhattan	Blue, white spots	117	Good, dry.
Early Short-topped		114	do
C. E. F. Seedling No. 2	White	111	do
American Magnum Bonum	do	109	Damp, yellow.
C. E. F. Seedling No. 170,	Red	102	Fair, rather wet.
Early Frame	White and pink	100	Fair, damp.
Matchless	do	100	Good, dry.
C. E. F. Seedling No. 153	Red	99	Good flavor, dry.
do do 118*a*		78	
do do 136	Red spots	63	Fair, wet.
Large vs. Small Seed.			
Early Rose, medium sized seed		290	
do small		252	
do large		238	
do planted 6 inches apart		244	
do do 12 do		243	
do do 18 do		229	

GRASSES AND FODDER PLANTS.

The yield of native hay throughout the Province was larger during the past year than in 1889; still many of the meadows are either drying up or becoming exhausted, and the demand for substitutes is still increasing. Considerable attention has therefore been given to grasses and fodder plants.

CULTIVATED GRASSES.

Of the 12 varieties of cultivated grasses sown in 1889, only the following survived the winter:—Tall, Hard and Meadow Fescues, Timothy and Kentucky blue grass. The Fescues made very little growth, and were only fit for pasture. The Timothy yielded about 1½ tons per acre. The Kentucky Blue grass was very thin in spring, but thickened out during summer and remained quite green until late in November. This is a very promising pasture grass. Of the clovers sown in 1889, Common Red and Lucerne, being somewhat sheltered, survived the winter and gave two cuttings, but the plots were too small for accurate returns to be obtained.

In May of this year, 12 varieties of grass and 9 varieties of clover were sown with spring wheat; all germinated readily, and were looking thrifty when winter set in.

NATIVE GRASSES.

I have pleasure in reporting continued success with the cultivation of native grasses. The six varieties mentioned in my last report as having been grown successfully in 1889, survived the past winter, and have given a fair yield of fodder. All were permitted to ripen their seed. We were, therefore, unable to test their value for feed. A considerable quantity of seed of these varieties has been secured which will be sown next spring. During the past season, several additional varieties have been sown, some of which are promising.

Below will be found the names, height and estimated yield this year of the seven varieties of native grasses sown in 1889. One variety (Agropyrum tenerum) was omitted in my last report but is included in this.

NATIVE GRASSES.

——	Remarks.	Height.		Estimated Yield.
		Ft.	In.	Tons.
Muhlenbergia glomerata, Trin	Very promising; somewhat late		27	2
Elymus Americanus, V and S	A coarse grass of fair quality	4		3
Elymus Virginicus, L	Bunchy, with heavy wheat-like head	3		1½
Bromus ciliatus, L	Bunchy; quality apparently good		30	1
Agropyrum tenerum, Vasey	Somewhat like English rye grass in appearance; early	4		1½
Agropyrum caninum, R and S	Rather hard; early		33	1½
Poa serotina, Ehrh	Very fine stalk, known here as red top or meadow grass	2		1

FODDER CORN.

Thirty-two varieties of fodder corn were grown on the farm during the past season. The seed was sown on May 31st with a common wheat drill, in rows three feet apart, and the plants thinned out to about 6 inches apart in the rows. Weeds were kept down with the horse cultivator. The season being favourable, growth was very rapid and the yield large. All the varieties were cut on August 29th. It was then cured in shocks of about 600 lbs. (green weight). The cured fodder was readily eaten by both horses and cattle.

Below will be found a list of the varieties sown and full particulars regarding growth, yield, &c.

[NOTE.—The weight of each variety as given is accurate, but it must be borne in mind that it is seldom that a large plot or field will give returns per acre equal to a small plot, where special care is given to the growth of the plants.]

TEST OF FODDER CORN.

——	Sown.	Came up.	Yield per Acre, Green Weight.		Stage of growth when cut.
			Tons.	Lbs.	
Thoroughbred White Flint	May 31	June 13	46	400	In tassel.
Blunt's Prolific	do 31	do 13	38	1,000	Not in tassel.
Early Mammoth	do 31	do 13	37	1,200	do
Long Yellow Flint	do 31	do 13	36	1,700	In tassel.
Long Sweet	do 31	do 13	34	1,300	In the silk.
Golden Dent	do 31	do 14	33		In tassel.
Stowell's Evergreen	do 31	do 12	30	500	do
Hybrid from P. C. Dempsey	do 31	do 13	30	280	do
Leaming Yellow	do 31	do 13	29	1,400	do
Golden Beauty	do 31	do 13	29	300	Not in tassel.
Early Adams	do 31	do 12	28	1,200	In tassel.
Crosby's Early Sweet	do 31	do 13	28	100	In the silk.
Amber Cream	do 31	do 13	28	100	do
Minnesota Sweet	do 31	do 13	26	800	In milk.
King Philip	do 31	do 13	25	600	In silk.
Cinquantine or Fifty-day Corn	do 31	do 12	24	1,400	do
Longfellow	do 31	do 12	23	1,300	do
Mitchell's Early White Flint	do 31	do 12	23	640	In milk.
Chester County Mammoth	do 31	do 14	23	200	Not in tassel.
Pee and Kay	do 31	do 13	22		In milk.
Queen of the Prairie	do 31	do 14	21	900	In silk.
Early Concord Sweet	do 31	do 13	21	900	do
Narragansett Sugar	do 31	do 14	19	1,600	In milk.
Hickory King	do 31	do 14	19	500	Not in tassel.
Virginia Horsetooth	do 31	do 13	19	500	do
Marblehead Sugar	do 31	do 13	18	700	In milk.
Perry's Hybrid Sugar	do 31	do 13	18	300	do
Extra Early Adams	do 31	do 13	16	1,000	do
White Squaw or Native	do 31	do 13	16	1,000	do
Early Corey	do 31	do 14	15	800	do
Dark Squaw or Native	do 31	do 13	12	420	do
Giant Prolific Ensilage	June 20	do 24	24	400	Not in tassel, seed at first planting did not germinate.

MIXED GRAIN GROWN FOR FODDERS.

In many parts of the United States where it is difficult to grow cultivated grasses, resort is had to a mixed grain crop for fodder. As an evidence of its value for feeding purposes, I might add that hay made from oats and barley commands a higher figure in the San Francisco market than clover hay.

To ascertain what would be most suitable for this Province, eleven mixtures of grain were tested on the farm, a portion being sown on oat stubble, the balance after a root crop.

A mixture of oats and peas gave the largest yield, closely followed by barley and peas.

MIXED GRAINS GROWN FOR GREEN FODDER AND HAY ON OAT STUBBLE.

——	Sown.	Cut.	Yield per Acre, Green.		Yield per Acre, Dry.	
			Tons.	Lbs.	Tons.	Lbs.
Oats, tares and peas	April 22	July 29	5	698	3	712
do barley and peas	do 22	do 29	5	90	3	606
do wheat do	do 22	do 29	4	147	2	946
Barley, wheat do	do 22	do 29	3	1,610	2	769

MIXED GRAINS GROWN FOR GREEN FODDER AND HAY, AFTER ROOTS.

Oats and peas	April 23	July 28	8	310	3	1,659
Barley and peas	do 23	do 26	9	1,081	3	1,206
Wheat do	do 23	do 26	7	91	3	299
Oats and tares	do 23	do 28	8	702	3	904
Rye and peas, 1st crop	May 23	do 17	4	1,573	2	186
do 2nd crop	do 23	Sept. 20	2	552	0	1,264
Rye, peas and tares, 1st crop	do 23	July 17	5	784	2	
do 2nd crop	do 23	Sept. 20	1	1,896	0	1,192
Rye and tares, 1st crop	do 23	July 17	4	1,540	1	1,953
do 2nd crop	do 23	Sept. 20	2	352	0	1,384
Rye	April 23	June 28	2	1,139	1	22
do	do 23	July 17	4	570	2	144
do and peas	do 23	June 28	2	1,288	0	1,939
do do	do 23	July 17	3	1,659	2	973

MILLETS.

Below will be found a list of the Millets tested on the farm during the past season, with the yield of fodder both green and cured. *Panicum Miliaceum*, introduced from India by Prof. Saunders, and known there as "the Inferior Millet," gave the largest yield, and is in every way promising. The seed was drilled in on fallow land, at the rate of 22 lbs. per acre.

——	Sown.	Harvested.	Yield per Acre, Green.		Yield per Acre, Dry.	
			Tons.	Lbs.	Tons.	Lbs.
Hungarian	June 7	Aug. 21	8	1,400	3	1,884
German Millet	do 7	do 28	10	1,600	4	1,786
Common do	do 7	do 6	7	1,816	3	648
Chena or Indian Millet	do 9	do 28	Not weighed		5	711

RAPE OR COLE.

One of our most promising green crops for late feeding is that of Rape or Cole. This has done remarkably well with us this year. Sown in rows 3 feet apart on June 3rd, it yielded in October 33 tons per acre (green weight). Cattle eat it greedily, and it seems particularly suitable for the feeding of sheep and cattle. To cattle it must be fed with care as in cold weather, it is apt to induce bloating.

BUCKWHEAT.

There is considerable enquiry among farmers for plants suitable for green manure. To determine the suitability of buckwheat for this purpose, three varieties were sown in adjoining plots of clay loam soil. The plants were weighed green just as they were in full blossom. Silver Hull gave 14 tons 168 lbs. per acre; Common, 12 tons 390 lbs., and Japanese, 9 tons and 816 lbs. The plots were planted with potatoes in 1889.

FRUIT AND FOREST TREES.

In submitting my report on the Horticultural and Forestry work on the farm, I beg to call attention to the fact that the extremely dry season of 1889, followed by a severe winter, was very trying to young trees newly transplanted, and this should be borne in mind when considering the report of trees planted in 1889.

Trees planted in the plots situated on the bluffs overlooking the valley and protected by a growth of scrub, have again proved the most vigorous. Of the 237 fruit trees planted during 1889 in the open prairie plot, 84 or about 36 per cent have died, while of the 158 trees planted in the protected plot, only 22 or about 14 per cent. have died.

Encouraged by the above results, four additional half-acre plots were cleared of scrub and ploughed. A belt of scrub 4 to 8 feet high has been left around each plot as a wind break. These plots have been planted as follows:—

No. 1, with apple trees set 20 by 20 feet apart, with raspberries planted in the intervening spaces; No. 2, with plum and cherry trees 20 by 20 feet apart, and gooseberries between; No. 3, with crab apple trees set 20 feet apart each way, and currant bushes intervening; No. 4, with grape vines planted 10 by 20 feet apart, and raspberries between.

In addition to the foregoing, a quarter acre plot has been cleared and broken up for strawberries. This we hope to fill with home-grown plants next spring.

APPLE TREES PLANTED IN 1889.

The winter of 1889 was very severe, and the trees in the exposed plot, already weakened by the hot winds of the previous summer suffered badly, while those planted among the scrub on the hillside were comparatively little injured. Of the 382 apple trees planted in different parts of the farm in 1889, 261 are still living, although some are considerably weakened and may succumb during the present winter. It is noticeable that the trees allowed to branch out near the ground have succeeded much better than those trained as tall standards, the latter, having a large amount of bare trunk, suffered severely from sunscald.

As these trees have now been planted nearly two years, it is thought advisable to give results in full as follows:—

——	Total Planted.	Alive.	Present Condition.	Number Dead.	Probable Cause of Death.
Sandy Glass	2	1	Extra good	1	Winter killed; in exposed situation.
Romna	2	1	do	1	do do
Russian Green	2	1	do	1	do do
Cross	2	1	do	1	do do
Pineapple	2	1	do	1	do do
Ostrokoff	2	2	do	0	
Kursk Anis	2	1	do	1	do do
Krimskoe	2	2	do	0	
Crooked Spice	2	1	do	1	do do
Repolovka	2	2	do	0	
Red Repka	2	2	do	0	
Sugar Sweet	3	2	do	1	
Zusoff	2	2	do	0	
Karabovka	2	2	do	0	
Tashkin	2	2	do	0	
Simbirsk No. 2	2	2	do	0	
Orel No. 5	2	1	do	1	Winter killed.
Orel No. 11	2	1	do	1	do
Broad Green	2	2	do	0	
Vargulek	2	2	do	0	
Kruder	2	1	do	1	Winter killed; in exposed situation
Anisim	2	2	do	0	
Silken	2	2	do	0	
Yellow Sweet	2	1	do	1	Winter killed.
Osimoe	2	1	do	1	do
Kremer's Glass	2	1	do	1	do
Tiesenhausen	2	1	do	1	do
Blushed Calville	6	3	do	3	do
Anisim, 18m	2	2	Good	0	
Anis	2	1	Extra good	1	do
Borovinka	2	2	do	0	
Antonovka	2	1	do	1	do
No name attached	3	0		3	do
Ukraine	4	4	Extra good	0	
Kursk Reinette, 20m	1	1	do	0	
Herren, 87m	1	1	do	0	
Autumn Streaked	10	5	do	5	In exposed place; winter killed.
Yellow Anis	10	9	do	1	do do
Red Anis	20	14	do	6	do do
Lejanka (Liebig)	20	13	do	7	do do
Titovka	10	8	do	2	do do
Grandmother	10	7	do	3	do do
Duchess of Oldenburg	10	10	do	0	
Plikanoff	10	9	do	1	do do
TALL STANDARD TREES.					
Antonovka	6	5	Good	1	Transplanting, 1890.
Arabka, summer	5	2	Growing from roots	3	Winter.
do winter	5	2	Fair	3	do
Anis	3	2	do	1	do
do yellow	2	0		2	Transplanting.
do red	2	1	Good	1	do
do mottled	2	2	do	0	
Aport	4	4	Fair	0	
Alexander	7	6	do	1	Winter killed.
Pineapple	3	2	Poor	1	do
Blue Pearmain	2	1	Fair	1	do
White Borodovka	2	1	Good	1	do
Ben Davis	4	4	Fair	0	
Belle de Boskoop	4	0		4	do
Borovinka	5	2	Good	3	do

——	Total Planted.	Alive.	Present Condition.	Number Dead.	Probable Cause of Death.
TALL STANDARD TREES.					
Grandmother	4	2	Fair	2	Winter killed.
Canada Baldwin	5	4	do	1	do
Duchess of Oldenburg	7	4	do	3	do
Fameuse	5	3	Poor	2	do
Gipsey	2	2	Good	0	
Gideon	4	0		4	do
Golden White	2	2	Extra good	0	
Grand Duke Constantine	2	2	Fair	0	
German Calville	2	1	do	1	do
Golden Russet	5	3	Growing from roots	2	do
Grimes Golden	3	1	do	2	do
Hibernal	2	2	Good	0	
Herren	2	2	Fair	0	
Haas	3	1	Growing from roots	2	do
Enormous	2	2	Fair	0	
Blushed Calville	2	2	Good	0	
Kellogg Russet	2	2	Growing from roots	0	
Livland Raspberry	2	1	Fair	1	do
Longfield	5	4	do	1	do
Mann	3	2	do	1	do
McIntosh Red	5	4	Growing from roots	1	do
Pointed Pipka	2	2	Good	0	do
Peach	3	2	Growing from roots	1	do
Red Bietigheimer	2	1	do	1	do
Christmas	2	2	Fair	0	
Romna	5	4	Good	1	do
Red Astrachan	3	2	Growing from roots	1	do
Sugar Miron	3	0		3	do
Serinkia	2	1	Growing from roots	1	do
Cross	2	0		2	do
Scott's Winter	3	2	Growing from roots	1	do
Stèklianka	2	2	Fair	0	
Ostrokoff's Glass	2	2	do	0	
Bogdanoff's Glass	2	2	Growing from roots	0	
Lead	2	2	Fair	0	
Switzer	2	2	do	0	
Stettin, red	2	0		2	do
do yellow	2	1	Growing from roots	1	do
Shaker Pippin	2	2	Fair	0	
Tetofsky	5	3	do	2	do
Titovka	3	2	do	1	do
Gipsey	2	2	do	0	
Tolman's Sweet	3	1	Growing from roots	2	do
Ukraine	2	1	Good	1	do
do	3	1	Fair	2	do
Vargul	2	1	Good	1	do
Winter St. Lawrence	2	2	Fair	0	
Wallbridge	3	2	Growing from roots	1	do
Wealthy	3	2	Good	1	do
Yellow Transparent	5	5	Growing from roots	0	

CRAB APPLES, 1889.

Of the 25 crab apple trees planted in 1889, 16 are still living. These have made good growth and some of the varieties appear quite hardy and promising.

——	Number of Trees Planted.	Alive.	Present Condition.	Dead.	Probable Cause of Death.
Transcendent	5	4	Extra good	1	Transplanting, 1890.
Whitney's No. 20	5	3	do	2	do
Hyslop	3	2	do	1	Winter.
Orange	2	2		0	
Early Strawberry	2	2		0	
Queen's Choice	2	2		0	
Lou's Favourite	2	1		1	Transplanting, 1890.
Martha	4	0		4	Winter.

CHERRY TREES, 1889.—PLANTING.

The cherry trees planted in 1889 were nearly all winter killed, but a further supply of hardy Russian varieties was planted last spring, and it is hoped some of these may prove hardy.

——	Number Planted.	Alive.	Present Condition.	Dead.	Probable Cause of Death.
Ostheim	5	2	Growing from roots	3	Winter killed.
Vladimir	3	0		3	do
Early Richmond	3	2	Growing from roots	1	do
12 m. from Russia	2	2	Good		

PEARS, TREES.—1889.

Nearly all the pear trees planted in 1889 were injured by the winter, either killed outright or to the snowline, a few of the trees of the hardy Russian varieties escaped with very little injury and have made fair growth during the past summer.

——	Number Planted.	Alive.	Present Condition.	Dead.	Probable Cause of Death.
Bessemianka	2	1	Good	1	Winter killed.
Beurre Hardy	2	0		2	do
Clapp's Favourite	2	2	Growing from roots	0	
Flemish Beauty	4	2	do	2	do
Howell	2	1	do	1	do
Gakovsk	3	1	Good	2	do
Kurskaya	4	3	do	1	do
Pomeranovka	2	1	Growing from roots	1	do
Sapieganka	2	1	do	1	do
Seckel	2	2	do	0	
Thin Twig	2	1	Fair	1	do

PLUM TREES PLANTED IN 1889.

Plum trees were mostly planted in the exposed plot, and suffered severely by winter. Those surviving were transplanted to the hill plots last spring. This also gave them quite a check.

A number of native plum trees have been set out; these will prove useful for grafting purposes.

——	Number of Trees Planted.	Alive.	Present Condition.	Dead.	Probable Cause of Death.
Bradshaw	2	2	Growing from root	0	
Coe's Golden Drop	2	1	do	1	Winter.
De Soto	4	2	Good	2	Transplanting
Early Red	7	6	do	1	do
German Prune	2	0		2	Winter.
Lombard	4	0		4	do
Late Red	2	2	Fair		
Marianna	2	2	Growing very vigorously from roots.		
Moreman	2	0		2	do
Moore's Arctic	2	2	Growing from roots		
Nicholas	7	3	Good	4	do
Otschakoff	3	2	Fair	1	do
Trabische	2	1	Growing from roots	1	do
Yellow Gage	2	1	do	1	do

GRAPE VINES.

Although very thrifty in summer and well covered with earth in the fall, none of the grape vines planted in 1889 survived the winter. A further supply of 100 vines composed of 18 varieties were procured in 1890. According to instructions, these were planted in holes 3 feet below the surface, and as the vines grew, the soil was gradually filled in, by this method, placing the roots much deeper than by the ordinary mode of planting.

Before winter the vines were covered with a mound of earth, which will be allowed to remain until late in spring.

