EXPERIMENTAL FARMS

REPORTS

OF THE

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CHEMIST - - - - - - - -	F. T. SHUTT, M.A.
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" " Indian Head, N.W.T. -	ANGUS MACKAY
" " Agassiz, B.C. - -	THOS. A. SHARPE

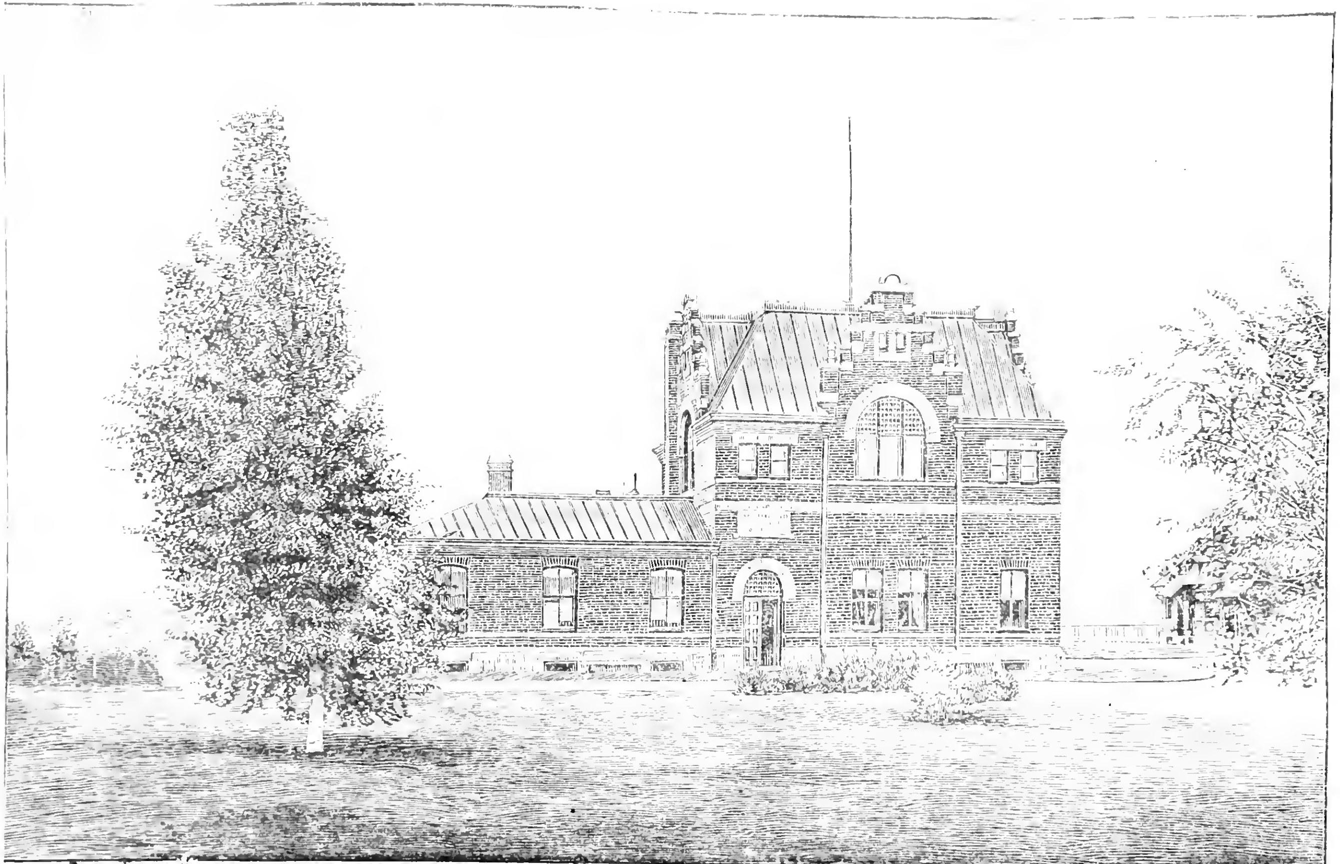
FOR

1897

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
PRINTED BY S. E. DAWSON, PRINTER TO THE QUEEN'S MOST
EXCELLENT MAJESTY
1898

[No. 8*a*—1898.]