APPLE TREES, &c., PLANTED IN 1890.

The past season has been more favourable for tree-growing than 1889, and the 22 apple and 5 plum trees planted in May of this year were all living when winter set in; of 17 cherry trees planted, 10 were living.

Beside the above, 500 apple and 50 pear seedlings raised on the Central Experimental Farm, Ottawa, from imported Russian seed, were placed in nursery rows; of these, 340 are living. Those which survive will be grown as seedlings, and it is hoped that some may produce fruit worthy of cultivation.

On the approach of winter, fruit trees of all kinds were wrapped with straw and tar paper to protect them.

GOOSEBERRIES.

Of the 96 plants of cultivated varieties, and 12 natives planted on the open prairie in 1889, only 9 were killed by the drouth of that year, but the surviving plants of Industry and Woodward's Whitesmith succumbed to the winter of 1889-90. The remaining varieties were removed to one of the sheltered plots, in April, and have made a thrifty growth during the past summer. Houghton's Seedling bore

a small quantity of fruit. During April, additional plants were procured and planted in the same plot. These have all done well.

—	1889.		1890.		Total Living.
	Planted.	Alive.	Planted.	Alive.	
Houghton's Seedling	26	26	138	130	156
Downing	25	25	108	103	133
Smith's Improved	25	20	48	45	65
Woodward's Whitesmith	10	0			
Industry	10	0			
Native	12	11	20	20	31

CURRANTS.

All the varieties of currants tried have proved perfectly hardy and have made a good growth. During the past season, although the bushes were small, many of them were loaded with fruit. Black Champion and Lee's Prolific both bore well, their fruit being about equal in size and quality. Of the red varieties, Fay's Prolific and Raby Castle produced some fine berries.

—	1889.		1890.		Total Living.
	Planted.	Alive.	Planted.	Alive.	
Black Currants, Lee's Prolific	427	426	.....	.....	426
do Black Champion	10	10	.....	.....	10
do do Naples	16	16	86	84	100
Red Currant, Fay's Prolific	26	24	.....	.....	24
do Raby Castle	265	202	.....	.....	202
do Red Cherry	10	10	133	130	140
do Victoria	25	13	.....	.....	13
do Red Grape	10	10	.....	.....	10
White Currant, White Grape	148	143	27	27	170
Native Black	20	20	19	19	39
do Red	11	11	.....	.....	11

RASPBERRIES.

A number of varieties of raspberries were received and planted late in May, 1889, but probably owing to the dry season, only one variety of the red (the Turner) and one of Blackcap (the Hilborn) survived the summer and following winter. These two varieties are very promising. The Turner has also produced some fruit.

About 20 varieties of raspberries and blackberries were planted in May, 1890, but owing to all the plants being too far advanced in growth when planted, only a few of each variety were alive at the commencement of winter. Some Philadelphias were procured, which were grown in Southern Manitoba. They were planted early, and all are alive and some have borne fruit.

As very few farmers will go to the trouble of protecting their bushes, it was thought advisable to test some of each variety without protection. The balance were protected by a mound of earth or manure placed over each plant

STRAWBERRIES.

Although none of the strawberries planted on the open prairie survived the summer of 1889 and following winter, I take pleasure in reporting a fair amount of success with those planted in the plot protected with scrub, this plot has a sandy loam soil naturally mulched with decayed leaves. When uncovered late in spring fully 90 per cent. of the plants in this plot were alive and quite fresh. During the summer they made rapid growth, the Crescent, Captain Jack and Wilson sending out a mass of runners. About the middle of July the Crescent produced a fair crop of very fine berries, Wilson and Captain Jack also bore a few. The varieties planted by us range for merit and hardiness in about the following order: Crescent Seedling, Wilson's Albany, Captain Jack and Manchester. Sharpless and Daniel Boone were planted but very few plants survived.

There are a large number of new plants of the three first named varieties, these will be available for planting and distribution next spring.

A variety of the native strawberry produced under cultivation an abundant crop of fruit of good quality. This will probably be worthy of a further trial, a few of them were planted on the open prairie in July and may prove sufficiently hardy to withstand the exposure.

FOREST TREES AND SHRUBS.

During 1889 nearly 12,000 forest trees and shrubs were planted on the farm, the greater portion of these were used in planting a windbreak on the west boundary. Owing to the drought of the summer of 1889, followed by a severe winter, 7,379 or over 60 per cent. of these have died. During the present year 21,721 trees, &c., were received from the Central Farm, Ottawa, and from Nebraska, of these 2,224 have died. The loss, however, of about 1,400 of these was no doubt attributable to heating in transit, leaving a loss of only 783 trees or less than 4 per cent. chargeable to the climate.

The trees planted in the shelter belt on the west boundary of the farm in 1889, were placed 9 feet apart, this year an additional tree has been placed between these making them 4 feet 6 inches apart, and 738 yards of additional belt 50 feet wide has been planted. A large proportion of the trees used in the belts this year were native varieties raised from seed on the farm and are likely to prove hardy. On this farm the following varieties of trees are found to succeed best: Native Ash-leaf Maple, Native Ash, American Elm (from native seed), Russian Poplars and Willows, Cottonwoods (northern grown), Alders, Birch and White Spruce.

Of shrubs the following have done well Asiatic Maple, (*Acer ginnala*), Caragana arborescens, Flowering Currant, Cytisus Capitatus, Lilac's, Spiraea opulifolia, billardi and nobleana. Climbers: Lycium Europeum and Clematis flammula. A Japanese rosebush, (*Rosa rugosa*), has also proved perfectly hardy.

FOREST TREES PLANTED IN 1889.

——	Number of Trees Planted.	Alive.	Present Condition.	Dead.	Probable Cause of Death.
Acacia or Honey Locust	340	3	.....	340	Winter killed.
Ash, White (seedlings)	250	19	.....	231	Summer drouth, '89, and winter.
do Red (seedlings)	349	81	.....	268	do do
do Green	285	160	Good	125	do do
do Black	50	0	.....	50	Winter.
do European Mountain	51	26	Good	25	do
do American do	22	16	Extra good	6	do
Alder, European	52	50	do	2	do
do White	10	10	do	0	
Arbor Vitæ or Cedar	1,066	596	Green and healthy.	470	Drouth, 1889.
Beech (seedlings)	172	0	.....	172	Received in bad order.
Birch, Yellow	105	89	Extra good	16	Drouth, 1889.
do White	50	48	do	2	do
do Canoe	40	28	do	12	do
do Sweet	10	6	do	4	do
Catalpa	1,066	0	.....	1,066	Winter, 1889-90.
Coffee Tree Kentucky	18	0	.....	18	do
Cherry, Black	153	15	.....	138	do
Elm, American	1,082	623	Good	459	Drouth and winter.
do do from native seed	1,087	954	do	133	do
do Rock	250	0	.....	250	do
Hemlock	43	4	.....	39	do
Oak, Macrocarpa (Burr Oak)	44	0	.....	44	Received in bad order.
do American Red	2	0	.....	2	Winter.
Larch, European	522	118	Fair	404	Drouth, 1889, and winter.
Maple, Ashleaved (Box-elder)	503	500	Extra good	3	do
do Norway	536	70	Poor	466	do d
do Soft (A dasycarpum)	76	62	Good	14	do
Pine, Scotch	258	45	.....	213	do
do Austrian	439	41	.....	398	do do
do Riga	67	29	Good	38	do do
Cottonwoods	308	300	Extra good	8	Drouth.
Populus Pyramidalis	1	1	do	0	
do Certinensis	5	4	do	1	Accidental.
do Beno	8	8	do		
do Virginiana	2	2	do		
do Aurea	1	1	do		
do Bolleana	2	2	do		
do Wobstii Riga	2	2	do		
do Sibirica	2	2	do		
do Petrovsky	36	36	do		
do Bereolensis	11	11	do		
do Alba Argentea	2	2	do		
Spruce, Norway	1,532	127	.....	1,405	Drouth, 1889, and winter.
do White	65	62	Fair	3	do
Sycamore	51	0	.....	51	do do
Walnuts, Black	100	0	.....	100	do do
Willows White	7	7	Extra good		
do Yellow	7	7	do		
do Purple	4	4	do		
do Norway	4	4	do		
do Voronesh	5	5	do		
do Wisconsin Weeping	8	8	do		
do Basket	7	7	do		
do Acutifolia	3	3	do		
do Laurifolia	1	1	do		

ORNAMENTAL TREES AND SHRUBS PLANTED IN 1889.

——	Number Planted.	Alive November 1, 1890.	Apparent Condition.	Dead.	Probable Cause of Death.
Birch, Cutleaf Weeping	3	2	Healthy	1	
Asiatic Maple (Acer ginnala)	2	2	do	.....	
Caragana arborescens	44	25	Extra good	19	Received in bad order.
Tilia sylvestris	1	1	Good	.....	
Cornus Sibirica	1	1	do	.....	
Pyrus Baccata Auruntiacum	1	1	do	.....	
Artemisia Abrotans (Southernwood)	4	4	Extra good	.....	
Berberis vulgaris	150	128	Good	22	Drouth.
do elegans	12	0	.....	12	Winter.
do purpurea	16	0	.....	6	do
Flowering Currants, Ribes alpinum	1	1	Good	.....	
do sanguineum	2	2	do	.....	
Cytisus capitatus	10	10	do	.....	
Robinia Bessoniana	88	0	.....	88	Winter killed.
do monophylla	10	0	.....	10	do
do viscosa	10	0	.....	10	do
do Decaisneana	4	0	.....	4	do
do pseudacacia	168	0	.....	168	do
do tortuosa	19	0	.....	19	do
Weigelia Sibirica	1	0	.....	1	do
do Lavallei	1	0	.....	1	do
do Vershafeldti	1	0	.....	1	do
Hydrangea paniculata	2	0	.....	2	do
Deutzia Fortunei	2	0	.....	2	do
Colutea Halipica	21	0	.....	21	do
Lilacs, Syringa vulgaris	4	4	Good	.....	
do alba	77	65	Very healthy	12	Drouth, 1889.
do Josikea	1	0	.....	1	
do De Marley	4	3	Good	1	
do purpurea	2	0	.....	2	
do rothamagensis	2	2	Good	.....	
Spiraea opulifolia	60	16	Extra good	44	Received in bad order
do Douglasii	6	1	Good	5	Drouth and do
do van Houtte	6	2	do	4	do do
do prunifolia	2	1	do	1	do do
do bullata	2	1	do	1	do do
do billardii	6	6	Extra good	.....	
do callosa	3	1	.....	2	
do rotundifolia	2	0	.....	2	Winter.
do Californica	7	1	.....	6	do
do nobléana	2	2	Good	.....	
Climbers—					
Lycium Europeum	1	1	Extra good	.....	
Clematis Flammula	7	3	do	4	Received in bad order.
do Vitalba	10	0	.....	10	do
Rosebushes—					
Rosa rugosa	1	1	Good	.....	

FOREST TREES PLANTED IN 1890.

——	Trees Planted.	Alive November 1, 1890.	Apparent Condition.	Dead.	Probable Cause of Death.
Ash (Fraxinus) American White	2,286	2,569	Good	317	Transplanted late.
do Green	2,000	2,000	do	0	
do Black	134	108	Fair	26	Drouth in early summer.
do pubescens	500	439	Good	61	do
do acuminata	61	57	do	4	do
Mountain Ash, American	31	31	do	0	
do European	111	89	do	22	do
Soft Maple (A dasycarpum)	2,000	1,950	do	50	do
Box Elder or Native Maple	175	175	do	0	
Norway Maple	110	105	do	5	
Alder, European	100	68	do	32	do
do American	100	92	do	8	do
Butternut	900	824	do	76	do
Kentucky Coffee Tree	250	241	Fair	9	
Black Walnut	1,000	522	Injured by frost	478	Received in bad order.
Honey Locust	500	500	do	0	
Black do	500	500	do	0	
Elm, American White	5,000	4,765		235	Drought in early summer.
do	389	382		7	
Russian Mulberry	1,050	856	do	194	
Cottonwood	1,000	434		566	Received in bad order.
Spanish Chestnut	25	25		0	
Sweet do	25	25		0	
White Birch	42	40	Good	2	
Populus Bolleana	100	94	do	6	
Russian Olive	100	100	Extra good	0	
Linden seedlings	500	463		37	
Hickory	15	15		0	
Spruce, Norway	378	352	Good	26	Transplanting.
do White	75	69	do	6	
do Blue	10	6		4	
Pine, Austrian	120	86		34	
do Scotch	175	141		34	
do Riga seedlings	500	103	Poor	397	Received in bad order.
do Mountain seedlings	150	91	do	59	do
European Larch	138				Bare of foliage, cannot say how many are dead.
Arbor Vitæ	65	63		2	
Red Cedar	100	56		44	Drought in early summer.
SHRUBS PLANTED IN 1890.					
Artemisia abrotans	25	25	Good	0	
Ribes aureum	5	5	do	0	
do alpinum	2	2	do	0	
Berberis vulgaris	50	37	do	13	
do purpurea	30	9	do	21	Transplanting
Caragana	100	66	do	34	do
Symphoricarpus racemosus	3	3	do	0	do
Viburnum opulus	3	3	do	0	
do lantana	4	4	do	0	
Deutzia candidissima	7	7	do	0	
Wiegelia Lavallei	3	3	do	0	
Philadelphus nana	35	21	do	14	do
do inodorous	11	11	do	0	
do coronarius	13	13	do	0	
do cordifolius	13	12	do	1	
Syringa alba	8	8	do	0	
do vulgaris	10	10	do	.....	
do de Marley	17	17	do	.....	
Spirea, 9 varieties	67	61	do	6	

NATIVE TREE SEEDS AND SEEDLINGS.

A large quantity of native maple, ash, oak, cherry and other seeds has been collected during the past year. A portion of these have been sent to the Central Experimental Farm, Ottawa, for distribution. Sufficient for 7¼ acres were reserved and sown on this farm in the fall and the balance kept for distribution from here and for spring sowing.

As an experiment, a few native elm seedlings were transplanted from the banks of the Assinaboine River last spring. These are doing well. 33,000 of elm, 4,000 of spruce and 1,500 of Buffalo berry seedlings were collected during the fall and healed in ready for spring distribution and planting.

12,300 native maple and 6,500 ash trees were raised from seed during the past summer. These will be available for planting and distribution during the coming spring.

The total number of trees and shrubs growing on the farm at this date is as follows: 53,000 forest trees and shrubs, 600 trees of large fruits and 2,000 of small fruits, or a total of 55,600 trees and shrubs.

AVENUE TREES.

During May, 5 per cent. of the large avenue trees set out in 1889 died. This loss was traced in nearly every case to the presence of cold clay soil around the roots. The balance of the trees are thrifty and have made a large growth.

In May of this year, two additional avenues, each 550 yards long, leading from the public road to the farm buildings were planted with large native maple trees. Of the 340 trees planted, 339 were living when winter set in. The avenue leading from the main entrance has, in addition to the maples, a row on each side 120 in all of native spruce procured from the Sandhills, twenty miles east of Brandon. All were planted in June. A large ball of earth was brought with each tree, and every care was taken to preserve the roots from drying. So far only 5 have died, the balance look very promising, and their bright green appearance during our long winter is very refreshing.

VEGETABLE GARDEN.

Early in spring a suitable plot of rich sandy loam was prepared, and sown with hardy varieties of vegetables. The season was favourable and the yield of nearly every kind large, the cauliflowers being particularly fine. In point of excellence, the varieties tested rank about as follows:—

Beans.—Early Dwarf China, Early Mohawk, Champion Scarlet Runner.
Beans.—Windsor or English Broad.
Beets.—Early Blood-red Turnip, Long Smooth.
Cauliflower.—Early Erfurt, Early Snowball, Sutton's First Crop.
Corn, for Table Use.—Cory, Native, Early Adams, Early Minnesota.
Cucumbers.—Long Green, White Spine, Boston Pickling, Chicago Pickling.
Cabbage (for summer use).—Early Express, Early Dwarf York, Early Winningstadt.
Cabbage (for winter use).—Premium Flat Dutch.
Carrot.—Chantenay, Early Shorthorn, Danver's Orange Red.
Kohl Rabi.—Red and White.
Lettuce.—Toronto Gem, Paris Cos, Hanson.
Onions.—White Globe, Red Wethersfield, Mammoth Silver King.
Pumpkins.—Mammoth King, Sugar.
Parsnips.—Hollow Crown, Student.
Peas (Early).—Steeles Extra Early, Kentish Invicta, Little Gem.
Peas (Medium early).—Telephone, Champion of England, Stratagem.
Peas (Late).—Laxton's Omega.
Radish.—White Tip, Scarlet Olive.
Rhubarb.—Champion, Paragon, Linnaeus.

Salsify.—Mammoth Standard.
Spinach.—Large Viroflay, Round Summer.
Squash.—Vegetable Marrow, Scalloped, Summer Golden, White Bush.
Tomatoes.—Dwarf Champion, Perfection, Mikado.
Turnips.—White Stone, or Nimble Dick, Six Weeks, Breadstone.

FLOWERS.

The impression is general throughout the Province that the cultivation of garden flowers here must necessarily require much time and skill to produce satisfactory results, while the reverse is the case, for it is questionable whether the natural soil of any portion of the Dominion is better adapted to the growth of flowers than that of this Province, as is evidenced by the abundance of wild flowers growing everywhere.

A plot of sandy loam soil, 100 feet by 100 feet in size, and with a southern exposure, was selected for a flower garden. This was either sown or planted with the following varieties of flowers, of which the tender sorts only were started in a hot-bed; these gave an abundant supply of bloom from the middle of July to the end of October:—

Asters—6 varieties were sown and produced an abundance of fine flowers.

Antirrhinum, or Snapdragon—A perennial; several varieties were sown and proved very hardy and attractive.

Balsams—3 varieties were sown; grew and bloomed well; very susceptible to frost.

Calliopsis—Were a showy mass of bloom all summer.

Chrysanthemums (Annuals)—3 varieties; grew very rank; bloomed freely.

Dianthus, or Pinks—8 varieties sown; some of the hardiest and best of flowering plants for this climate; some varieties will withstand our winters.

Dianthus Barbatus, or Sweet William—Has lived through the winter without protection.

Linum Perenne, or Flowering Flax—Perfectly hardy and flowered from May to October.

Linaria Safferina—Hardy, and bloomed profusely from June to October.

Pansies—10 varieties sown; hardy; all grew and bloomed well.

Phlox Drummondi—5 varieties sown; all bloomed freely until October.

Petunias—2 varieties; grew rapidly, and produced a mass of bloom.

Poppies—5 varieties; all grew well, and produced some very fine flowers.

Stocks—3 varieties; did not do well.

Salpiglossis—Grew well, and produced an abundance of very showy and effective bloom.

Verbenas—Grew well, and flowered abundantly until very late in fall.

Zinnias—Bloomed well and were very showy all summer, but very tender.

BEES.

Of the four hives of bees placed in the cellar in November, 1889, three came through the winter in good condition; the fourth, a late and weak swarm, lost its queen and perished in early spring. From a self-registering thermometer kept in the bee-cellar, the temperature was found to range between 30 and 32 all winter.

During the past season the three hives increased to ten, but owing to unfavourable weather and excessive swarming, only 20 lbs. of surplus honey per hive (spring count) was obtained. All were placed in the cellar early in November.

BUILDINGS.

Since my last report a comfortable bank barn, 111 feet by 50 feet, has been erected on the farm. The stone basement is 10 feet high, and has accommodation for forty head of cattle and 12 horses. The upper storey will be used for storing grain, hay, &c.

Two silos, 9x9, and 21 feet high, are built in the west end of the barn, extending from the floor of the basement to 11 feet above the floor of the upper storey. The silos are constructed of 3x12 inch studding and double boarded both inside and out; tar paper was also placed between each two layers of boards.

Two excellent springs have been found near the barn, one of these has been flowing all winter.

A house for the use of the Superintendent is also finished. This will allow of the one at present occupied by the Superintendent being used as a boarding-house, which is greatly needed on the farm.

Accommodation for swine, sheep and poultry is greatly needed, and the buildings at present in use as implement sheds are only temporary, and should be replaced by permanent ones.

NEW BREAKING AND FALLOW LAND.

The former occupant having broken up portions of the valley in irregular patches, the intervening spaces have been cleared of scrub, stones, etc., and broken up. This will add very much to the appearance of the farm, and largely increase the area for cultivation. Eight acres on the side of the bluff overlooking the valley have also been cleared and ploughed. Altogether, 140 acres of new land has been broken and backset during the year.

About 95 acres of fallow land has been prepared. For comparison, a small portion was ploughed once, and the balance twice. The weeds were kept down between ploughings by means of surface cultivation.

ROADS, GRADINGS, &c.

Two avenues, each 550 yards long, leading from the public road to the farm buildings, have been graded during the past year, and 230 yards gravelled. Nearly a mile of road has also been graded on the upland prairie, and another road through the valley a mile long laid out and partly graded. Considerable grading has also been done on approaches to the new barn, &c.

VISITORS TO THE FARM.

I take pleasure in reporting a rapidly-increasing interest in the work of the Experimental Farm, as evidenced by the large and increasing number of visitors during the summer months.

Since the completion of the different railroads centering in Brandon, the advantage of this location as a site for the Experimental Farm is very apparent. It is within easy reach of farmers living in all portions of the Province, and the system inaugurated last year by the different railroad companies, of granting reduced fares on special days, enables all to visit the farm at very little expense.

In July the County Council of the municipality of Cornwallis visited the farm in a body, and at their next meeting passed a resolution strongly endorsing the work of the farm, and advising all in their municipality to visit it.

The British Delegates, with their friends, paid a visit to the farm in September. As the harvest was about over, and there was no opportunity of examining the growing crops, samples of the produce of the farm were displayed in the new barn. All expressed a deep interest in the work of the farm generally, but particularly in those experiments connected with the culture of grasses, roots and fodder plants.

CORRESPONDENCE, &c.

The correspondence between the farmers of the Province and the Experimental Farm is rapidly increasing. In 1889, 467 letters were received; in 1890, 842, or an increase of nearly 100 per cent. Many of these letters are of such a nature as to occupy considerable time in answering. The correspondence and the book-keeping connected with the farm has so far been carried on by the Superintendent.

SEED GRAIN DISTRIBUTION.

During the early spring of the past year a number of farmers throughout the province were supplied with promising varieties of seed grain grown on the Farm, the amounts sent to each applicant varying from 3 lbs. to 2 bushels, quantities of 1 bushel or more being charged for at market rates. The reports so far as received from these farmers are such as to lead us to hope that the Farm will prove very useful in distributing throughout the province new and improved varieties of seed grain.

The quantity available for distribution this year is much larger, but judging from the number of applications already received, all will be applied for.

EXHIBITS AT AGRICULTURAL FAIRS.

Some of the products of the Farm were exhibited at the following summer and fall fairs:—Brandon, Pilot Mound, Deloraine and Killarney.

Samples were also sent to the Manitoba Government and to the Canadian Pacific Railway Company, and were exhibited by them throughout the Eastern Provinces. The exhibit from the Farm shown at the International Exhibition, St. John's, N. B., by the Manitoba Government was awarded a diploma for the best collection of farm produce.

A small building on the Farm has also been fitted up as a museum, and samples of the produce of the Farm prepared and arranged. This is much appreciated by visiting farmers, especially during the winter months.

FARMERS' INSTITUTES.

During the present winter an excellent Farmers' Institute has been formed at Brandon, the meetings are well attended and much interest shown in the subjects under discussion. Other institutes are being organized throughout the province and will no doubt be productive of much good.

Papers on the following subjects were read by me at the Brandon Farmers' Institute:—"Notes on some of the varieties of wheat tested on the Experimental Farm," and "The selection, treatment and method of sowing grain."

I attended a very interesting meeting of the Manitoba Dairymen's Association held at Portage la Prairie on January 15th and 16th, at which the following papers were read:—"Canadian Dairying," by Senator Boulton; "Dairying in Manitoba," by Professor Barre; "Grasses' and Forage Plants suitable for Manitoba," by S. A. Bedford, Superintendent of the Manitoba Experimental Farm.

Interest in dairying and mixed farming is increasing throughout the Province, and many inquiries are received regarding the work to be undertaken in this line by the Experimental Farm.

I have the honour to be, Sir,

Your obedient servant,

S. A. BEDFORD,

Superintendent.

BRANDON, MANITOBA, 29th January 1891.

EXPERIMENTAL FARM FOR THE NORTH-WEST TERRITORIES.

REPORT OF A. MACKAY, SUPERINTENDENT.

INDIAN HEAD, N. W. T., 31st December, 1890.

WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

DEAR SIR,—In submitting this, my third annual report of work done and returns from crops on the North-West Experimental Farm, allow me, before entering into farm work proper, to refer to a few points of great importance to the settlers in this country.

Never in the history of our country has such an abundant crop of grain and straw been granted, but in quality much of the wheat has been very inferior. Barley, oats, peas and vegetables are a good, I may say a great crop, but these, so far, do not count for much in summing up our prosperity.

To a man accustomed to farming in the North-West nothing is so agreeable as raising wheat, yet nothing is doing so much harm to the country.

Although our soil is unsurpassed, our climate healthy and agreeable, because a frost of a few degrees visited us in August the whole country has been greatly injured and all because we try to grow only No. 1 Hard wheat which requires to be entirely free from frost to bring a reasonable price. To a man depending entirely on wheat, a frost in August is almost ruinous; and the sooner a change is made the sooner will the North-West Territories attain their proper place in our great Dominion.

Many argue that because frost visited Ontario in early times, and gradually ceased as the country became opened up, that the same effect will be produced here, when cultivation is carried on over large areas and the surface exposed to the influence of the sun. I fear there is no similarity in the two provinces in this respect. From the very nature of things we are subject to frost at any time and our wisest course is to be prepared for it.

Many foretold no frost last season until September. Still it came shortly after the middle of August, and had it come a little earlier or a few degrees harder, I ask how would it have left those depending entirely on wheat?

I submit the returns of the various crops grown on this Farm as evidence that we need not and should not depend entirely on one crop.

Another point of great importance is early seeding. Every settler realizes this fact, but very few act up to it. As long as seed and land hold out seeding continues, whether it be in April, May or June. The result is that most of the late sown grain is frozen and the country, sometimes on this account, pronounced a failure.

Let a series of years be taken by any settler and if he examines the difference between the first and last half of his crop it will astonish him to find how little of the former has ever been frozen and how small a percentage of the latter has paid harvesting expenses.

On the Experimental Farm, nine days changed an acre of Red Fife, promising 40 bushels, to an actual yield of 23 bushels per acre. Fifteen days made the difference between a crop of 35 bushels per acre of No. 2 Hard and one of $19\frac{8}{60}$ bushels of chicken feed.

Let a settler compare the early, medium and late seeding as shown in wheat tests on this Farm and then compare them with his own returns and I doubt not they will be found much the same.

Early maturing grain is another point of very great importance. I need not remind you, Sir, how safe the field of Ladoga wheat on this farm looked on the morning of the 21st August last, nor how cold and green its neighbour, Red Fife, across a 12-foot road, looked on that eventful morning. By the dates given it will be seen that both were sown at the same time, and while one was waiting your inspection several days after being ripe, and still was cut some time before the frost came, the other on which our whole country depends was barely ready for the binder when frost overtook it.

The field of Carter's Prize Cluster Oats also had been seven days in stook on your arrival, while others were hardly fit to cut 10 days afterwards. Yet the Cluster variety was sown only one or two days earlier than these.

I respectfully submit the foregoing to the serious consideration of the settlers of the North-West Territories.

The returns from the various crops grown on the Experimental Farm the past year will, I trust, be regarded as satisfactory.

You saw them being harvested and can understand how bright the prospects may be one day and how clouded the next. How a promise of forty bushels per acre, to-day, may be materially reduced to-morrow. Although many of the varieties of wheat were injured by frost, the returns from other grains, the results of tests of fodder plants and the progress made in tree culture, will, I hope, be deemed favourable.

The winter of 1889-90 was considered a genuine one. The past summer may also be classed in the same category, inasmuch as it was totally different from any of its predecessors since 1882. Winter lingered long, but finally gave way about the middle of April. A favourable seeding season followed and crops on the Farm were hurried in as quickly as possible. In June, rain, long absent, came in abundance; in fact, the outpour was too boisterous by far and, when accompanied by hail, proved disastrous to many things. The root-crop, corn, young grass, &c., suffered considerably. The growth of straw after the rains came was very remarkable, but had the great drawback of causing the grain to be long in ripening and proved, in the end, to be a serious loss to the country.

On the Experimental Farm, sixteen varieties of wheat were in stook when frost came, and those uncut suffered in proportion to the state they were in when overtaken.

All the varieties of barley but one were harvested on the 21st August and may be taken as entirely-free from loss, so far as frost is concerned.

Six kinds of oats were uncut on that day. These suffered in weight, although straw and quality did not appear to be at all affected.

Five degrees of frost was recorded on the Farm on the 21st August, which was sufficient to kill potato-tops, corn, cucumbers, beans, &c.

Harvest commenced on 9th August and was prolonged till the 25th September on account of frequent rains and a heavy snow storm, which unusual occurrence took place on 10th September.

All grain was got in in good condition and, when threshed, barley alone was found to be discoloured, but not to any great extent. Wheat was not hurt by rain, but the frost cut down the yield and greatly injured the grade.

It is worthy of notice the effect fallowed land had on the crop just harvested, it having prolonged the ripening process fully eight days over that which had been fall ploughed and several days over spring ploughing.

Hot winds in July caused the grain on fall and spring ploughing to be considerably shrunken, but hastened the ripening and caused such to be out of danger of frost earlier than on fallow land. The summer fallow, however, has several great advantages—causing a better yield, it can be got ready when no other work is on

hand, and at the same time is in the very best condition to hurry in the crop in the spring, which is one of the things absolutely necessary for success here.

A great deal of controversy has arisen over the best way of killing weeds by summer fallow. The course too commonly adopted is to allow them to attain their full growth, and then turn them under. This is, no doubt, a good plan if the work can be accomplished in a few days, or before the seeds form and ripen, but in the great majority of cases this cannot be done, and long before the field is ploughed there is a thousandfold added to the already innumerable weed seeds ready for growth in the spring. Two plans are being tried on the Experimental Farm to overcome these troublesome pests. One is to gang plough a weedy field in the fall, thereby causing weeds to start early in the following spring. The other to plough early in May and June and by repeated cultivation prevent the weeds from attaining more than a bare appearance above the ground. No definite conclusion can yet be given as to the success of the first mode except that it takes not more than one-half the work to keep down the weeds during the time the fallow is being made, in comparison with the labour necessary on spring ploughing to effect the same purpose. Whether weeds will appear more numerous in the grain from fall or spring ploughing can only be determined by next year's crop; but as to the success of the latter way, that is by ploughing early and repeated cultivation, there need not be the slightest doubt.

Land ploughed last year, before 1st July, bore abundant evidence this year of the wisdom of early work.

A Randall harrow was found to be the most effectual implement last summer to keep down the weeds, but it was necessary to use it often and allow nothing to appear very far above the surface.

WHEAT.

This, as in past years, was given the largest acreage, for the reason that it is the chief product of the country and important that some early and good varieties be obtained.

Nineteen new and 28 old varieties were tested. Red Fife was given 32 acres, Ladoga 16 acres, White Fife, Eureka, Saxonka, Red Fern and others, 1 to 2 acres each; 26 varieties had $\frac{1}{2}$ an acre and newer sorts from $\frac{1}{10}$ to $\frac{1}{5}$ of an acre each. The larger portion of the land was fallowed, but fall and spring ploughing were sown with Red Fife, to test the difference in earliness and yield.

Red Fife and Ladoga were sown at different dates and with different quantities per acre. These were also sown by drill and broadcast, and attempts were made to sow by press drill, but on account of the sticky nature of the soil these were not successful. Grain on fall ploughing is shrunken and as will be seen the yield is much less than that on fallow. That on spring ploughing was equally as good as on fallow in quality and nearly the same in yield.

The difference between early, medium and late sowing is very noticeable, but this may, to a large extent, be accounted for from the frost of 21st August which caught the various lots in different stages of ripening. The field sown on 16th April was barely ripe and could have stood several days without injury had no frost occurred.

The grain from this field grades No. 2 Hard and is plump but frozen. The medium, sown on 24th April, was equally heavy in straw as that sown on 16th, but the frost came when the grain was in the milk and the result is 23 instead of 35 bushels per acre. The late sown on 30th April, was about $\frac{1}{3}$ less in straw and the heads were much smaller than that first sown. The frost caught it just as the grain was well filled but quite soft, and hurt it badly, so badly in fact that it is useless for anything but feed, and although the return is $19\frac{8}{60}$ bushels per acre, this quantity may be put down at about 12 bushels of wheat for its feeding properties.

In the tests of different quantities per acre the results must not be taken as indicative of the relative advantages from the various quantities sown, as none of the plots

reached maturity when overtaken by frost, unless it is considered that each plot was injured equally, which I think could not be the case, as plots sown with $1\frac{3}{4}$ bushels per acre would have, on a reasonable calculation, one-half more heads exposed to the frost than that sown with one bushel and consequently suffer more per acre. The test, however, is given as showing the results of these different methods of seeding when their growth is stopped by frost.

In comparing Ladoga as an early wheat with Red Fife, in the tests of sowing different quantities per acre, Ladoga comes out about the same as in all other trials, being a few bushels behind in yield, but the grain is better or at least not hurt so much by frost on account of its being a few days more advanced.

In testing by broadcast and drill, nothing on the farm was so apparent, during the whole summer, as the difference between the two ways of sowing, especially when the grain was put in late. That sown by drill in every case came up in a few days and very even; that sown broadcast, early, came up with the drilled grain, but not so even or thick; whereas that sown broadcast, late, was ten days behind in appearing above ground, and then, was not one-half as thick.

When rain came in June, the grain near the surface started and thickened up the crop, but frost coming before this portion was filled or even the heads wholly formed, the last growth did more harm than if it had never started. Perhaps nothing has caused so much poor grain in the country as broadcast seeding the past year. A few drying days, in seeding time, made the soil an ash-heap for one or one and one-half inches down, and unless the seed was below this, it must there remain until rains come. This year they did not come until June, with the result that that portion of seed above the moisture did not grow for several weeks after that where the moisture was, and when the frost came was sufficiently advanced to injure the early grain by mixing with it, but not far enough on to be of any use in itself.

On the advent of frost on the morning of the 21st August, four plots of Red Fife and four of Ladoga, which were sown on the 30th of April, were thought to be in suitable condition to test the effect of cutting a part immediately after frost, and allowing another part to remain standing until ripe and noting the difference in yield. This was done, and the result was that the grain left until ripe gave 4 bushels per acre more than that cut immediately after the frost. The average of the eight one-half acre plots cut on the 21st was 15 for Red Fife and $14\frac{40}{60}$ bushels per acre for Ladoga. The average of that cut when ripe, or on 29th August, was $19\frac{8}{60}$ for Red Fife, and $18\frac{50}{60}$ Ladoga, or an increase of a little more than 4 bushels per acre in both varieties.

As will be seen there were sixteen varieties of wheat cut when frost came. This number does not include Red Fife, which was harvested both before and after the 21st.

In earliness, Karachi Club Bombay and Hard Calcutta were first last year and are the same this.

Gehun, a variety tried this year, is early and has given the best yield of any kind tested.

Campbell's Triumph, the Red and White Connell, Green Mountain, Campbell's White Chaff, &c., are all fine wheats; while Defiance, Judket, Magyar, Russian Hard Tag and others are late and not suitable for a year like the past.

The different varieties of wheat, except a few sorts from India, were very heavy in the straw and had frost held off for 10 days more, the yield would have been increased several bushels per acre in those sorts not cut by 21st August. The returns from those cut before the 21st, may be regarded as a correct and full yield.

Frozen Red Fife seed was sown, which in quality would grade No. 3 frozen. This was put in by drill at the rate of 2 bushels per acre, and returned $21\frac{50}{60}$ bushels. It was sown at the same time as No. 1 Hard, Red Fife and beside it on land similarly prepared. No. 1 Hard gave 23 bushels per acre.

The following are the varieties of wheat tried, the date of seeding is given, the harvest, yield, and weight per bushel, also the different tests of early, medium and late sowing, different quantities per acre sown, and drill and broadcast seeding, &c.:—

Wheat, 1890.

Variety.	Seeding.	Harvest.	Yield.	Weight.
			Bush.	Lbs.
Red Fife	April 16..	Aug. 23..	35·16	59
Ladoga	do 16..	do 13..	28·10	58½
Saxonka	do 16..	do 19..	28·8	60¾
White Fife	do 17..	do 23..	33·7	59¼
Eureka	do 17..	do 23..	23·18	60
Red Fern	do 17..	do 23..	28·18	59½
White Connell	do 18..	do 25..	28·32	57¾
Red do	do 18..	do 25..	26·40	60
Golden Drop	do 21..	do 19..	21	59¾
Defiance	do 21..	do 28..	21	57
Magyar	do 21..	do 28..	19·35	55½
Chilian White	do 21..	do 21..	29·8	59
Russian Hard Tag	do 21..	do 28..	27	59½
White Delhi	do 22..	do 19..	23·40	64
Soft Calcutta	do 22..	do 19..	19·8	62
Improved Summer Cob	do 22..	do 28..	19·30	57½
Rio Grande	do 22..	do 19..	20·50	58
Karachi (India)	do 22..	do 9..	20·10	61¼
Assiniboia	do 22..	do 19..	30·30	59½
Campbell's Triumph	do 23..	do 21..	28·38	58¼
Blue Stem	do 23..	do 25..	27·30	56½
Hungarian Mountain	do 23..	do 25..	17·30	58½
French Imperial	do 23..	do 25..	24·25	59
Wellman's Fife	do 23..	do 24..	18·54	58
Herison's Beardless	do 23..	do 24..	27	58½
Carter's Cross Bred, I	do 23..	do 28..	16·28	53¾
do D	do 23..	did not	fill.	
Club Bombay (India)	do 23..	do 9..	25·57	60½
Hard Red Calcutta (India)	do 23..	do 15..	36·10	62
Australian	do 23..	do 21..	27·7	57½
Azima (Russian)	do 23..	do 21..	19·4	56
Green Mountain	do 24..	do 21..	34	58¾
Campbell's White Chaff	do 24..	do 19..	32·4	59½
Greek Summer	do 24..	do 19..	25·4	61½
Simla (India)	do 24..	do 25..	29·37	58½
Gehun do	do 24..	do 15..	46·34	64¼
Kangra do	do 24..	do 15..	25·32	64
Palampur do	do 24..	do 25..	15·32	55
Seoraj do	do 24..	do 15..	20·43	63¼
Kulu do	do 24..	do 28..	22·30	54½
Judket	do 21..	do 28..	18·16	55
Polish Odessa	do 23..	did not	head out.	
Sandomerica	do 23..	do	do	
Baltic Red	do 23..	do	do	
Hungarian	do 23..	do	do	
Californian White	do 23..	Aug. 28..	21	55
Early, Medium and Late Seeding—Test.				
Red Fife	do 16..	do 23..	35·16	59
do	do 24..	do 28..	23	58¾
do	do 30..	do 29..	19·8	54
Ladoga	do 16..	do 13..	28·10	58½
do	do 24..	do 18..	30	59¼
do	do 30..	do 29..	18·50	56
Different Quantities of Seed per Acre.				
Red Fife, 1 bushel per acre	do 30..	do 29..	22·58	54
do 1¼ do	do 30..	do 29..	21·34	54
do 1½ do	do 30..	do 29..	19·8	54
do 1¾ do	do 30..	do 29..	14·20	54
Ladoga 1 do	do 30..	do 29..	23·40	56
do 1¼ do	do 30..	do 29..	18·45	56
do 1½ do	do 30..	do 29..	15·55	56
do 1¾ do	do 30..	do 29..	12·20	56

WHEAT, 1890.