Office Building, Museum and Chemical Laboratory of the Central Experimental Farm.

APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS.

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OTTAWA, 1st December, 1897.

SIR,—I have the honour herewith to submit to you the eleventh annual report of work done and in progress at the Central Experimental Farm and also at the several Branch Experimental Farms.

Since the resignation of the late Agriculturist Mr. Jas. W. Robertson—in January, 1896—I have carried on the work of the Agriculturist in addition to the duties devolving on me as Director, and in this report as in that of 1896, full particulars of the results of all the experiments conducted with farm crops and stock, are presented in that part written by myself. You will also find appended reports from the following officers of the Central Experimental Farm: From the Horticulturist, Mr. John Craig; from the Chemist, Mr. Frank T. Shutt, and from the Entomologist and Botanist, Dr. James Fletcher. Reports are also submitted from the Poultry Manager, Mr. A. G. Gilbert, and from the Foreman of Forestry, Mr. W. T. Macoun.

From the Branch Experimental Farms there are reports from Mr. Geo. W. Forrest, Superintendent, and from Mr. W. S. Blair, Horticulturist of the Experimental Farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. S. A. Bedford, Superintendent of the Experimental Farm for Manitoba, at Brandon; from Mr. Angus Mackay, Superintendent of the Experimental Farm for the North-west Territories, at Indian Head; and from Mr. Thos. A. Sharpe, Superintendent of the Experimental Farm for British Columbia, at Agassiz.

In these reports particulars are given of the results of many important and carefully conducted experiments in agriculture, horticulture and arboriculture, the outcome of practical work in the fields, barns, dairy and poultry buildings, orchards and plantations at the several experimental farms; also of scientific investigations in the chemical laboratory and the information gained from the careful study of the life histories and habits of injurious insects and noxious weeds, and of the most practical and economical measures for their destruction. In the report of the Entomologist and Botanist there will also be found particulars of the experiments and observations made during the past year in connection with the Apiary.

The large and constantly increasing demand by the farmers of the Dominion for the publications issued from the experimental farms is a gratifying evidence of the desire for information among this class of the community, also of the high esteem in which these records of the work of the farms are held. It is hoped that the facts brought together in the present issue will be found of much practical value to the Canadian farmer and fruit grower and that they may assist in advancing these industries in this country.

I have the honour to be, sir,

Your obedient servant,

WM. SAUNDERS,
Director Experimental Farms.

To the Honourable
The Minister of Agriculture,
Ottawa.

ANNUAL REPORT

ON THE

EXPERIMENTAL FARMS

REPORT OF THE DIRECTOR AND ACTING AGRICULTURIST.

(WM. SAUNDERS, LL.D., F.R.S.C., F.L.S.)

In the eleventh annual report of the Experimental Farms herewith submitted there will be found much information on agricultural topics, also on subjects bearing on agriculture; the results of a large number of experiments which have been conducted during the season of 1897 at each of the Experimental Farms with all the more important farm crops. These experiments have been planned to gain further information as to the most productive varieties to sow, also to find out which are the earliest to ripen. Additional information has also been sought as to the best time for sowing, the proper depth to sow, and the quantity of seed that should be used to produce the best results.

The advantages arising from the selection of plump, well matured seed of the best sorts, have been frequently urged and the good results arising from such a course demonstrated. New sorts are obtained by careful selection and cultivation, by the preservation and culture of occasional sports; also by cross-fertilizing. The farmer who tries to make the best of his opportunities may do much to improve both the character and quality of the grain he grows, and may with judicious care often raise crops of such quality as will command high prices for seed from his less thoughtful neighbours.

The judicious use of fertilizers to maintain the fertility of the land and to restore in the most economical manner those important elements of plant food which have been taken from the soil by frequent cropping, is a question of much importance; so also is that of the relative value of natural and artificial fertilizers for this purpose. Many interesting facts are given in this connection in that part of the report where the results obtained from the tests made with different fertilizers and combinations of fertilizers are noted on the special trial plots which have been devoted to that purpose for the past nine or ten years. Further information has been gained regarding the value of green crops for ploughing under to enrich the land, especially such leguminous crops as clover. The fact has been demonstrated that such crops can be put in with spring-sown grain without reducing the yield of such cereals, and that after the grain has been harvested the clover will grow vigorously during the summer, act as a catch crop all the season, by appropriating the elements of fertility which are brought down by the rain, and at the same time gather and lay up in its roots and leaves a large store of nitrogen for the use of subsequent crops. The tests, which have now been continued for several years, have shown such convincing results that during the last season nearly all the grain fields on the Central Experimental Farm have been sown with clover in this way. The quantities of fertilizing constituents which may thus be added to the soil at a small cost, are shown by the analyses which have been made and reported on by the Chemist of the Experimental Farms.