Variety.	Seeding.	Harvestl	Yield.	Weight.
Drill vs. Broadcast—Test.			Bush.	Lbs.
Red Fife, drill	do 16..	do 23..	35·16	59
do broadcast	do 16..	do 23..	32·00	59
Ladoga drill	do 30..	do 29..	19·8	54
do broadcast	do 30..	do 29..	8·50	54
Test—Cutting Wheat immediately after Frost and Cutting when Matured.				
Red Fife	do 30..	do 21..	15·00	51
do	do 30..	do 29..	19·8	54
Ladoga	do 30..	do 21..	14·40	56
do	do 30..	do 29..	18·50	56
Result of Wheat Sown on Summer Fallow—Fall and Spring Ploughing.				
Red Fife, fallow	do 16..	do 23..	35·8	59
do spring ploughing	do 16..	do 18..	30·40	59
do fall do	do 14..	do 15..	23·00	58½

BARLEY.

Thirty-two varieties of this grain were sown last spring from 24th to 30th of April. Except the India sorts all were very heavy in straw and a good deal was laid down by rain storms before harvest. The only barley not lodged was Duck-bill and this although having more straw than any other was not in the least injured in this respect; it was, however, more discoloured than any other sort, from having fewer beards and the exposed position of the grain in the heads.

Seven varieties were sown in acre lots on 24th April. All were cut down by frost after coming up a few inches above the ground and were retarded a few days in their growth from this cause, but in the end suffered no loss from it. Each acre was very heavy in straw, taking from 5 to 6 pounds of twine to bind them. For earliness, yield, good straw, vigorous growth, and general appearance none equalled the Duck-bill.

Mensury, a six-rowed variety, approaches the Duck-bill in straw, but is not equal in yield and the straw crinkles down as it approaches maturity, which is not the case with the Duck-bill.

Goldthorpe is very like the Duck-bill in straw and formation of head and will, no doubt, be a very productive barley for the North-West.

Three of the seven varieties were sown again on the 29th or five days later than the first seeding. These were not quite so heavy in straw and a large proportion of each lot except Duck-bill was badly lodged.

Although the yield was not quite so large as from the early seeding, the berry was somewhat better on account of the straw not being so thick on the ground. Both were sown with the same quantity of seed per acre, but the spring frost had the effect of causing the early sown to stool out one-third more than the late.

Early seeding of barley on the Experimental Farm has invariably produced the best crop. Though on one occasion the early growth was cut back by frost three times; yet in the end the crop turned out the best, and in view of the probability of there being a large increase in the acreage sown next spring of this grain, it is recommended to sow as soon as possible after the spring opens.

One and one-half bushels is sufficient seed per acre where sown early, as it will almost certainly be cut back by frost and will then stool out more than if sown later; 1¾ to 2 bushels per acre is necessary if sown late.

None of the varieties have this year come up to last year in weight per bushel. Although the yield is far better, the grain is not so plump or rounded, which was probably caused by the large growth of straw.

The following table shows the varieties sown and returns, &c:—

BARLEY, 1890.

Variety.	Sown.	Matured.	Yield.	Weight.
			Bush.	Lbs.
Two-Rowed Carter's Prize Prolific	April 24..	Aug. 19..	49·6	52¼
do Duckbill	do 24..	do 12..	55·20	51¼
do Saale	do 24..	do 19..	53·30	50
do Thanet	do 24..	do 19..	49·4	48¾
do Beardless	do 24..	do 19..	45	51½
do Danish Chevalier	do 24..	do 16..	46·10	47¾
do Chevalier	do 24..	do 18..	43·25	49¾
do Golden Melon	do 28..	do 17..	50·30	50½
do Swedish	do 28..	do 17..	53·9	51½
do Peerless White	do 28..	do 17..	40·16	47¾
do Peerless	do 28..	do 14..	39·10	47
do Danish Printice Chevalier	do 28..	do 17..	37·8	49¼
do English Malting	do 28..	do 17..	37·26	49¾
do Early Minting	do 28..	do 18..	34	49
do Selected Chevalier	do 28..	do 17..	25	50½
do Goldthorpe	do 29..	do 14..	45·24	48
do New Zealand	do 29..	do 14..	36·32	51¾
do Sharpe's Improved	do 30..	do 26..	46·42	49½
Six-Rowed Mensury	do 29..	do 7..	47·17	49½
do Baxter's	do 29..	do 6..	41·16	49¼
do Odessa	do 30..	do 15..	38·5	47¾
do Rennie's Improved	do 30..	do 7..	39·15	49½
do Sialkot (India)	do 30..	July 31..	20	49⅓
do Seoraj do	do 28..	Aug. 15..	25·24	48¼
do Kulu do	do 28..	do 15..	38·7	48
do Simla do	do 28..	do 15..	24	50½
do Palampur (India)	do 28..	do 15..	30·30	55
do Bhagarmany Hills (India)	do 30..	do 7..	31·42	53¼
Feed Barleys.				
Lahoul (India)	do 30..	do 21..	28	60
Spiti Valley	do 29..	do 6..	37·10	60
Six Rowed Naked	do 30..	do 15..	39·25	57¾
Large Two-Rowed Naked	do 29..	do 13..	28·03	61½
Test of Different Dates of Seeding.				
Prize Prolific	do 24..	do 19..	49·6	52¼
do	do 29..	do 17..	45	52¼
Duckbill	do 24..	do 12..	55·20	51¼
do	do 29..	do 11..	53·10	51¼
Beardless	do 24..	do 19..	45	51½
do	do 29..	do 15..	42·34	51½

OATS, 1890.

Oats were a good crop, but like the barley were very heavy in straw, and those on fallow were badly lodged. Oats were sown on fallow and on fall and spring ploughing. The returns from each are appended.

Prize Cluster, this year, maintained its reputation for earliness, although not so decidedly as last.

Flying Scotchman and Poland White were equal to it in this respect, but in this only; as neither in grain nor straw did either ofthese varieties equal the Prize Cluster.

The black oats have given the largest yield. This is somewhat remarkable from the fact that they were quite green when frost visited the Territories, and must have been injured to some extent.

The best crop of oats in point of yield was grown on land gang-ploughed three inches deep in the spring; the seed being sown before the land was ploughed.

The field having borne a wheat crop the preceding year, some volunteer grain came up with the oats. The united crop gave a return of 85 bushels per acre.

Oats like barley ripened in shorter time the later it was sown. This may have been caused by frost retarding the early sown and a few days of bad wind in May injuring them, or from being in a more exposed place than those later sown.

The following are the varieties sown, yield &c:—

OATS, 1890.

Variety.	Sown.	Harvest.	Yield.	Weight.
			Bush.	Lbs.
White Prize Cluster	April 22..	Aug. 13..	63	45
do Welcome	do 22..	do 19..	42·15	38
do Egyptian	do 22..	do 20..	61·30	36
English White	do 22..	do 18..	41·7	36
White Early Racehorse	do 22..	do 20..	47·20	40
do Banner	do 22..	do 22..	58·20	40
August White	do 25..	do 14..	48·16	35½
White English Potato	do 25..	do 13..	46·4	34½
do Flying Scotchman	do 26..	do 11..	53·20	42
Poland White	do 26..	do 11..	47·20	36
Black Longfellow	do 26..	do 21..	30	36
White Cream Egyptian	do 29..	do 17..	55·8	42
Rennie's Prize White	do 26..	do 14..	63·10	45
White American Triumph	do 26..	do 22..	58·16	40
Black Tartarian, Imp. 19	do 23..	do 29..	74·30	40
do	do 23..	do 29..	71·24	36
Black Champion	do 23..	do 29..	58·4	37
Summer fallow compared with fall and spring ploughing.				
Black Tartarian, fallow	do 23..	do 29..	71·24	37
do fall ploughing	do 23..	do 18..	52·5	36
do spring ploughing	do 23..	do 16..	67·24	37
do do	do 29..	do 24..	85·10	37
Results of sowing at different dates.				
Fallow, Prize Cluster Acre.	do 22..	do 13..	68·10	43½
do do Field.	do 25..	do 11..	65·2	43½
do Welcome Acre.	do 22..	do 19..	42·13	39
do do Field.	do 26..	do 14..	48·19	39
do Black Tartarian Acre.	do 23..	do 29..	71·24	36
do do Field.	do 26..	do 25..	67	37
do do spring ploughing.	do 29..	do 25..	85·5	37

PEAS.

Five varieties of Field peas were sown; fallow and fall ploughing being used for the test.

All the varieties were greatly damaged by a hail storm, which passed over the Farm on 12th June, cutting off the young leaves and battering the stocks. The Extra Early peas never recovered, and continued poor to the end. Black Eye, Crown and Multiplier gave a large crop in straw, but were late in ripening, and to the frost of August 21st may be attributed the loss of at least one-fourth of the yield.

Mummy peas were obtained late, and were far from being ripe when overtaken by frost, and hence are a light crop. The prospect for this variety was good up to the time of frost, and with early seeding, it is likely to be very suitable for the country.

Considerable difference will be observed in yield from fallowed land and from fall ploughing. This piece of fall ploughing was given great attention, it having had two ploughings and several harrowings; yet the crop was poor in everything but weeds and volunteer grain.

PEAS, 1890.

——	Sown.	Harvest.	Yield.	Weight.
Returns from Summer Fallow.			Bush.	Lbs.
Black Eye	April 24..	Aug. 28..	30·10	62
Crown	do 24..	do 23..	25·53	62½
Multiplier	do 24..	do 28..	27·58	61
Extra Early	do 28..	do 3..	10	63
Mummy	May 23..	do 28..	12	..
Returns from Fall Ploughing.				
Black Eye	do 24..	do 26..	14·5	..
Crown	do 24..	do 20..	10·14	..
Multiplier	do 24..	do 26..	13·30	..
Extra Early	do 28..	do 3..	4	..

FALL WHEAT.

Three varieties, viz., Manchester, Democrat and Tasmania were sown in the fall of 1889. On account of dry fall weather, and being a little late in sowing, a large growth did not take place before winter set in. During the winter, straw to the depth of two inches was put over one-half of each variety, but the only difference observed in the spring was that the portions covered were green a few days longer than those which were not; all died early in May. One variety, "Velvet Chaff," was sown this fall, also one variety of fall rye, viz., "Reading Giant," and two acres of spring wheat was sown just as winter set in.

FODDER PLANTS.

Rye, millet, Hungarian grass, tares, oats, peas and corn were sown for fodder. Of all the varieties tested, rye, this year, like last, proved to be the best and most reliable, and can, without doubt, be depended on every year for a crop of fodder or hay. Rye, sown on fall ploughing on 29th April, cut on 14th July, gave 1½ tons cured hay per acre.

That sown on 2nd May on spring ploughing, cut on 14th July, returned 2½ tons per acre of very fine cured hay. It was again sown on 17th May and on 7th July on fallow, and cut on 1st August and 1st September, the yield being 3 and 2 tons respectively. Rye was also sown for seed on 29th April and on 17th May; ripe on 1st and 15th August. They gave 18·20 and 30·45 bushels per acre respectively. Rye and tares, rye, tares and oats, and rye and oats were sown on 2nd May and gave a large quantity of green fodder, but were not entirely successful for hay on account of having to cut the crop before tares or oats were far enough advanced. Barley would be a more suitable grain to sow with rye, as both would come in nearly together. Oats, tares and peas were sown together in equal parts on 2nd May and cut on 24th July returning 1¾ tons per acre. The hay from this mixture is not equal to rye, but does very well for green fodder.

Golden and common millets were sown on spring ploughing on 7th May; injured by hail on 12th June, were cut on 4th August and gave 1¾ tons per acre each. The same varieties were sown on fall ploughing on 22nd May. Injured by hail and hot winds, gave only 1¼ tons per acre when cut. The same were again sown on fallow on 17th May, but overtaken by frost before ripe, and gave only 1¼ tons per acre.

Hungarian grass was sown each time the millets were, and gave the same quantity per acre, but was hardly so far advanced when cut. Tares, sown on 29th April and cut on 24th July gave 1¾ tons per acre; sown on 17th May and cut on 9th August returned 2 tons per acre. Hay very poor, only suitable for green fodder.

CORN.

Corn was sown and planted for fodder on 23rd and 26th May. That portion sown was put in with seed drill by closing up all but four spouts of the drill. The drills were 24 inches apart for the corn sown, and 30 inches where planted.

The most vigorous sorts had attained a height of 5 feet when overtaken by frost on 21st August and all growth stopped. As soon after the frost as possible two-thirds of all the corn was cut and shocked up and the remainder left for ten days. The portion uncut was considerably more withered or dried up than that cut on the morning of the frost. The corn was left in the field in shocks until the ground became frozen, then drawn into the barn and is now being cut with the cutting-box and fed to the cattle, which devour it very readily. In earliness Mitchell's Early, Early Cory and Early Adams are ahead of the rest. In quantity of fodder, Golden Dent, Golden Beauty, Blunt's Prolific, Thoroughbred White Flint, Chester County Mammoth, and Queen of the Prairie rank first. Cinquantine or fifty day corn, though not so high as these, was better suckered and further advanced and may prove a better corn for fodder than any.

The following are the varieties tested and the condition they were in when overtaken by frost:—

CORN, 1890.

Land.	Variety.	Height.		Condition on 21st August.
		Ft.	In.	
	Cinquantine	4	0	In tassel.
	Ex. Early Adams	4	0	Fully tasseled. In silk.
	Ex. Early Cory	3	6	Tasseled. In silk.
	Mitchell's Early	3	6	do do
	Perry's Hybrid	4	0	Commencing to tassel.
	Minnesota Sweet	3	6	do
	Early Concord	3	6	No sign of tassel.
	Narragansett	3	9	Tasseled. No silk.
	Crosby's Early	3	9	Commencing to tassel.
	Blunt's Prolific	4	0	Strong growth. No tassel.
	Virginia Horse Tooth	4	0	No tassel.
	Golden Dent	5	0	Strong growth. No tassel.
	do Beauty	5	0	do do
	Queen of the Prairie	4	9	do do
	Longfellow	4	6	Late. No tassel.
	Thoroughbred Wh. Flint	5	0	do Good growth. No tassel.
	Pee & Kay	4	6	Fully tasseled out.
	Chester Co. Mammoth	5	0	Late. No tassel.
	King Philip	4	0	do do
	Stowell's Evergreen	4	6	do do
	Amber Cream	4	0	Partially tasseled.
	Early Minnesota	3	0	Barely tasseled.
	Leaming Yellow	4	0	Late. Not tasseled.
	Sugar	3	6	Fully tasseled out.
	Long White Flint	4	0	Late. No sign of tassel.
	Fallow and Fall Ploughing Test.			
Fallow	Queen of Prairie	4	9	Strong growth. No tassel.
Fall ploughing	do	4	0	Weak do do
Fallow	Thoroughbred Wh. Flint	5	0	Strong do do
Fall ploughing	do	4	2	Weak do do
Fallow	Golden Beauty	5	0	Strong do do
Fall ploughing	do	4	6	Fair do do
Fallow	Virginia Horse Tooth	4	6	Late do
Fall ploughing	do	3	0	Very weak do

GRASSES.

Up to the present the testing of grasses has proven very disappointing on account of the difficulty of getting any of the varieties to start on this Farm. If the seed is put down out of reach of the winds, very little will germinate; if near the surface, the periodical winds of May or early June sweep them out of the ground. If not sown until after the winds are over, the young plants are not strong enough to stand the dry weather of August and September and generally perish.

The past season was an exception in this respect, and any grasses sown in the latter part of June or the first of July, made a vigorous growth during the rest of the season. Unfortunately the greater part of all our grasses and clovers had been sown at different times before this growing period came, and except for the lawn grasses sown about the house and barn, we had no seed left to sow over again. As evidence of the difficulty of getting a catch of grass seed, I may mention that the lawns were sown three times before success was attained. In my last report mention was made of 18 grasses and clovers having been sown in addition to some native and other sorts. These, except two native kinds were all destroyed by winds. The 18 varieties were resown as quickly as possible. Out of the 18 varieties Perennial Rye Grass, Italian Rye Grass, Orchard Grass, Meadow Fescue, Sheep Fescue, Crested Dog's Tail, Red, Alsike, Lucerne, Sanfoin and White Clovers grew. Perennial Rye Grass, Italian Rye Grass and Crested Dog's Tail were completely killed by the winter or spring. Orchard Grass was half killed, but gave ¾ tons per acre. Meadow and Sheep Fescue were hurt very little and the return from these was 1¼ tons each. The clovers all came through in good shape and returned, Alsike, 1 ton; Red, 1¼ tons; Lucerne, 1½ tons; Sanfoin, 1½ tons; White was a thick mat and of course could not be cut. In addition to those already mentioned, there appeared this spring from the second seeding, Hard Fescue, Red Top and timothy; the timothy producing ¾ tons per acre.

This year all those varieties that stood last winter were sown with grain and in plots on the bare fallow, and in addition 33 varieties were sown in small plots in the garden, 8 kinds are from India, 20 native, and the balance includes Texas Blue Grass, Bermuda Grass and Johnson Grass.

Winds and hail destroyed the various kinds sown on the bare fallow, and a thin catch was obtained among the grain. In the small plots Muhlenbergia sylvatica, Muhlenbergia glomerata, Poa serotina and Glyceria grandis grew well. The first two headed out and ripened their seed. Johnson grass had obtained a height of 30 inches when destroyed by frost. Very little of any of the other varieties grew.

FLAX.

Flax was sown on three different dates. First on 7th May, second on 17th May and third on 22nd May. Ripe on 15th, 20th and 22nd August, respectively. Gave 7·10, 12·5, 9·26 bushels per acre. The stalks grew about 30 inches high..

BUCKWHEAT.

Was sown on 22nd May and 2nd June. Both seedings made a good growth, but were overtaken by frost on 21st August and completely killed.

BEANS.

Twenty varieties of beans were planted on 21st May. They consisted of the following:—

Sugar Pearl, Sugar Grey; Chevrier; Emperor William; Schirmer's Purple Seeded; Golden Butter Wax; Large Podded; English Horse; Sugar Pearl Rose predome; Negro Black; Ne plus Ultra; Round Yellow 6 Weeks; Flageolet Purple Seeded; Zion House; Negro Extra Early; Empress Augusta; Black Speckled; Nettle-leaved White and Hundred to One.

Butter Wax and 6 Weeks were the earliest but not early enough to escape the first frost on 21st August. Except the English Horse beans, all were destroyed at this date,

English Horse was not hurt then, but succumbed to a frost of 10° on 12th September. When overtaken the beans were hardening and a very few days more would have put them out of danger. All the beans were in pods, but Butter Wax and 6 Weeks were more advanced by a week than any other sort.

ROOT CROP.

On account of the root crop being on a heavy piece of land the past season, the crop was not a good one considering the year.