While it must be admitted that conditions of climate and the general character of the season—which are beyond the control of the farmer—are most important factors bearing on crop production, still there are many things which the farmer may do which will greatly increase the chances for abundant returns, provided the season is favourable. It is gratifying to know that during recent years more thought and attention has been given by farmers to their calling, that improvements have been manifest in the preparation of the soil, and the general management of the crops; the stores of fertility in the land have been more carefully husbanded, by a judicious rotation of crops; more attention has also been paid to the care of barn-yard manure, and greater efforts made to replace those elements in the soil, which repeated cropping has removed. The progress which has been made is encouraging; it has given Canadian farmers a reputation which it is most desirable should be maintained, and has, at the same time, aroused a spirit of inquiry in reference to agricultural affairs which promises well for the future. The enterprise and efforts towards improvement shown by our people have resulted in a greatly enlarged export trade to the mother country, particularly in animals and their products. Along these lines of farm work, co-operation and skill finds a large and remunerative field, and such exports can be carried on to an almost unlimited extent without depleting the soil in any material degree.

The scientific investigations which have been conducted at Ottawa have been of much value. Much work has been done in connection with injurious weeds in ascertaining the extent of their distribution and the best methods of checking the inroads of these vigorous invaders. Information has been given in response to many inquiries concerning injurious insects, and practical remedies for their subjugation suggested. Much interesting work has also been done in connection with bee-keeping. Useful work has also been accomplished in the chemical branch in determining the constituents of soils, and in giving suggestions as to the best methods by which they may be made more fertile. Further information has also been gained in reference to the results of the rotting of barn-yard manure under different conditions also in regard to the feeding value of forage crops, and on other kindred subjects.

Additional experience has been gained in connection with the feeding of poultry and their profitable management. Particulars of the results obtained will be found in the report of the Poultry Manager. Records of the rapid progress which has been made in connection with the Arboretum and Botanic Garden with particulars of the growth of the different species of timber trees comprising the forest belts are reported on by the Foreman of Forestry.

The experiments in cross-fertilizing have been successfully continued and a large number of new varieties produced, particularly of fruits which are likely to prove hardy on the North-west plains. The collection of fruits at Ottawa has also been enriched by the addition of many promising sorts.

The results of the practical tests which have been made in the feeding of steers, milch cows and swine at the Central Experimental Farm have been widely disseminated, and the information thus given has served a useful purpose in advancing these important branches of agricultural industry. The experiments conducted at the Branch Experimental Farms in Manitoba and the North-west Territories, along similar lines, have been most useful to those engaged in stock raising in that country, and the introduction of the Awnless Brome Grass and the demonstrations which have been made of its hardiness and value for hay and pasture have laid the foundation for a great extension of the trade in cattle and dairy products in the North-west country.

The many tests which have been made with a very large number of varieties of fruit at the Branch Experimental Farm at Agassiz, British Columbia, have been the means of bringing out much practical information in reference to fruit growing, and has materially aided that branch of industry, so important in the Pacific province.

The results of the tests undertaken in all these different lines of agricultural and horticultural work will be found in the subsequent pages. They have all been planned with the special object of furnishing reliable data for the use of those engaged in agricultural or horticultural pursuits in Canada.

EXPERIMENTS WITH OATS.

During the season of 1897, sixty-five varieties of oats have been tested under fairly uniform conditions, in order to gain information regarding their relative yield, earliness and other characteristics. They were all sown on the 5th and 6th of May on plots of $\frac{1}{20}$th acre each. The soil was a sandy loam of fair quality which received a light dressing of manure, about 12 tons per acre, in the autumn of 1895, when it was ploughed under. The land was ploughed in the autumn of 1896 about 8 inches deep, and disc-harrowed twice in the spring of 1897, and harrowed three times with the smoothing harrow before sowing. In the following table full particulars are given of the results obtained, and in the accompanying figure a view is given of a portion of these experimental plots at the time of harvest.