Shortly after the carrots, mangels, beets and turnips were above ground a hail storm passed over and almost destroyed them. Three varieties of mangels and all the beets were killed and the land was resown with turnips near the end of June. Those left partly injured never recovered from the hail and were often after this put back by heavy dashes of rain which several times flooded the pieces of land on which the roots were sown.

TURNIPS.

Bangholm, Queen of Swedes, Skirvings, Lord Derby Green Top, Highland Prize, Purple Top and Elephant were the varieties sown. Bangholm, Skirvings and Queen of the Swedes each gave 500 bushels per acre. Lord Derby, 300 bushels; Green Top, 420 bushels; Highland Prize, 320 bushels; Purple Top, 410 bushels; and Elephant, 480 bushels per acre.

MANGELS.

Mammoth Long Red, Mammoth Long Yellow, Giant Intermediate, Prize Yellow and Giant Yellow Intermediate were sown. The three latter were destroyed by hail. Mammoth Long Red returned 605 bushels and Mammoth Long Yellow, 502 bushels per acre.

CARROTS.

Orange Giant, White Belgian, Long Orange Nantez, White Vosges and Improved Short White were sown. Improved Short White was by far the best; in fact, the only one worth taking up and it only gave 200 bushels per acre.

SUGAR BEETS.

Three varieties were sown, but all were destroyed.

Chicory and Amber Sugar Cane were also sown. The chicory grew to a fair size, but was very rooty.

Amber Cane did not grow over six inches high.

POTATOES.

The following potatoes were planted last May: Early Rose, Beauty of Hebron, Morning Star, White Star, Stray Beauty, Early Bird, May Queen, Gleason, Matchless, Rosy Morn, Wonder of the World, Sharpe's Seedling, Bliss' Triumph, Early Ohio, Lees Ex. Early, Early Conqueror, Genessee Seedling, Empire State, Stonewall Beauty, Richters, Brownwell's Beauty, Clark's Beauty, Adirondack, Alpha, Richter's Gem, Jumbo, Boston Market, Member of Parliament, Great Eastern, Rose's New Giant, Harrison, Conqueror, Goodrich, St. Patrick, Thorburn, White Elephant, Snow Flake, Thorburn's Paragon, Vick's Pride, Sugar, Kidney August, Telephone, Pride of America, Richter's Elegant, Chicago Market, Empress Bell, Brownwell's Beauty, Early Puritan, Count Moltke, and 29 seedlings. Like the mangels and turnips the potatoes suffered from excess of rain on the heavy soil, and before the majority were matured the frost of 21st August came and stopped further progress.

On the whole the crop was only fair. Beauty of Hebron made the best show of tops. Morning Star, Stray Beauty, Sharpe's Seedling, Beauty of Hebron, Early Rose, Lee's Ex. Early, Rose's New Giant, White Elephant, Clark's Triumph, Empress Bell, Early Puritan, Late Rose, Boston Market, Harrison, Early Bird, Early Conqueror and Brownell's Beauty were the best croppers.

VEGETABLE GARDEN.

This necessary but often much neglected portion of farm work was again much injured by winds. Although not so destructive as last year, they were sufficiently so to require the resowing or replanting of several of the varieties tested and kept back all at least 4 weeks; which in our short season makes the difference between a good and a medium crop.

Vegetables, all over the North-West, were exceptionally good the past year; and anyone whose garden was sheltered either by natural or artificial means from the cold winds of May and hot winds of July, has, this fall, an abundant crop.

The following were the varieties tested in the vegetable garden on the Experimental Farm; the results are also given:—

Cabbage.—Early Epping, Early Summer, Winningstadt, Large Drum Head, and Green Curled Scotch Kale were set out. Early Epping was the earliest. Heads small, but firm. Early Summer was later, but cabbage good. Winningstadt did not come to head. Large Drum Head, late, with some fine heads. Kale did extra well.

Cauliflower.—Snowball, Ex. Early Erfurt and Mitchells were planted. The snowball and Ex. Early Erfurt were by far the best. Mitchells, although they were the best plants, made few heads, and those few were poor.

Celery.—London Red, Paine's Golden Yellow and Sandringham were planted on 12th June. All did well.

Onions.—Globe Danvers, Wethersfield, Barletta and White Globe were sown, and White and Yellow Dutch Sets were put out. All were so badly injured by winds that they had to be resown, but too late for any good results.

Carrots.—Chantenay, Ox Heart and Scarlet Nantes were sown. These were all blown out after coming above ground, and although sown over again, the crop was poor.

Turnips.—Early Milan, Nimble Dick, Orange Jelly and Large White Globe were sown. All were blown out. A fair crop was the result of a second seeding. Early Milan being the earliest.

Radish.—Rosy Gem, Long Scarlet and Scarlet Oliveshaped were sown. Rosy Gem and Scarlet Oliveshaped were the earliest and best.

Peas—Maclean's Little Gem, Maclean's Advance, American Wonder, Early Dwarf Brittany, Pride of the Market, Yorkshire Hero and Champion of England. These were sown on 17th April, and almost entirely destroyed by winds when about six inches high; were resown on 19th May. Maclean's Advance was the earliest. All gave good crops, except Dwarf Brittany.

Beans.—Early Valentine, Early Mohawk and Golden Wax were planted on 9th May. Early Valentine gave green beans for table use on 28th July; the others a few days later. None were ripe when frost overtook them on 21st August.

Beets.—Half-long Blood and Early Eclipse were sown on 24th April; destroyed by wind and resown on 9th May with Early Egyptian and Lentz. Early Egyptian was earliest and best quality, but Lentz was the heaviest crop.

Tomatoes.—Conqueror, Smooth Red, Dwarf Champion, New Peach and Potato Vine were planted on 3rd June. Dwarf Champion and Conqueror had the largest and best crop of tomatoes. The others had a fair crop. None ripened except under glass.

Salsify—Good crop, but roots rough.

Spinach.—Entirely blown out.

Parsnips.—Two-thirds blown out. Balance, fair crop.

Parsley.—Sown 16th April and 6th May. Good crop.

Lettuce.—Toronto Gem, Prize Head and Early Hanson were sown at different times from 23rd April to end of May. The early sowing was destroyed by winds, the later sowing did well and gave lettuce until October.

Corn.—Early Cory, Fifty Day, Crosby's Early, Early Adams, Mitchell's Early, and Native Squaw corn were planted on 23rd May. The Squaw corn and Early Adams had a few ears fit to use when frost of 21st August came. Crosby's Early, Early Cory and Mitchell's Early were a few days later.

Watermelons, Citrons and Cucumbers were sown. The water melons formed no fruit. A few fair sized citrons were on the vines and the cucumbers were fit to use when frost came.

Asparagus.—First cut on 1st June and continued for a month.

Rhubarb.—Badly injured by hail on 12th June, but a good crop toward end of season.

FLOWER GARDEN.

I trust those who may read this annual report and have never seen the North-West will not imagine a flower garden to be an utter impossibility. Although we have not yet succeeded in making one equal to many seen in Ontario, nevertheless the attempt is being made to grow flowers as well as raise No. 1 Hard wheat. We do not boast much of the success in raising Zinnias, Marigolds, &c., but in Sweet Williams, Pansies, Mignonette, Sweet Peas, Phlox, &c.. visitors to the Farm during August, September and October testified by their button-holes that such ample success was obtained as to warrant every settler in having a flower garden.

Pansies, Dianthus, Phlox Drummondi, Asters, Stocks, Mignonette, Portulacca, Petunias, Sweet Peas, Verbenas, &c., were sown or transplanted from hot beds from 16th May to 11th June. Of these Pansies, Mignonette, Sweet Peas, Phlox Drummondi, Stocks, Dianthus, Verbenas, and Poppies proved the best and surest for the North-West climate.

APPLE TREES.

Apple trees suffered greatly last winter and this spring, so mnch so that I am compelled to report almost the entire failure of those set out in 1888-89. Numbers are living, but in such a crippled condition that I am almost afraid they may be classed with the lost. Last season was a very hard one on trees of all kinds and when succeeded by a severe winter and unfavourable spring the result could hardly be anything but disastrous. Only one tree of 1888 planting grew from the tips and that only ½ inch. Eight trees were cut down to the snow-line, or about 18 inches above ground and all but these were killed to the ground. Sprouts have come from above grafts, but whether they will stand any better than the parent trees remains to be seen.

Those planted in 1889 died by wholesale, but very few being found alive this spring. This year's planting consists of 500 Russian seedlings, which it is hoped and expected will stand better than any before put out. The following are apple trees planted in 1888, 1889 and 1890, showing state they are in at present:—

APPLE TREES, 1888.

——	Planted.	Killed to Snow Line.	Killed to Ground.	Growth from Tops.	Dead.
Alexander	8	.....	4	.....	4
Wealthy	3	2	1	.....	0
Walbridge	3	.....	.....	.....	3
McIntosh Red	3	.....	1	.....	2
Tolman's Sweet	3	.....	2	.....	1
Keswick Codling	3	.....	3	.....	0
Red Astrachan	3	.....	1	.....	2
Anis	3	1	2	.....	0
Golden Russet	3	1	.....	.....	2
Mann	9	.....	7	.....	2
Duchess	5	.....	3	1	1
Scott's Winter	3	.....	1	.....	2
Grimes' Golden	3	.....	1	.....	2
Tetofsky	3	.....	2	.....	1
Canada Baldwin	3	.....	2	.....	1
Fameuse	6	.....	1	.....	5
	64	4	31	1	28

One hundred and twenty-three of 43 Russian varieties (not named) were also planted in 1888. Twelve of these are growing from tops, 44 from ground, 14 were killed to snow line, the remainder are dead.

Planted, 1889.	Planted.	Killed to Snow Line.	Killed to Ground.	Growth from Tops.	Dead.
Arabka (Dept)	35	2		2	31
Longfield	10				10
Mottled Anis	11				11
Repka Malenka	9			4	5
Whitney, No. 20	19				19
Titovka	20				20
Barloff	5				5
English Borovinka	4				4
Red Anis	19	2			17
Grand Duke Constantine	4				4
Zolotareff	3				3
Bogdanoff	1				1
Ostrokoff	6				6
Enormous	8				8
Reinette	2				2
Cross	7			1	6
Antonovka	19				19
Switzer (Dept.)	9				9
Golden White	9				9
Grandmother	8				8
Herren	4				4
Red Repka	3				3
Label defaced	2				2
Hibernal	14		2	1	11
Yellow Anis	17	1	2		14
Vargul	3				3
Sandy Glass	13				13
Ukraine	3				3
Livland	7				7
Russian Apple	6				6
Plikanoff	10	2	1		7
Autumn Streaked	10	1	1		8
Lieby	10		1	9	0
Getman's Bean	4				4
White Borodovka	8				8
Titus	10		1		9
Grandmother	10	2		6	2
Red Duck	10	5		4	1
	352	15	8	27	302

CRAB APPLES.

Three each of Hyslop, Transcendent, Red Siberian and Whitney Crab were planted in 1888. Two Hyslop, 2 Transcendent, 1 Red Siberian and 3 Whitney are living, all growing from the tops; 1 Transcendent was cut down to ground, remainder are dead.

In 1889, 109 crab-apple trees of 8 varieties were planted. This year only 6 are living.

CRAB APPLES, 1889.

——	Planted.	1890, Living.
Stanley	22	5
Minnesota	8	0
Brier's Sweet	10	1
Gibb	20	0
Orange	30	0
Late Winter	9	0
Welcome	10	0
	109	6

PEARS.

In 1888, 20 pear trees were set out. These consisted of Beurré Hardy, Clapp's Favourite, Howell, Flemish Beauty, Seckel and 2 Russian varieties. One Flemish Beauty lived through the first winter. None were alive in spring of 1890. Thirty Russian seedlings were planted in May last.

PLUMS.

Twenty-three plum trees of 9 varieties, viz:—Golden Drop, Moore's Arctic, Lombard, Marianna, German Prune, Wolf, Speer, Rollingston and Early Red were planted in 1888. Eleven of these were alive last year. This fall, 2 Speer, 3 Wolf, 1 Rollingstone and 3 Early Red are alive. All are cut back and only side shoots are growing. This year, 3 trees of Early Red were planted and are all alive now.

CHERRIES.

Thirty-four cherry trees were planted in 1888. The varieties were Ostheim, Morello, Vladimir and Early Richmond. One Early Richmond and two Vladimir stood the first winter, but are dead now. This year three varieties, were planted consisting of 5 Koslov Morello Cherry, 3 Black Hill and 3 M. Cherry No. 6. All lived and made good growth the past summer.

SMALL FRUITS—CURRANTS.

We never had a better prospect for currants than last season up to 12th June. At that time all the fruit was formed and much of it well grown. The bushes were loaded down, and everything promised a most abundant crop. Unfortunately a shower of hail passed over on that day and left very few on the bushes. When ripe only two quarts of currants were gathered.

The following are varieties set out with number of bushes of each kind living at present from planting done in 1888 and 1889:—

CURRANTS, 1888–89.

——	Planted.	Living.
Victoria	25	24
Lee's Prolific	349	266
Champion	12	10
Fay's Prolific	25	20
Raby Castle	255	246
White Grape	185	141
Red Dutch	20	16
Black Naples	44	42
Red Grape	7	6
	922	771

Almost all the losses occured with bushes set out in 1889 from the dry weather which prevailed that season.

RASPBERRIES.

These were uncovered on the 28th April. Golden Queen, Cuthbert and Caroline were all killed down to ground. The Turners and Philadelphias were in fair order, but the canes were very weak. All these varieties made good growth during the past summer and the canes are a good size and well ripened. Turner and Philadelphia had a great deal of bloom, but the hail of 12th June hurt them badly. There was, however, considerable fruit of good size and well formed gathered from these two kinds. The following varieties planted in 1889 were entirely killed by the dry summer or cold winter: Hilborn, Doolittle, Parnell, Clarke, Marlboro', Souhegan, Gregg, Ohio, Taylor and Snyder; while out of 139 Mammoth Cluster, Rancocoas, Reeder, Brandywine, Hornet and Hebner's Cluster, only 46 plants are living, and these made little or no growth during the past summer. Except a few hydrids, no raspberries were set out the past spring and the hail of 12th June killed them all. In 1888 a good many native raspberry bushes were obtained and this year they bore a fair quantity of fruit. Like the cultivated varieties they suffered from hail.

GOOSEBERRIES.

No new varieties have been planted or additions made to this fruit since 1889. Smith's Improved, Houghton Seedling and Downing were then planted. Smith's Improved and Houghton showed a good deal of bloom this spring but nearly all was knocked off by hail. A few berries ripened of the Smith's Improved and a considerable quantity of the Houghton. The Downing was mostly winter killed but all started again from the roots. The Houghton has stood the two winters best of any of the varieties set out.

STRAWBERRIES.

All the vines came through the winter and spring safely, but bore little or no fruit afterwards.

The hail was partially the cause of this and dry weather last summer, which prevented the runners from growing, was no doubt also partly to blame. This winter a good number of healthy young plants are covered up, and it is hoped better success will be had next season.

GRAPES.

Seventeen varieties of grapes were planted last spring. These consisted of Champion, Niagara, Moore's Early, Roger's, Woodruff Red, Hartford Prolific, Agawam, Worden, Telegraph, Brighton, Clinton, Elvira, Concord, Jessica, Early Victor, Delaware and one not named. They were planted 18 inches deep, and as the vines grew, soil was filled in until level with surface. When winter set in all were well mulched with earth and coarse manure.

FOREST TREES.

Thirty-eight thousand three hundred and seventeen forest trees were planted in May last. These consisted of 4 varieties of pine, 4 of spruce, 3 of maple, 4 of ash, 3 of elm, 2 of chestnut, 2 mountain ash, and 1 variety each of cedar, larch, juniper, basswood, birch, hickory, oak, butternut, walnut, Russian mulberry, honey locust, coffee tree, cottonwood, Russian olive, and red cedar. The pines, with the exception of Scotch, suffered greatly from hot winds in June and July, and as table will show a large proportion died. The spruce and larch suffered much loss, but not to the same extent as the pine. The maple, elm, ash and Russian olive nearly all grew. Honey locust, butternut and walnut were nipped by the first frost and by 20th December every tree seemed dead. It will be seen that very few trees, planted in 1889, came through last winter; those that did so, excepting ash-leaved maple and Manitoba elm made little or no growth the past year. White and Norway spruce never moved; in fact this fall they

appear to be dying. Scotch and Riga pine show the most vitality. So far, the following may be said to be the result of tree testing on the farm: Scotch, Riga and European mountain pine and red cedar a fair success. The spruces, hemlock and American arbor vitæ have thus far failed. The birches, mountain ash, Norway maple, American elm and Cottonwood have in a measure succeeded, as a number of each have stood two winters and made a fair growth the third summer.

Butternut, walnut, ash, locust, beech, catalpa, sycamore, oak, hickory, &c., have failed. Our native maple, elm, ash, oak and cherry are, of course, successful wherever grown, and it seems quite safe to recommend that such as these be planted almost entirely by settlers.

FOREST TREES planted, 1889–90, with number living in November, 1890.

Name.	Planted, 1889.	Living, 1890.	Planted, 1890.	Living, 1890.
Scotch Pine	421	70	175	164
Austrian Pine	400	0	200	21
Riga Pine	43	28	500	40
Mountain Pine	.....	.....	150	96
White Spruce	1,018	358	310	247
Norway Spruce	675	30	185	140
Hemlock	153	0	.....	.....
Cedar	650	0	70	63
Red Cedar	50	40	180	52
Ash-leaved Maple	500	440	225	221
Norway Maple	875	142	110	93
Soft Maple	75	0	2,010	1,946
Russian Olive	.....	.....	100	100
Black Walnut	53	5	1,000	800
Rock Elm	135	120	.....	.....
Manitoba Elm	982	955	.....	.....
American Elm	600	200	320	320
Yellow Birch	71	50	.....	.....
White Birch	.....	.....	42	28
European Birch	50	30	.....	.....
Canoe Birch	100	40	.....	.....
Green Ash	90	30	2,020	1,820
White Ash	140	0	2,970	2,680
Black Ash	105	4[illegible]	8[illegible]1	782
Mountain Ash	75	50	.....	.....
Oak	54	0	200	0
Locust	374	0	5[illegible]0	436
Red Oak	2	0	.....	.....
American Beech	200	0	.....	.....
Black Cherry	114	50	.....	.....
White Elm	.....	.....	5,017	4,898
Juniper	.....	.....	5	3
Russian Mulberry	.....	.....	1,000	849
Linden	.....	.....	415	0
Chestnut, sweet	.....	.....	25	19
Spanish Chestnut	.....	.....	25	22
Native Maple	.....	.....	215	215
Catalpa	850	0	.....	.....
Cottonwood	2,000	160	1,000	897
European Alder	50	5	.....	.....
Sycamore	41	0	.....	.....
Coffee Tree	.....	.....	250	150
European Larch	500	0	135	42
Butternut	.....	.....	625	409
European White Ash	.....	.....	11	11
Blue Spruce	.....	.....	10	9
Hickory	.....	.....	15	10
American Mountain Ash	.....	.....	31	30
European Mountain Ash	.....	.....	11	11
Native Maple, Elm and Ash (transplanted)	.....	.....	17,676	16,980

WHERE TREES WERE OBTAINED.

Four thousand nine hundred and forty-seven were received from the Central Experimental Farm, Ottawa; 15,450 from Nebraska; 29 from Prof. Budd, Iowa; 215 from Rev. Mr. Fotheringham, Grenfell, 17,676 transplanted from seed sown on Farm, 1887 and 1888; also 3,450 shrubs and cuttings of willow and poplar from Central Experimental Farm, Ottawa, and 737 shrubs and cuttings from Prof. Budd. 500 cuttings of seven varieties of our native willow were obtained and planted; a total of 42,998, and if to these were added 705 fruit trees, a grand total of 43,703 trees, shrubs, &c., were planted in May last.