OATS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
				Inches.	Inches.		Bush.	lbs.	Lbs.	
1	Holland	Aug. 18	105	45 to 48	9 to 11	Sided	70	25	27¾	Considerably.
2	Golden Giant	" 17	103	42 to 48	10	"	57	12	26¼	Badly.
3	Mennonite	" 5	91	39 to 48	8 to 9	Branching	56	11	30¼	Considerably.
4	Improved American	" 7	93	42 to 50	8 to 9	"	53	28	30¼	"
5	Early Etampes	" 8	94	36 to 41	8 to 9	"	53	23	30¼	"
6	White Schonen	" 7	93	42 to 48	8 to 9	"	53	8	31½	"
7	Early Golden Prolific	" 6	93	42 to 48	8 to 9	"	50	30	33	"
8	White Russian	" 5	92	42 to 48	8 to 9	"	50	30	33½	Badly.
9	Columbus	" 6	92	42 to 48	9	"	49	29	30	Considerably.
10	Wallis	" 7	93	48 to 53	9 to 10	"	49	9	26½	Badly.
11	Joanette	" 7	93	36 to 42	8 to 9	"	49	4	31¾	Considerably.
12	American Triumph	" 6	92	40 to 48	9	"	49	3	32¼	"
13	Wide Awake	" 7	94	42 to 48	8 to 9	"	48	23	34¼	"
14	Banner	" 9	96	44 to 50	9 to 10	"	47	7	28½	Badly.
15	Golden Beauty	" 6	92	42 to 48	9	"	47	7	29	"
16	Lincoln	" 7	94	42 to 48	8 to 9	"	46	6	35	Considerably.
17	Bonanza	" 3	90	48 to 54	10 to 11	"	45	30	38¼	Badly.
18	Abundance	" 6	93	42 to 48	9 to 10	"	45	15	28¼	"
19	American Beauty	" 6	92	42 to 48	8 to 9	"	45	10	29¼	"
20	Thousand Dollar	" 6	93	43 to 48	8 to 9	"	45	10	36	Considerably.
21	Buckbee's Illinois	" 9	96	44 to 48	8 to 9	"	44	24	31¼	Badly.
22	Medal	" 8	94	48 to 55	10 to 12	Half-sided	44	14	32	"
23	Siberian O. A. C	" 9	96	44 to 50	9 to 10	Branching	44	14	30	"
24	Miller	" 9	96	42 to 48	8 to 10	"	43	33	32¼	"
25	Scottish Chief	" 3	90	46 to 53	11 to 12	"	43	28	32½	"
26	Holstein Prolific	" 8	94	40 to 48	9 to 10	"	43	28	31¼	"
27	Victoria Prize	" 3	90	54 to 60	11 to 12	"	43	18	32	"
28	Improved Ligowo	" 5	91	45 to 52	8 to 9	"	42	17	33	"
29	Master	" 7	93	48 to 56	10 to 12	Half-sided	42	12	31½	"
30	Hazlett's Seizure	" 9	96	42 to 52	9 to 10	Branching	42	12	33¼	"
31	Welcome	" 3	90	48 to 54	9 to 11	"	41	16	34	"
32	White Wonder	" 3	90	48 to 54	10 to 11	"	40	25	33¼	"
33	Early Gothland	" 6	92	42 to 52	8 to 9	Half-sided	40	10	36½	Considerably.
34	Siberian	" 17	103	48 to 54	9 to 10	Sided	40	5	24½	"
35	Bavarian	" 9	96	44	8 to 9	Branching	39	9	28¼	Badly.
36	Russell	" 8	94	48 to 58	10 to 12	Half branching	39	4	32	"
37	Olive	" 8	94	40 to 50	9 to 10	Half-sided	38	23	30	"
38	Brandon	" 9	96	43 to 57	10 to 12	"	38	13	34	"
39	Prize Cluster	" 3	90	43 to 52	10 to 11	Branching	37	7	38	"
40	King	" 9	96	42 to 48	9 to 10	"	37	2	30¼	"
41	Pense	" 9	95	48 to 60	9 to 10	Half-sided	37	2	28¼	"
42	Early Maine	" 8	95	44 to 50	8 to 10	Branching	36	31	29	"
43	Rosedale	" 9	95	36 to 52	8 to 9	Half-sided	36	6	34	"
44	Oxford	" 9	96	48 to 56	10 to 12	"	36	6	33	"
45	Early Blossom	" 9	95	36 to 48	8 to 9	"	36	1	29	"
46	Abyssinia	" 9	95	36 to 48	8 to 9	"	35	3	33	"
47	Cromwell	" 9	96	46 to 56	10 to 12	"	35	25	34	"
48	Rennie's Prize White	" 5	92	48	10 to 11	Branching	34	24	34½	"