WHERE PLANTED.

A large number were planted on wind-break on the west side of Farm. This wind-break is 100 feet wide and extends one mile the entire length of Farm. This had been two-thirds planted the year before with many varieties of trees, 10 feet apart each way. Last spring every tree, excepting native maple and a few elm, were found to be dead. This necessitated almost the entire replanting, which was done, and the unfinished portion was also planted, but instead of being planted 10 feet apart, the rows were made 5 feet, and the greater portion set out with trees 5 feet apart in the rows.

Our native maple and elm were the principal sorts put out in the plantation, but a number of pine, spruce, ash, elm, Russian olive, &c., were interspersed.

On the southern portion of farm on banks of the coulée, a block of 5 acres was planted with box elder or native maple, trees being put 5 feet apart each way, also two small blocks of 1 acre each on the northern part of Farm. In addition, large numbers were planted along roads, around dams, buildings, &c., and in nurseries. It is computed that at least 22 acres of land were set out in trees in May, last.

WILLOWS AND POPLARS.

The following varieties of willow and poplar were planted in 1889:

—	Name.	Number Planted.	State, 1890.
Willows	Salix Acutifolia	3	3 growing from tips.
do	Wis. Weeping Willow	7	All dead.
do	Salix Voronesh (116)	5	All living to tips.
do	White Willow	7	do from roots.
do	Yellow do	7	All dead.
do	Purple do	4	4 growing from roots.
do	Norway do	4	All growing from tips.
do	Salix Laurifolia	2	do roots.
Poplars	Populus Wobstii, Riga (4?)	2	do tips.
do	do Virginiana	4	All dead.
do	do Beno	8	5, poor growth from roots.
do	do Pyramidalis	2	All dead.
do	do Bolleana	2	do
do	do Aurea	2	2, growth from tips.
do	do Certinensis Sargent	6	All dead.
do	do Not named	7	do

Three varieties of willow, Salix Voronesh, Salix Acutifolia and Norway willow and 2 of poplar stood last winter well, and made a strong growth this past season. This year 2,910 cuttings of these willows and poplars were received from Ottawa and from Prof. Budd, Iowa, and set out, but only a small percentage grew. Five hundred cuttings of our native willow were also planted, with no very good results.

SHRUBS.

One thousand three hundred and twenty-seven shrubs of the following varieties were planted last spring: Alnus incana, Artemisia, Sorbus acuparia, Caragana arborescens, Alnus glutinosa, Spiraea Van Houtte, Spiraea Fortunei, Spiraea superba, Syringa De Marley, Spiraea callosa, Spiraea opulifolia, Weigelia Lavallei, Ribes aureum, Viburnum opulus, Syringa vulgaris, Syringa alba, Deutzia candidissima, Philadelphus nana, Philadelphus coronaria, Berberis purpurea, Spirea Bullata, Berberis vulgaris, Symphoricarpus racemosus. The following list shows the proportion which survived:—

PLANTED IN 1889.

Name.	Number.	Condition in 1890.
Ligustrum vulgare	46	All dead.
Robinia pseudacaia	155	do
do tortuosa	9	3 living.
Cytisus alpinus	16	All dead.
do capitata	54	19 living.
do laburnum	80	All dead.
Spartium scoparium	48	do
Robinia bessoniana	77	18 living.
Cytisus elongatus	20	All dead.
Clematis viticella	6	do
Genista Germanica	45	do
Spirea alba	1	do
Robinia monophylla	24	do
Berberis elegans	12	2 living.
Spirea opulifolia	71	55 do
do Billardii	7	6 do
Clematis flammula	10	All dead.
Ribes acuparia	17	8 living.
Cytisus Lab. sessifolius	7	All dead.
Berberis vulgaris	3	1 living.
Colutea halepica	22	All dead.
Genista tinctoria	5	do
Cytisus hirsutum	24	do
Cytisus Lab. quercifolia	7	do
Robinia viscosa	16	do
Ceanothus Americanus	16	do
Spiraea callosa	11	10 living.
Cytisus Lab. Parkii	24	All dead.
Spiraea rotundifolia	3	do
Ribes sangineum	24	do
Weigelia	1	do
Colutea frutescens	21	do
Acer Ginnala	2	2 living.
Philad. Zeyheri	5	All dead.
do coronaria	3	do
Syringa De Marley	7	5 living.
Weigelia Lavallei	7	All dead.
Cytisus	80	do
Philad. cordifolia	2	do
Syringa rothamagensis	2	do
Pyrus bacca aurantiacum	2	2 living.
Spiraea Californica	6	All dead.
do prunifolia	1	1 living.
Syringa Josikea	2	2 do
Weigelia Desboisi	2	All dead.
Lycium Europeum	1	1 living.
Spiraea Douglasi	6	1 do
Philad. inodorus	1	All dead.
do grandiflora	2	do
Caragana arborescens	1	1 living.
Deutzia Fortunei	2	All dead.
Berberis purpurea	6	do
Tilia sylvestris	2	2 living.
Syringa alba	70	45 do
do vulgaris	5	2 do

From the foregoing it will be seen that the Syringas, Caraganas and Spiraeas, came through fairly well. Out of the whole list Caragana, Syringa alba, and Acer Ginnala came through in perfect condition, and can safely be recommended for trial. To these may be added Eleagnus or Russian Olive which was planted in 1888, has stood two winters and during the past year made good growth.

TREE SEEDS.

Maple seeds were sown in the spring of 1889 and in the fall of the same year. Large numbers of the spring sowing were blown out, but many survived and made a growth of 6 to 8 inches, and this year are 20 to 24 inches high. Those sown in the fall came up in time to be completely destroyed by wind in May.

Two bushels of black walnuts were sown in 1889. From these 40 trees grew, but none lived through the winter.

A large quantity of elm seeds was also sown in the spring of 1889, but between winds and failure to germinate, only a few hundred grew.

This last season, large quantities of maple, ash and elm were sown in May, June and July. Those sown in June have done the best on account of not being troubled by winds after they appeared above ground. In October, 3 busbels hazel nuts, 12 bushels acorns, 2 bushels of wild cherry seeds, 2 bushels saskatoons, and 2 bushels hawthorns were sown in beds. Several bushels of Manitoba maple aud ash seeds were sown in October. According to instructions, I had picked by half-breeds in the Qu'Appelle Valley the large quantity of 156 two bushel bags of maple, and 83 bags of ash seed. With a part of these it is intended to sow a large area of land in the spring, so as to have a plentiful supply of young trees for transplanting and distribution. The portion not required for the Indian Head Farm has been forwarded to Ottawa for general distribution.

HORSES.

Eleven horses constitute the force on hand. Nine of them are draught and two general purpose. Excepting a few attacks of colic, no sickness has taken place among the horses since my last report. All are well at present and in good condition. Since work stopped in the fall, no hay has been fed. Cut oat sheaves, bran and straw constitute their food.

CATTLE.

During October a selection of cattle was made from those on the Central Farm, at Ottawa, of the following breeds:—Shorthorns, Ayrshires, Holsteins and Polled Angus. Of the Shorthorns, 1 bull, 3 cows and 1 heifer were obtained; Ayrshires, 1 bull, 1 cow and 2 heifers; Holsteins, 1 bull and 3 cows, and Polled Angus, 1 bull and two cows. Since their arrival, one of the Polled Angus cows has increased the herd by the birth of a heifer calf. In the month of November, two cows and nine heifers were purchased from farmers. Ten of these are the ordinary Shorthorn grades of the country and one a Polled Angus grade. They were obtained for the purpose of crossing with the pure-bred bulls on the Farm. Since their purchase three births have taken place.

In the following list the particulars of their breeding are given, the animals having been selected from strains likely to be very useful in the North-West:—

Shorthorn Bull.

Rosy Prince 8th, No. 9,198, C. H. B.—Date of birth, 6th November, 1886; colour red, with a little white; bred by Richard Gibson, Delaware, Ontario; sire Wild Eyes Laddie, No. 67,992, E. H. B.; dam Rosy Princess 7th, by 7th Lord of Oxford.

Shorthorn Cows and Heifers.

Wild Flower, No. 14206.—Date of birth, 3rd April, 1886; colour red and white; bred by Richard Gibson, Delaware, Ontario; sire, Wild Eyes Laddie No. 9192 C.H.B.; dam, Hermosa by Prince 3344; 2nd dam, Rose by Viceroy of Richmond.

Cowslip 3rd, No. 16646.—Date of birth, 13th October, 1886; colour red; bred by James Graham, Port Perry, Ontario; sire Prince Victor 5th; dam, Cowslip 2nd by Royal Buck 2374; 2nd dam, Cowslip 797 by Senator 1058.

Red Rosebud 2nd, No. 16918.—Date of birth, 14th November, 1887; colour red and white; bred by John Miller & Sons, Brougham, Ontario; sire, Vice Consul (Imp.) 4132; dam, Rosebud (Imp.) 5205, by Gladstone 43286; 2nd dam, Rosebud 6th, by Sir Christopher 22895.

Nellie Elgins, No.—Date of birth, 31st December, 1889; colour red; bred at Central Experimental Farm, Ottawa, Ontario; sire, Mazurka Duke 5th; dam, Miss Elgins 5th, No. 16644 by Minna Duke No. 2108 C.H.B.; 2nd dam, Miss Elgins 2nd No. 4108.

Holstein Friesian Bull.

"Onetta's Edgely," No. 11308.—Date of birth, 8th October, 1888; colour black, with white markings; bred by Smith Bros, Churchville, Ontario; sire Duke of Edgely, H. F. 552; dam Onetta D.F. 1816.

Holstein Friesian Cows.

Abi, H.F.H.B. 9831.—Date of birth, 5th July, 1887; colour black, with white patches; bred by C. F. Sweezey, Marion, N.Y.; sire, Oatka 3rd Neptune, jr., H.H.B. 4531; dam, Snowie, H.F.H.B. 3114, by Empire Boy, H.H.B. 2615; 2nd dam, Rosalind, H.H.B. 577.

Bonnie Ethel's Mercedes, H.F.H.B. 11243.—Date of birth, 5th April, 1888; colour black, with white markings; bred by Thomas E. Wales, jr., Iowa City, Iowa; sire, Mercedes Prince, H.H.B. 2150; dam, Bonnie Ethel, H.H.B. 9510.

Siepkje 3rd Queen.—Date of birth, 11th September, 1888; colour black, with white markings; bred by W. A. Rowley, Mount Clemens, Mich.; sire Macomb Boy, H.F.H.B. 8734; dam, Siepkje 3rd, H.F.H.B. 2387.

Ayrshire Bull.

Pride of Carleton, No.—Date of birth, 3rd August, 1889; colour red, with white spots; bred at Central Experimental Farm, Ottawa, Ontario; sire, Rob Roy 3971; dam, Clara No. 3590 by Promotion; 2nd dam, Maud No. 2356.

Ayrshire Cows and Heifers.

Gipsy, No. 3979.—Date of birth, 15th August, 1886; colour red, with white spots; bred by James Drummond, Petite Côte, Quebec; sire, Promotion 3212, imported; dam Victoria 2931, by Lorne 2227; 2nd dam, Effie 579, by Gordie 26.

Viola, No. 943.—Date of birth, 1st November, 1888; colour white and red; bred by David Nicol, Cataraqui, Ontario; sire, Norseman 478; dam, Dido 942, by General 155; 2nd dam, Dora 244, by Douglas 148.

Eve, No.—Date of birth, 2nd October, 1889; colour red, with white markings; bred at Central Experimental Farm, Ottawa, Ontario; sire, Rob Roy 3971; dam, Eva No. 3828, by Promotion; 2nd dam, Bell 3131.

Polled Angus Bull Calf.

Date of birth, 3rd March, 1890; colour black, bred at Central Experimental Farm, Ottawa, Ontario; sire, King of Eastview, No. 8780; dam, Dolly Varden, of Eastview, No. 6792, by Knight of Canada, No. 5622; 2nd dam, Dolly Varden 3rd, No. 3458.

Polled Angus Cows.

Pride of Eastview, No. 6809.—Date of birth, 3rd October, 1886; colour black, bred by late Hon. J. H. Pope, Cookshire, Quebec; sire, Knight of Canada, 5622; dam, Pride of Montbletton 3rd, 3473.

Stella of Eastview, No. 7638.—Date of birth, 14th June, 1887; colour black; bred by late Hon. J. H. Pope, Cookshire, Quebec; sire, Knight of Canada, 5622; dam, Stella of Ardconnon, 4929.

POULTRY.

Three breeds of poultry were obtained from Central Experimental Farm, Ottawa, last October, namely:—Plymouth Rocks, Light Brahmas and Houdans. When a poultry house is built further breeds will be added to these.

BEES.

Two hives of bees were obtained last summer but were late in reaching here and made little or no honey afterwards. Before putting them into the cellar they were supplied with sugar to carry them over the winter.

LAND PREPARED FOR 1891.

Two hundred and fifteen acres have been summer fallowed during the past season. Of this 105 acres were ploughed twice and several times harrowed; 70 acres were ploughed once and cultivated from 2 to 3 inches deep and harrowed 3 times. 40 acres were gang-ploughed in the fall of 1889; ploughed once in 1890 and twice harrowed. Fifteen acres stubbleland was ploughed in October for testing purposes next year; 10 acres were also gang ploughed.

No weeds were allowed to grow over 2 inches high at any time on the fallow. One hundred acres were in crop in 1889, and 105 acres had not been cropped since Experimental Farm commenced, and was in consequence in a very bad state with wild buckwheat and pig weed.

OTHER WORK.

One new dam was built, before frost set in, across the coolée on the north part of the Farm, to collect water for the stock during the summer; additions were also made to the drains already built; some new roads were made and kept in order where crops were growing; and some grading done about the buildings.

WATER.

I am pleased to report the purchase of a wind-mill and the necessary piping to bring from one of the dams to the barn the supply of water required for stock and other purposes, and trust the further drawing of water from tanks will be avoided after the spring opens.

This fall, cisterns in the dwelling houses and a large tank in basement of barn were made and well filled with rain-water collected from the roofs, before winter set in. They are found to be of great use, especially that one in the barn for supplying water to the stock during cold weather.

BUILDINGS.

No new buildings or additions were made during the past year. An implement house is urgently needed, for, on account of the large crop, no room can be found in the barn, and a temporary erection provides poor shelter for costly implements. A good sized granary was put up in the barn during the summer, but part of the oat crop filled it. Wheat, barley and much of the oats had to be put in bins or sacks on the barn floor, or in the basement.

FAIRS.

During the month of October the Fall Fairs held in Whitewood, Broadview, Grenfell, Indian Head and Regina were attended with an exhibit of the products of the Farm. Samples of the various grains were shown in the straw and in bottles or bags; also a collection of 82 varieties of potatoes and 40 varieties of our native grasses, mostly gathered on the Experimental Farm. A collection of the grain in straw, grown on the Farm, was also sent to the Central Fair at Ottawa, and shown at the Toronto, London and Ottawa Exhibitions. A collection of the better sorts of barley, wheat and oats in straw was also sent to the Board of Trade, Regina, and from there forwarded with other exhibits of the North-West Territories, in a special car through Ontario, Quebec and the Maritime Provinces.

I have the honour to be, Sir,

Your obedient servant,

ANGUS McKAY,

Superintendent.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA.

REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

AGASSIZ, B. C., Dec. 31, 1891

To WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit the following report of the work done on the Experimental Farm at Agassiz, B. C., for the year 1890.

The winter of 1889 and 1890 was the severest known in this district for some years past, the ground was frozen to a considerable depth early in January. The spring was rather wet and cold, and although during the latter part of haying and through harvest we had rather unsettled weather, yet the summer has on the whole been a favourable one for the growth of grain, and root crops. Up to this date there has only been two slight frosts, pansies, daisies and other hardy flowers are unhurt.

During the winter we had plenty of work for the men employed, as there was a large quantity of birch, alder, and other roots to be hauled off the ploughed land, the weather being too wet to admit of burning them in piles on the ground. We took off during the winter, and in spring after the second ploughing, over six hundred wagon loads, which were burned when dry.

On the 10th of March we began clearing a piece of bench land at the base of the mountain, for grapes and other fruits, and cleared ground sufficient to plant a small orchard of peach, nectarine, apricot, cherry and fig trees, as well as grape vines, of which the following is a list

PEACHES.

1. Schumacher.	1. Hilborn.
1. Early Rivers.	1. Lord Palmerston.
1. Amsden.	1. Salway.
1. Mountain Rose.	2. Late Crawford.
2. Wager.	1. Stevens' Rare Ripe.
1. Old Mixon.	2. Foster.
1. Wheatland.	1. Waterloo.
1. Early Barnard.	1. Alexander.
1. Early Beatrice.	1. Lemon Cling.
1. Golden Cling.	1. Coolidges Favourite.
1. Early Canada.	1. Stump the World.
2. Early York.	1. Globe.
3. Early Crawford.	1. Hale's Early.
1. Aiken.	1. Smock.

Three of these trees have died, the rest have done well.

APRICOTS.

1. Nicholas.

NECTARINES.

1. Pitmaston's Orange.	1. Boston.

CHERRIES.

1. May Duke.
1. Windsor.
1. Mezel.
1. Early Richmond.
1. Yellow Spanish.
1. Lieb.
1. Black Eagle.
1. Black Tartarian.
1. Knight's Early Black.

FIGS.

2. Brown Turkey.
2. Early Violet.

ORANGE.

1. Satsuma Orange from Japan.

All of these trees made a good growth.

GRAPE VINES.

2. Rogers 34.
3. Worden.
2. Brighton.
2. Clinton.
2. Delaware.

These have all made a very fair growth.

The land on the bench being warm and dry and earlier than that on the level, this was done before the level land was sufficiently thawed to allow of its being worked.

As soon as the frost was out of the level land harrowing was begun with the disk and drag harrows, and after getting the ground well harrowed down, it was cross ploughed and again thoroughly harrowed when the fruit trees received and heeled in last fall were planted and plots sown with wheat, oats, barley and roots.

GRAIN.

The varieties of fall wheat, and rye, sown last fall have all done fairly well, considering that the land could not be got in good condition, in the short time we had to prepare it previous to planting.

Fall Wheat.	Date when Sown.	Date when Harvested.	Number of Pounds Sown.	Number of Pounds Harvested.
	1889.	1890.		
Manchester	Oct. 30	Aug. 1	6¼	133
Tasmania	do 31	July 30	5½	93
Democrat	Nov. 1	do 30	6	98
Carter's Hybrid A	Dec. 18	Aug. 19	1	29
do B	do 18	do 13	1	31
do C	do 20	do 19	1	20
do D	do 20	do 19	1	24
do F	do 20	do 19	1	28
do G	do 21	do 19	1	22
do H	do 21	do 19	1	24
do J	do 21	do 19	1	18
do K	do 21	do 19	1	28
Fall Rye.				
Giant Reading	Nov. 4	do 8	5½	92
Polar	do 4	do 8	5½	100

The varieties of spring grain were sown on land newly reclaimed and could not be expected to do much under such conditions. The general experience of the old settlers in British Columbia goes to show that it takes two or three years of cultivation to get this fern land into condition, to do itself justice, and the experience gained this year on the Experimental Farm confirms this view. I hope, however, to be able to shorten this time somewhat, as arrangements have been made with the

Canadian Pacific Railway to leave their stock cars here long enough to admit of the manure being taken out of them, and I hope in this way to get during the winter—together with what will be made on the farm—a sufficient quantity to dress most of the land that was broken last fall. In cleaning the land all the ashes from the burned wood and roots were saved and used to dress the land about the newly planted fruit trees, and where applied early in the season, produced most satisfactory results. The peaches especially showing more than double the growth and a healthier appearance, where the ashes were applied, than those not so treated.

Spring Wheat.	Date when Sown.	Date when Harvested.	Number of Pounds Sown.	Number of Pounds Harvested.
	1890.	1890.		
Carter's Hybrid I	April 3	Aug. 29	1	35
Campbell's Triumph	May 6	do 26	3	45
California White	do 6	do 27	3	44
Hungarian Mountain	do 6	do 27	3	43
Judket	do 6	do 26	3	45
Ladoga	do 6	do 26	3	35
Red Fife	do 6	do 28	3	31
White Fife	do 6	do 28	3	45
Red Fern	do 6	do 28	3	35
Rio Grande	do 6	do 28	3	47
Campbell's White Chaff	do 6	do 26	3	48
White Delhi	do 6	do 26	3	13
White Russian	do 6	do 28	3	61
Mountain Spring	do 6	Sept. 4	8¼	98
Barley.				
Large Two-rowed Naked	do 6	Aug. 25	6	54
English Malting	do 6	do 25	6	89
Saale	do 6	do 25	6	79
Rennie's Improved Six-rowed	do 6	do 5	6	79
Baxter's Six-rowed	do 6	do 5	6	64
Peerless White	do 6	do 25	6	61
Goldthorpe	do 6	do 29	6	85
Beardless	do 6	do 29	6	50
Prize Prolific	do 6	do 29	6	65
Odessa	do 6	do 18	6	76
Golden Melon	do 6	do 29	6	25
Danish Chevalier	do 6	do 29	6	47
do Printice Chevalier	do 6	do 29	6	56
Mensury	do 6	do 7	6	38
New Zealand	do 6	do 29	6	30
English Malting	do 6	do 29	6	39
Improved Chevalier	do 6	do 29	6	24
Six-rowed Wheat	do 6	do 18	6	47
Spiti Valley (Indian)	do 6	do 18	3	10
Oats.				
Prize Cluster	do 6	do 27	6	70
Victoria Prize	do 6	do 27	6	69
American Triumph	do 6	do 28	6	58
Bonanza	do 6	do 14	6	50
American Banner	do 6	Sept. 4	6	68
Early Racehorse	do 6	Aug. 27	6	66
Flying Scotchman	do 6	do 27	6	69
Rennie's Prize White	do 6	do 27	6	51
Cream Egyptian	do 6	do 27	6	70
Egyptian White	do 6	do 27	6	54
Welcome	do 6	do 26	6	55
Golden Grains	April 25	do 14	1	48
Rosedale	do 25	do 12	1	32

NOTE.—Golden Grains and Rosedale oats were sown on old land, which probably accounts for the great difference in their yield.

CORN.

There were 29 varieties of corn planted on 13th and 14th of May for fodder. It was sown with the grain-drill, in rows 36 inches apart, and cultivated to kill the ferns. Some of the varieties made a very fair growth, but only a few matured corn. There was considerable difficulty in getting it cured for fodder owing to the frequent rains and the yield on the newly broken land was small. Further tests will be needed to determine its relative value for fodder here.

The following is the weight of yield per acre:—

		Tons Per Acre.
No. 1	Moore's Early Concord, corn matured, one of the best..	10
" 2	Crosby's Early Sugar, corn matured, good	8
" 3	Early Mammoth, no corn, ears did not form	12
" 4	Early Adams, corn matured to glazing stage	5
" 5	Extra Early Adams, corn matured to glazing stage	5
" 6	Mitchell's Extra Early White Flint, produced some matured ears	5
" 7	Long White Flint, ears did not form	8
" 8	Long Yellow Flint, ears did not form	8
" 9	Thoroughbred White Flint, ears did not form	8
" 10	Cory Sugar, matured corn, a small growing sort, not a good yield	4
" 11	Marblehead Sugar, matured corn, ears very small	4
" 12	Narraganset, sweet, corn did not fill to tips of cob	8
" 13	Perry's Hybrid, did not produce corn	10
" 14	Chester Co. Mammoth, no corn formed	12
" 15	Minnesota Sweet, produced corn, ears small	6
" 16	Stowell's Evergeen, no ears formed	12
" 17	King Philip, produced corn to roasting stage, ears did not fill to tip	7
" 18	Hickory King, roasting ear corn, good	8
" 19	Queen of the Prairie, no ears formed	10
" 20	Golden Beauty, no ears formed	8
" 21	Golden Dent, no ears formed	8
" 22	Amber Queen, roasting ear corn, good	10
" 23	Long Yellow, no ears formed	10
" 24	Leaming Yellow, no ears formed	8
" 25	Blunt's Prolific, no ears formed	10
" 26	Virginia Horse-tooth, no ears formed	10
" 27	Pee and Kay, no ears formed	12
" 28	Fifty day corn, ears formed but very small	3
" 29	Tom Thumb, no ears formed, planted 9th June	1

SOUTHERN COW PEA.

A small quantity was sown of the Southern Cow Pea so valuable for fodder in the Southern States. Evidently the summer is not hot enough here for them, they made a very poor growth and do not promise to be of much value in this province.

ENGLISH HORSE-BEANS.

Three pounds of these were planted and did fairly well, but not having barn room in which to dry them they sprouted in the pod and were spoiled.

BEANS.

Owing to wet weather and a press of other work, the beans were not harvested promptly when ripe, but pulled and put under cover as opportunity offered. The Black Wax was the first to ripen followed by Negro Extra Early. Others ripened in rapid succession.

Beans.	Date when Sown.	Number of Pounds Sown.	Number of Pounds Harvested.
	1890.		
Nettle-leaved White	May 9	3	47
Hundred to One	April 29	3	65
Schirmers	May 17	3	35
Emperor William	do 7	3	53
Black Speckled	do 8	3	55
Negro Extra Early	April 27	3	13
Chevrier	May 8	3	37
Sugar Pearl Rose Pedrome	do 13	3	36
Wax Date	do 13	3	27
Sion House	do 12	3	39
Schirmer's Purple-seeded	do 12	3	32
Round Yellow Six Weeks	do 7	3	51
Ne Plus Ultra	do 13	3	39
Negro Black, Long-podded	do 7	3	28
Flageolet, Purple-seeded	do 12	3	31
Sugar Pearl	April 25	3	53
Largest Podded	May 9	3	32
Golden Butter-wax, Black	April 28	3	36
Empress Augusta	do 25	1	8
Sugar, Grey White-podded	May 13	3	47

POTATOES.

There were 31 varieties of seedlings received from the Central Experimental Farm, these were planted in rows 3 feet apart and about 1 foot in the row.

They are being tested as to their table qualities, and those of merit will be planted next year. A few of them were so badly rotted as to be worthless.

The following are the weights from potatoes planted:

——	Date Planted.	Date Harvested.	Number of Pounds Planted.	Number of Pounds Yield.
Number 2*	May 10	Sept. 20	¾	19
do 5	do 10	do 20	3	26
do 9	do 10	do 20	3	28
do 10	do 10	do 19	3	39
do 15	do 10	do 19	3	54
do 21*	do 10	do 19	3	26
do 27	do 10	do 20	3	19
do 53	do 10	do 20	3	63
do 54	do 10	do 20	3	62
do 73	do 10	do 20	3	55
do 80	do 10	do 19	3	75
do 83*	do 10	do 19	3	20
do 94	do 10	do 19	3	55
do 98	do 10	do 19	3	33
do 116	do 12	do 19	2	52
do 118	do 12	do 19	3	43
do 120	do 12	do 20	3	32
do 122	do 12	do 18	3	61
do 123	do 12	do 19	3	58
do 136*	do 12	do 19	2	24
do 141	do 12	do 20	2	33
do 153	do 12	do 22	3	33
do 170	do 12	do 22	3	42
do 177	do 12	do 22	3	34
do 178	do 12	do 22	3	65
do 188	do 12	do 19	3	30
do 155	do 12	do 20	3	39
do 196	do 12	do 20	3	34
do 209	do 12	do 20	3	75
do 225	do 12	do 20	3	75
do 231	do 12	do 19	3	34
Japanese	do 12	do 19	2½	57

* Rotted.

TURNIPS AND MANGELS.

There were five varieties of Swede turnips sown 20th June in drills, 3 feet apart, Elephant Swede, Skirvings Purple Top, Lord Derby, Queen of the Swedes, and Bangholm, all of which made a medium growth, some of each variety were sown in ridged and some in flat drills, but there was no apparent difference in growth from the time they appeared above ground until harvested.

Four varieties of mangels were sown 18th April, Mammoth Prize Long Red, Mammoth Long Yellow, Golden Intermediate, Warden Prize Yellow Globe.

The Long Red and Yellow Globe gave the best returns.

FIELD CARROTS.

Two varieties of field carrots were sown 22nd April, Orange Giant and Mitchell's Perfection. Both of these gave good returns.

FRUITS.

The old orchard has been carefully cultivated and kept clean. There was a fair crop of apples this year, but many of them were so badly damaged by scab as to be unfit for use. There were small exhibits sent to Brandon and Indian Head to be shown in the North-West, with the products from the Experimental Farms at those places, to the Central Experimental Farm in Ottawa, also to the exhibition at Calgary Alta.

Two hundred and seventy-seven apple trees comprising 78 varieties were received last fall, these were planted this spring, and all except two have made a good healthy growth. In addition we have received and planted this autumn 44 trees of 19 varieties, making altogether 321 trees and 97 varieties of which the following is a list:—

No. of Trees.	Variety.
7	Golden Russet,
2	Henry do
3	Anis,
3	American Pippin,
5	Alexander,
3	Bottle Greening (one dead),
7	Ben Davis,
7	Baldwin,
2	Blue Pearmain,
3	Blenheim Orange,
3	Belle de Boskoop,
2	Bombshell,
2	Bailey's Sweet,
2	Canada Red,
3	do Baldwin,
3	Carolina Red June,
3	Cooper's Market,
5	Colvert,
3	Chenango Strawberry,
12	Duchess of Oldenburg,
5	Famcuse,
5	Early Harvest,
2	Fallawater,
3	Fanny,
7	Gravenstein,
5	Grimes' Golden,
3	Fall Jennetting,
5	Haas,
3	Sweet Bough,
3	Sutton's Beauty,

No. of Trees.	Variety.
2	Lady,
2	Ontario,
2	Hyde's King of the West,
2	Wagener,
2	North-Western Greening,
2	White Pippin,
2	Rawles Janet,
2	Lawver,
2	Stark,
3	Hurlburt,
3	Hastings,
2	Jonathan,
2	Jersey Sweet,
5	King,
2	Keswick Codlin,
3	Longfield,
5	Maiden's Blush,
7	Mann,
4	McIntosh Red,
3	McMahon's White,
2	Mayne Island (one dead),
2	Magog Red Streak,
4	Northern Spy,
2	Oregon Red Cheek,
3	Peach of Montreal,
5	Peck's Pleasant,
2	Pewaukee,
3	Ribston Pippin,
5	Red Bietigheimer,
3	Rolfe,

No. of Trees.	Variety.
3	Salome,
3	Shannon,
3	Smith's Cider,
2	Spitzenburgh,
7	Twenty Ounce,
2	Tolman's Sweet,
5	Tetofsky,
2	Waxen,
3	Wellington,
3	Winter St. Lawrence,
3	Wolf River,
7	Wealthy,
2	Walbridge,
5	Yellow Belleflower,
3	Warner's King,
5	Yellow Transparent,
2	Autumn Swaar,
2	Stump,
2	Shiawassa Beauty,
2	Western Beauty,
2	Delaware Winter,
2	Arnold's Beauty,
5	R. I. Greening,
2	Rambo,
9	Red Astrachan,
2	Swaar,
2	Seek No Further,
3	St. Lawrence,
3	Scott's Winter,
2	Cano,
2	Rome Beauty,
2	Bullock's Pippin,
2	Roxbury Russet,
2	Hubbardston's Nonesuch,
2	Autumn Strawberry,
2	L. S. Pearmain,
2	Fall Pippin.

Crab Apples.

2	Montreal Beauty,
2	Whitney,
2	Transcendent,
2	Yellow Siberian,
2	General Grant,
4	Hyslop.—In all 14 trees of 6 varieties.

PEARS.

Last fall 143 pear trees of 36 varieties were received; they were planted in the orchard this spring and have done well. This season there was sent from the Central Experimental Farm and other sources 36 std. pear trees, 16 varieties, making a total of 179 trees and 52 varieties of which the following is a list:—

No. of Trees.	Variety.
2	Armond Morrell,
8	Bartlett,
7	Beurre Easter,
3	Beurre Diel,
3	Beurre Hardy,
5	Beurre Clairgeau,
7	Beurre d'Anjou,
3	Buffum,
7	Clapp's Favourite,
7	Duchess d'Angouleme,
3	Doyenne d'Ete,
2	Grey Doyenne,
2	White Doyenne,
3	Doyenne Boussock,
2	Early Madeline,
8	Flemish Beauty,
3	Goodale,
3	Howell,
2	Keiffer,
2	Dearborn's Seedling,
5	Louise Bon de Jersey,
2	Souvenir d'Esperin,
2	Belle Lucrative,
2	Madeline,
1	Wilder,
1	Salviata,
4	Lawrence,
2	La Conte,
3	Mount Vernon,
5	Margaret,
5	Osband's Summer,
2	Passe Colmar,
3	President,
3	Ritson,
5	Sheldon,
7	Seckel,
4	Souvenir de Congress,
3	Summer Belle,
5	Tyson,
2	Winter Nelis,
2	Dula Medovska,
2	Tonkovietka,
1	Dempsey,
2	Sapieganka,
2	Bessemianka,
5	Vicar of Winkfield,
6	Kurskaya,
2	Frederick Clapp,
2	Brandywine,
3	Idaho,
2	Onondaga,
2	Beurre Bosc.

All those planted last spring have made vigorous growth.
The following dwarf pear trees were also received:—

No. of Trees.	Variety.	No. of Trees.	Variety.
2	Beurre d'Anjou,	2	Josephine de Malines,
2	Doyenne Boussock,	2	Kieffer,
2	Bartlett,	2	Louise Bon de Jersey,
2	Beurre Easter,	2	Lawrence,
2	Duchess d'Angouleme,	2	Margaret,
2	Clapp's Favourite,	2	Seckel,
2	White Doyenne,	2	Urbaniste,
2	Beurre Hardy,	2	Tyson,
2	Howell,	4	Beurre Superfin.

A total of 38 trees of 18 varieties; all have made a good growth.

PLUMS.

The plums have all lived and made a fine growth, some of this year's shoots being over six feet long. The following is a list of the different varieties:—

No. of Trees.	Variety.	No. of Trees.	Variety.
3	Peters' Yellow Gage,	2	Lombard,
1	Sugar Plum,	5	Peach Plum,
2	Damson,	5	Coe's Golden Drop,
5	Reine Claude,	2	Prunus Simoni,
3	Fellenburg,	2	Bleekers Gage,
4	Weaver,	5	Pond's Seedling,
5	German Prune,	3	American Violet,
2	Victoria,	3	Hudson River Purple,
7	Bradshaw,	3	McGillivray,
5	Imperial Gage,	2	Prune d'Agen,
2	Italian Prune,	5	Red Egg,
2	Columbia,	7	Washington,
2	Jefferson,	2	Green Gage,
3	Smiths Orleans,	2	Quakenboss,
3	Saunders,	2	Richland,
3	Moore's Arctic,	2	Kelsey's Japan,
4	Yellow Egg,	2	Ogon,
3	Genii,	2	Lincoln,
3	Duane's Purple,	2	Spaulding,
3	General Hand,	2	Satsuma Blood,
3	Munroe,	2	Abundance,
3	Niagara,	2	McLaughlin,
4	Shippers' Pride,	2	Saratoga,
3	Moyer,	2	Botan,
3	Large Golden Prolific,	2	Shropshire Damson.
2	Beauty of Naples,		

Of these one Imperial Gage is dead, leaving a total of 152 trees of 50 varieties all in first-class condition.

PEACHES.

In addition to the peach trees noted in my report last year, a consignment was received in the spring; all were planted, and with the exception of five, are alive, and have made a thrifty growth. There is now in the orchard, or in nursery rows awaiting planting, the following varieties.

No of Trees.	Variety.
5	Foster,
5	Salway,
5	Late Crawford,
3	Lemon cling,
2	Amsden,
2	Hale's Early,
3	Hilborn,
2	Aiken,
2	Coes Golden Cling,
3	Early Canada,
4	Globe,
3	Early Beatrice,
3	Stump,
3	Old Mixon,
3	Mountain Rose,
5	Early York,
3	Early Barnard,
3	Wheatland,
3	Smock,
3	Alexander,
3	Stephens Rare-ripe,
2	Waterloo,
2	Malta,
2	Coolidges Favourite,
2	Alexander Noblesse,
2	Early Silven,
2	Princess of Wales,
2	Lord Palmerston,
2	Surpasse Melocoton,
2	Wheelers Late,
2	Jaques Rare-ripe,
2	Red-cheek Melocoton,
2	Amsden June,
2	Golden Drop,
2	Golden Rare-ripe,
2	Belyeas Late.
2	Fords Late,
2	Yellow St. John,
2	Burke,
1	John Haas,
2	Mary's Choice,
2	Barnards New Rare-ripe,
2	Early Rivers.

No of Trees.	Variety.
7	Early Crawford,
3	Schumacher,
5	Wager,
2	Scott's Nonpareil,
2	Marshall's Late,
2	George 4th,
2	Druid Hill,
3	Lovett's White,
2	Susquehanna,
2	Hill's Chili,
2	Stonewall Jackson,
2	Lemon Free,
2	Southern Early,
2	Moore's Favourite,
2	Ward's Late,
2	Fox's Seedling,
2	Hugh's I. X. L.,
2	Chair's Choice,
2	Kayport White,
2	Pratt,
2	Steadley,
2	Reeve's Favourite,
2	Elberta,
2	Hyne's Surprise,
2	Willet,
2	Indian Blood,
2	Heath Free,
2	Chinese Blood,
2	Shipley's Late,
2	Hyatt,
2	Heath's Cling,
2	Muir,
2	Normand's Choice,
2	Troth's Early,
3	Good,
2	Cooley's Mammoth.
2	Reeds Early Golden,
2	Kaloola,
2	Thurber,
2	Hances Golden,
3	Wonderful,
2	Gudgeon,

A total of 207 trees of 85 varieties.

CHERRIES.

The cherry trees received last fall, also those received from the Central Experimental Farm in spring were planted, some on the bench land, and the remainder in the orchard. Four trees have died, the others have made a very good, and in some cases, an exceptionally fine growth. The collection includes in all 137 trees of the following 41 varieties.

No. of Trees.	Variety.
7	Knights Early Black,
7	May Duke,
3	Downer's Late Red,
3	Ostheim,
3	Early Purple Guigne,
3	Great Bigarreau,
3	Parent,
3	Black Heart,
3	Cumberland,
3	Coe's Transparent,
3	Vladimir,
3	Empress Eugenie,
3	Lithau,
3	Louis Phillipe,
7	Black Tartarian,
2	Mezel,
2	Rockport,
2	Bessarabian,
2	Lutovka,
2	Dyehouse,
2	Late Duke,

No. of Trees.	Variety.
7	Yellow Spanish,
7	Black Eagle,
2	Napoleon,
2	Royal American,
3	Lieb,
5	Windsor,
2	Black Republic,
7	Early Richmond,
5	Elton,
3	Florence,
3	Champagne,
3	Love Apple,
2	Willamette,
2	English Morello,
5	Montmorency,
2	Reine Hortense,
2	Governor Wood,
2	Olivet,
2	Carnation,
2	Wragg.