OATS—TEST OF VARIETIES—*Concluded.*

Number.	Name of Variety.	Date of Ripening.		No. of days Maturing.	Length of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
					Inches.			Bush.	lbs.		
49	Imported Irish........	Aug.	2	89	36 to 48	9 to 10	Branching..	34	4	39½	Badly.
50	Oderbruch	"	9	95	44 to 51	8 to 9	Half-sided..	33	4	34¼	"
51	Cream Egyptian.......	"	9	95	42 to 51	8 to 9	" ..	33	3	34¾	"
52	Winter Grey...........	"	3	90	48 to 58	11 to 12	Branching..	31	26	36½	"
53	Early Archangel.......	"	5	92	42 to 54	9 to 10	" ..	31	26	38	"
54	Golden Tartarian.....	"	17	103	44 to 50	10 to 11	Sided......	31	8	24	"
55	California Prolific Black	"	13	99	38 to 48	8 to 10	"	30	20	26¾	"
56	Black Beauty..........	"	6	92	45 to 50	10 to 12	Branching..	30	7	33	"
57	Newmarket....	"	4	90	45 to 48	8 to 9	" ..	28	32	30¼	"
58	Flying Scotchman	"	6	93	42 to 45	9 to 11	" ..	28	23	36½	"
59	Coulommiers	"	18	104	42 to 45	9 to 10	" ..	28	13	29¼	"
60	White Monarch........	"	15	102	38 to 50	8 to 9	" ..	27	32	29½	"
61	Mortgage Lifter	"	2	89	36 to 48	10 to 11	" ..	27	17	35	"
62	Prolific Black Tartarian	"	13	99	42 to 48	8 to 10	Sided.......	23	11	22	"
63	Doncaster Prize........	"	15	102	39 to [illegible]	8 to 9	Branching..	23	8	31	"
64	Poland	"	7	93	43 to 51	8 to 9	" ..	21	11	36	"
65	Scotch Hopetoun......	"	15	102	44 to 48	8 to 10	" ..	18	3	26½	"

In the foregoing list are included eleven of the new cross-bred sorts which have been produced at the experimental farms. The names and parentage of ten of these were given in the Annual Report of the Experimental Farms for 1896, the 11th named Holland, was produced at the experimental farm at Brandon in 1892. It is a cross between Giant Cluster male and Prize Cluster female and was included in the test plots of varieties for the first time this year. It stands at the head of the list this season having exceeded in yield all the other sorts experimented with.

Owing to the almost continued wet weather which prevailed at Ottawa for a short time before and during harvest, all the varieties of oats were much injured by rust, their yield and weight was thus much reduced and some of the sorts which have for several years past given the largest crops have on this account fallen behind and hence occupy places lower down in the list.

TESTS FOR THE PREVENTION OF SMUT IN OATS.

Further experiments have been made during the past season in the treatment of seed grain to prevent this troublesome disease. In the Annual Report of the Experimental Farms for 1896, page 12, details are given of tests made with three varieties of oats which were soaked in a solution of potassium sulphide for 24 hours, and in every instance where the grain was so treated, although the seed used was very smutty the crop was practically free from smut. During the past season one variety only was used the Doncaster Prize oats and this was the worst affected with smut of any variety we had. The seed used in this test was from the untreated crop of last year of which about one-fourth of the heads were diseased. Different portions of the seed were soaked for varying periods in a solution of potassium sulphide made by dissolving 1½ pound in 25 gallons of cold water while others were treated with the Bordeaux Mixture made by dissolving 4 pounds of copper sulphate with 4 pounds of lime in 40 gallons imperial measure of water.