APRICOTS.

Of this fruit there has been received and planted the following, all of which have made vigorous growth, 43 trees of 18 varieties.

No. of Trees.	Variety.
3	Alexander,
3	Gibb,
3	J. L. Budd,
3	Catherine,
3	Alexis,
3	Nicholas,
2	Alberge de Montgamet,
2	Breda,
2	Carmine Gros,

No. of Trees.	Variety.
2	De Coulange,
2	Moorpark,
2	Peach,
2	Royal,
2	St. Ambroise,
2	Turkey,
4	Shense,
2	Roman,
1	Early Golden.

NECTARINES.

Of nectarines we have the following 12 varieties—25 trees, 21 of which are living and thrifty.

No. of Trees.	Variety.
2	Downton, (1 dead)
2	Early Violet,
2	Lord Napier, (1 dead)
2	Milton,
2	Red Roman, (1 dead)
2	Spencer,

No. of Trees.	Variety.
2	Victoria,
2	Pitmaston,
3	Boston, (1 dead)
2	Stanwick,
2	Hardwick,
2	Early Newington.

QUINCES.

Fourteen trees of six varieties of Quinces have been planted and thirteen have lived and made healthy growth.

4 Orange,	2 Rea's Mammoth,
2 Pear (1 dead),	2 Meech's Prolific,
2 Champion,	2 Fuller.

GRAPE VINES.

Of grape vines 202 have been planted, of which there are now living 188 vines of 78 varieties.

No. of Vines.	Variety.
3	Amber Queen,
3	August Giant,
8	Brighton,
3	Jessica,
3	Delaware,
3	Early Victor,
3	Niagara,
3	Lady,
3	Naomi,
3	Wilder,
3	Moore's Early,
3	Agawam,
13	Worden,
3	Concord,
3	Pocklington
3	Salem,
3	Herbert,
3	Martha,
3	Massasoit,
3	Gaertner,
2	Ives seedling,
2	Elvira, (1 dead),
2	Moore's Diamond,
2	Triumph,
2	Eumelan, (1 dead),
2	Lady Washington, (1 dead)
2	Berckmans,
2	Hayes,
2	Prentiss, (1 dead),
2	Arnolds No. 1, (Othello,)
5	Clinton,
2	Eldorado,
2	Wyoming Red, (1 dead)
2	Mo. Riessling,
2	Telegraph,
2	Mills,
2	Centennial,
2	Highland,
2	Ulster Prolific,
2	Barry, Rogers 21, (1 dead),
3	Rogers 28,
3	Rogers 39,
3	Lindley,
3	Catawba,
2	Florence,
2	Secretary,
2	Moyer, (1 dead),
2	Brant,
2	Autochon,
2	Eva, (1 dead),
2	Victoria,
2	Champion,
2	Woodruff Red,
2	Jefferson, (1 dead),
2	Essex,
2	Merrimac,
2	Rogers 34, (1 dead),
2	Bacchus,
2	Creveling,
2	Cynthiana, (1 dead),
2	Canada,
2	Rogers No. 1,
2	Goethe,
2	Israella,
2	Duchess,
2	Cottage,
2	Marion, (1 dead),
2	Poughkeepsie Red,
2	Eaton,
2	Oriental,
2	Rogers No. 5,
2	Noah, (1 dead),
2	Kensington,
2	Emerald,
2	Delta,
2	Cross between Delaware and Concord
2	Cross between Chasselas & Concord,
1	Chance seedling.

SMALL FRUITS.

Of the small fruits planted, the currants, raspberries, blackberries and gooseberries all came through the winter in good condition, but the ground heaved so badly that the strawberries were almost destroyed, only 12 strawberry plants being left when growth began.

There are now planted in suitable plots the following varieties of small fruits.

Blackberries, planted in rows 8 feet apart and three feet apart in the rows over 900 of the following 17 varieties.

Agawam,
Snyder,
Taylors Prolific,
Gainor,
Crystal White,
Tecumseh,
Early Harvest,
Kittatinny,

Western Triumph,
Stones Hardy,
Minnewaska,
Early Cluster,
Wilson Junior,
Wilson Early,
Lawton,
Erie.
Early King with 50 plants of Lucretia Dewberry.

Of red, yellow and black cap raspberries there are nearly 800 plants of the following 25 varieties.

Cuthbert,
Marlboro,
Turner,
Hansell,
Brandywine,
Heebner,
Shaffer,
H. R. Antwerp,
7 varieties of Saunders' seedlings.
Gregg,
Hilborn,
Caroline,
Brinckle's Orange,
Souhegan,
Mammoth Cluster,
Golden Queen,
Clarke,
Hornet,
Franconia.

RED AND WHITE CURRANTS.

Of these nearly 250 bushes have been planted in rows 8 feet apart and 6 feet apart in the rows of the following 10 varieties.

Cherry,
Fay's Prolific,
Versailles,
Moore's Ruby,
Knights large red.
White Grape,
White Dutch,
Victoria,
Red Dutch,
Long bunch Holland.

BLACK CURRANTS.

Nearly 150 bushes of these have been planted in rows 8 feet apart and 6 feet apart in the rows of the following 16 varieties.

Black Naples,
Champion.
Lee's Prolific,
Manitoba Wild.
nd 12 varieties of Saunders' seedlings.

GOOSEBERRIES.

About 100 bushes have been planted 8 feet apart and 6 feet in the rows of 9 varieties.

Houghton,
Smith's Improved,
Golden Prolific,
Industry,
Triumph.
Crown Bob,
White Smith,
Downing,
Transparent.

STRAWBERRIES.

From the Central Experimental Farm there was received in the autumn about 7,500 plants of the following 39 varieties:—

May King,
Hathaway,
Black Giant,
Bubach,
Seneca Queen,
Manchester,
James Vick,
Woodruff,
Jumbo,
Emerald,
Green Prolific,
Mary Fletcher,
Crescent,
Old Ironclad,
Prince of Berries,
Osceola,
Connecticut Queen,
Westfield's No. 2,
Haverland,
New Dominion,

Charles Downing,	Jessic,
Photo,	Itasca,
Cumberland Triumph,	Norman,
Windsor Chief,	Sharpless,
Atlantic,	Wilson,
Wonderful,	Captain Jack,
Maggie,	Gandy,
Mrs. Garfield,	Pine Apple,
Jersey Queen,	Bordelaise.
Belmont.	

Some of these were planted on the bench land and the balance in plots which were prepared by manuring and thorough cultivation during the summer; it is hoped that they will come through the winter this time in good condition.

FOREST TREES, SHRUBS AND VINES.

As many of these were very small when planted they were more or less injured by the heaving of the ground in the spring, many of them had to be reset on that account. Those that lived have made a vigorous growth.

The following lists show the number which has been planted of each sort with the number now living. It is proposed to plant many of the hard wood timber trees on the bench lands and in the interspaces among the rocks on the face of the mountain at the back of the farm for the purpose of ascertaining whether these valuable woods of the east cannot be grown here to advantage. If such land, much of which is of no value other than for timber, can be utilized in this way it will no doubt result in much future benefit to the Province.

The trees in the following list have been raised from seed, either at the Central Experimental Farm or by some of the growers of forest trees and shrubs in the United States; the following list gives the number planted and living.

—	No. Planted, Fall, 1889.	No. Alive, Fall, 1890.
Ash, Black, *Fraxinus sambucifolia*	200	35
do Green, *Fraxinus viridis*	200	200
do White, *Fraxinus Americana*	1,000	762
Black Walnut, *Juglans nigra*	500	458
Butternut, *Juglans cinerea*	4	4
Black Cherry, *Prunus serotina*	200	195
Beech, American, *Fagus ferruginea*	100	61
do European, *Fagus sylvatica*	100	77
White Elm, *Ulmus Americana*	500	410
Rock do *Ulmus racemosa*	500	123
Red do *Ulmus fulva*	50	31
Hickory, *Carya alba*	500	33
Sugar Maple, *Acer saccharinum*	500	468
Red do *Acer rubrum*	200	148
Tulip Tree, *Liriodendron tulipifera*	15	6
Chestnut, American, *Castanea vesca Amer*	75	69
do Spanish, *Castanea vesca*	50	36
Kentucky Coffee Tree, *Gymnocladus Canadensis*	50	40
Sycamore, American, *Platanus occidentalis*	100	61
Basswood, *Tilia Americana*	200	147
Canoe Birch, *Betula papyracea*	100	44
Yellow do *Betula lutea*	200	140
Locust, Black, *Robinia pseudacacia*	100	100
Honey Locust, *Gleditschia triacanthos*	50	41
Catalpa, Hardy, *Catalpa speciosa*	100	66
do Japan, *Catalpa Kaempferi*	100	58
do Lee's Hybrid, *Catalpa hybrida*	100	67
Persimmon, American, *Diospyros Virginiana*	50	27
Russian Mulberry, *Morus hybrida*	101	101
Ailanthus, *Ailantus glandulosa*	100	61

—	No. Planted, Fall, 1889.	No. Alive, Fall, 1890.
Larch, American, *Larix Americana*	50	35
do European, *Larix Europea*	100	82
Black Spruce, *Abies nigra*	50	25
Hemlock Spruce, *Abies Canadensis*	50	32
White Pine, *Pinus strobus*	200	151
Bull Pine, *Pinus ponderosa*	10	5
Scotch Pine, *Pinus sylvestris*	200	83
Riga Pine, *Pinus sylvestris Rigensis*	45	25
Austrian Pine, *Pinus Austriaca*	200	73
Jack Pine, *Pinus Banksiana*	100	85
English Yew, *Taxus baccata*	50	35
Mugho Pine, *Pinus mugho*	50	46
Dwarf Mountain Pine, *P. mugho v. rostrata*	150	144
Red Bud, *Cercis Canadensis*	50	30
American Wahoo, *Enonymus atropurpureus*	10	10
High Bush Cranberry, *Viburnum opulus*	10	10
Black Thorn, *Prunus spinosa*	100	88
English Oak, *Quercus robur*	50	45
Russian Apple Seedlings	100	97
Quercus monophylla	27	27
Tilia macrophylla	16	13
do grandiflora Europea	30	28
Sambucus glauca	7	6
Crataegus oxyacantha	12	10
Pyrus domestica	6	6
Colutea frutescens	12	11
Cephalanthus occidentalis	8	7
Populus Bolleana	50	44
Magnolia tripetala	12	1
Calycanthus Floridus	24	11
	7,824	5,338

A consignment of useful and ornamental trees and shrubs was also received from France, and although they were a long time in transit, and some were beginning to grow in the cases, yet a large percentage have made a healthy growth and look promising at this time.

The following list gives the number planted and living:—

—	No. Planted, Summer, 1890.	No. Alive, Fall, 1890.	—	No. Planted, Summer, 1890.	No. Alive, Fall, 1890.
Acacia julibrissin	50	18	Ampelopsis Veitchii	50	18
Acer campestris	100	89	Arbutus unedo	10	1
do platanoides	100	100	[illegible] Japonica	10	7
do pseudo-platanus	100	100	do hymelaica	10	9
do negundo variegata	25	25	Azalea pontica	10	10
do pseudo-platanus purpurea	50	50	do mollis	10	10
do Tartaricum	25	25	Berberis Darwinii	50	25
do do ginnala	50	50	do dulcis	50	50
do platanus Reitenbachi	10	10	do stenophylla	25	18
do do Schweidleri	10	10	Betula alba	100	96
Æsculus hippocastaneum	100	98	do laciniata	10	3
do rubicunda	10	10	do pendula elegans	10	6
do flore albo pleno	10	10	do purpurea	10	9
Æsculus laciniata	10	10	do pyramidalis	10	5
Akebia quinata	10	9	Bignonia grandiflora	10	10
Alnus cordata	10	10	do radicans	25	16
do laciniata	10	2	Bocconia cordi	10	10

—	No. Planted, Summer, 1890.	No. Alive, Fall, 1890.
Buxus arborescens	50	50
do aurea var	25	25
do Japonica aurea	25	20
do Balearica	50	44
do fol argentea	50	45
do microphylla glauca	50	50
do mac. rotundifolia	25	24
do pyramidalis var	25	20
do suffruticosa	500	435
Ceanothus Albert Pittet	10	0
do azureus	10	7
do gloire de Versailles	10	0
do intermedius	10	4
do Marie Simon	10	0
Cytisus hirsutum	25	14
do laburnum	100	96
Celtis Australis	25	25
Cercis Canadensis	25	23
do siliq. carneum	25	20
do do rubrum	25	17
Chionanthus Virginicus	10	1
Corchorus Japonicus	25	20
do do variegata	10	0
Cornus mascula	25	22
do sanguinea	25	25
do Sibirica	25	24
do do var	10	9
do var elegantissima	10	9
do mas variegata	10	10
do mas aurea elegant	10	0
Coronilla emerus	10	6
Corylus avellana	50	48
do laciniata	10	2
do purpurea	10	2
Castanea vesca (Spanish Chestnut)	100	96
Cotoneaster buxifolia	25	25
do Nepaulensis	25	25
do Simmonsii	25	2
Crataegus pyracantha	50	29
do Lalandii	25	24
Daphne laureola	25	25
do mezereum rubrum	10	1
Deutzia candidissima	25	9
do flore pleno rosea	25	1
do gracilis	25	25
Diervilla lutea	10	0
Diospyros lotus	50	41
Eleagnus angustifolia	10	10
do macrophylla	10	9
do pungens var	10	10
Eucalyptus globulus	10	0
Euonymus argentea	25	25
do latifolia aurea	10	7
do viridis Japonica	10	7
Fagus purpurea	50	50
do laciniata	10	10
do pendula	10	10
Forsythia Fortunei	25	18
Hedera Algeriensis	10	10
do variegata	10	0
Hibiscus Syriacus	25	25
Hortensia Japonica	25	11
Hydrangea paniculata grandiflora	25	16
Hypericum hircinum	25	0
Juglans Regia (English Walnut)	50	50
Laurus camelliafolia	25	25
Ilex aquifolium	500	395
Laurus angustifolia	25	9
Ligustrum ameurense	50	47
do Italicum	25	6
do Japonicum	25	20

—	No. Planted, Summer, 1890.	No. Alive, Fall, 1890.
Ligustrum longifolium	10	10
Lonicera aurea reticulata	10	3
do Belgica (monthly)	10	0
do Halleana	10	6
do Sinensis	10	1
do verna	10	1
Liriodendron tulipifera	25	25
Magnolia grandiflora	25	20
Mahonia aquifolium	25	21
do Japonica	25	21
Morus Italica moretti	10	10
Platanus orientalis	50	48
Pawlonia imperialis	10	0
Pavia macrostachya	10	10
Philadelphus Deutziaflorus	25	2
do grandiflorus	10	10
do foliis aureus	10	8
Prunus pissardi	10	10
Pyrus Japonica	20	20
Quercus cerris	25	25
do ilex	10	9
Rhus cotinus	25	25
Salisburia adiantifolia	25	24
Sambucus aurea nova	10	6
do laciniata	10	9
do pendula	10	10
do aurea var	10	9
Spiraea Californica	10	10
do Douglasi	25	25
do Fortunei alba	10	0
do Thunbergii	10	0
do Van Houttei	10	5
Staphylea colchica	10	2
Syringa Charles X	10	10
do rothamagensis	10	7
Tilia platyphylla	100	100
do sylvestris	50	50
Tamarix Africana	10	10
do Indica	10	10
do Japonica	10	10
Ulmus campestris	100	90
do latifolia	100	100
Ulex Europea	50	4
Viburnum lantana	10	9
do opulus flore pleno	10	10
do macrocephalum	10	
Virgilia lutea	10	10
Weigelia amabilis	10	3
do nana variegata	10	1
do rosea	10	0
Wistaria sinensis	25	23
do alba	10	9
Yucca filamentosa	10	10
Rhododendron arboreum	10	10
Abies amabilis	10	4
do apollonis	10	10
do Canadensis	50	20
do nobilis	10	7
do Orientalis	10	3
do Nordmaniana	10	10
do pectinata	25	25
Picea cephalonica	25	21
Araucaria imbricata	2	2
Cedrus Atlantica	10	5
do deodora	10	10
do Libani	10	3
Cephalotaxus Fortunei	10	10
Cryptomeria Japonica	10	9
do elegans	10	10
Cupressus Lawsoniana	10	6
do argentea	10	10

—	No. Planted, Summer, 1890.	No. Alive, Fall, 1890.	—	No. Planted, Summer, 1890.	No. Alive, Fall, 1890.
Cupressus elegantissima	10	9	Taxodium distichum	10	10
do lutea	10	7	Taxus baccata	510	319
Juniperus Hibernica	10	10	do do v. fastigiata	10	6
do Bermudiana	10	7	do variegata	10	10
do Japonica aurea	5	5	do do aurea	10	10
do sinensis var argentea	5	5	do var elegantissima	10	10
do Virginiana elegantissima	10	10	Thujopsis borealis	10	10
Pinus cembra	10	2	Thuja aurea	10	6
do Laricis Corsica	50	19	do elegantissima	10	9
do Mugho	40	40	do conica	10	6
do ponderosa	10	9	do filiformis Japonica	10	10
Podocarpus Korayana	10	10	do vervaenana	10	9
Retinospora aurea gracilis	10	5	Wellingtonia gigantea	10	2
do argentea	10	1	Bengal China Roses	25	2
do ericoides	10	0	Roses Hyb. perpetual	50	3
do filifera	10	3	do climbing	25	0
do leptoclada	10	10	Willow	10	9
do pisifera aurea	10	6			
do plumosa	10	5		6,047	4,706
do squarrosa	10	10			

In addition to the foregoing, a further consignment of useful and ornamental trees, shrubs and vines was received this fall from the Central Experimental Farm, also a case of flowering bulbs, containing 1,700 bulbs; from the Experimental Farm at Indian Head a thousand asparagus plants, and from a nursery a hundred of another variety, all of which have been carefully planted. There are now altogether over 500 different varieties of fruit, and more than 400 varieties of useful and ornamental trees, shrubs and vines, making a total of nearly 1000 sorts.

Fifteen experimental plots of fall wheat were sown in the autumn, and two of rye, all of which at the present time are looking well.

There is now ready for crop, exclusive of what is sown with fall grain or in nursery, about 70 acres—making in all about 90 acres. 250 fir trees and stumps have been taken out besides the birch, alder and other brush with which much of the land was thickly covered. Ferns have given a considerable amount of trouble in the newly reclaimed land, but it is hoped they will be got rid of in a year or two by frequent hoeing during the season of growth.

The short-horn bull and cow are both in good thrifty condition, and during the year a very fine calf has been added to the stock.

FOWLS.

Most of eggs laid by the fowls during the spring and early summer were sold for hatching. There are a few chickens of the following breeds :—Wyandottes, Houdans and White Leghorns. The Houdans and the Wyandottes began laying earliest.

The following is an account of the number of eggs laid by each breed during the year:—

——	Three Houdans.	Two White Leghorns.	Three Wyandottes.	Two Black Spanish.
March	15	10	27	3
April	48	31	58	45
May	62	27	45	40
June	48	35	22	39
July	33	20	12	41
August	29	21	21	19
September	1	10	8	0
October	2	0	0	0
November	0	0	0	0
December	9	7	15	5
	247	161	208	192

The bushy-tailed rats were very troublesome in the poultry house, occasionally carrying off both eggs and chickens.

I have the honour to be, Sir,

Your obedient servant,

THOS. A. SHARPE.

Superintendent.

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