HOW TO MAKE BORDEAUX MIXTURE.

This may be conveniently made by taking an ordinary coal oil barrel which holds about 40 gallons imperial measure or 50 gallons wine measure. Fill this about two-thirds full of cold water and suspend the 4 pounds of copper sulphate (blue stone) in a

Uniform test plots of cereals at the Central Experimental Farm, Ottawa, 1897.

cotton bag so that it will be entirely immersed just under the surface of the water. In this way it dissolves rapidly. In another vessel slake 4 pounds of fresh lime with 4 gallons of water. After the lime is slaked the creamy mixture should be strained through a fine sieve or a piece of coarse sacking into the barrel containing the copper sulphate in solution when the barrel should be filled with water. After the mixture is thoroughly stirred it will be fit for use.

The oats were treated as follows with the results given. The size of the plots on which the oats were sown was about $\frac{1}{80}$th of an acre each and the heads were counted on 33 by 3 feet (99 square feet).

Material used.	Number of hours soaked.	Total Number of heads.	Number of good heads.	Number of smutty heads.
Bordeaux Mixture	4	2,502	2,500	2
Potassium Sulphide Solution	4	2,711	2,575	136
Bordeaux Mixture	8	3,013	3,011	2
Potassium Sulphide Solution	8	3,366	3,264	102
Bordeaux Mixture	12	3,058	3,055	3
Potassium Sulphide Solution	12	2,740	2,713	27
Bordeaux Mixture	24	2,817	2,815	2
Potassium Sulphide Solution	24	2,592	2,590	2
Untreated	....	2,730	1,720	1,010

From the above experiment it would appear that smutty oats soaked in Bordeaux Mixture for 4 hours are rendered as free from smut as if soaked for 8, 12 or 24 hours. But where potassium sulphide is used it appears to be necessary to steep the grain in the solution for 24 hours in order to entirely free it from smut. While the solution of potassium sulphide seems to be a reliable remedy for smut in oats provided the grain is steeped in it for 24 hours, the Bordeaux Mixture is a cheaper remedy, more easily obtainable, and appears to be quite as effective with only 4 hours soaking. It is proposed to test this remedy on a more extensive scale during the coming season.

FIELD CROPS OF OATS.

Golden Giant.—3½ acres. Soil a light sandy loam. The land was manured in 1895 with about 12 tons of barn-yard manure per acre. The previous crop was pease. It was ploughed in the autumn of 1896, about 8 inches deep, and in the following spring it was disc-harrowed once, and harrowed twice with the smoothing harrow before sowing. Sown 29th April, two bushels per acre, came up 9th and 10th May, and was ripe 17th August. The time to mature was 110 days. The yield per acre was 53 bushels 25 pounds, weight per bushel 31 pounds. Length of head, 9 to 11 inches, sided, length of straw, 48 to 51 inches. Made a strong and even growth, only a few spots lodged, there was some smut, and the leaves and stems were badly rusted.

Improved Ligowo.—4¼ acres. Soil a clay loam of good quality, which was manured in the autumn of 1894, with about 18 tons of barn-yard manure per acre. The previous crop was barley. The land was ploughed very shallow in 1896, immediately after harvest, to start shed grain and weed seeds, and again later in the autumn about 8 inches deep. In the spring of 1897, it was disc-harrowed twice, and harrowed twice with the smoothing harrow before sowing. Sown 30th April, two bushels per acre, came up 10th May; and was ripe 2nd August. The time to mature was 94 days, and the yield per acre was 44 bushels 10 pounds; weight per bushel, 37 pounds. Length of head, 8 to 10 inches, branching, length of straw, 44 to 48 inches. Made a strong and even growth; a few spots lodged. There was some smut, and the leaves and stems were considerably rusted.

Siberian, O.A.C.—1¾ acre. The soil, preparation and treatment, was the same as that for the Improved Ligowo. The previous crop was barley. Sown 30th April, 1¾ bushel per acre, came up 10th May; and was ripe 5th August. The time to mature was 97 days. The yield per acre, 48 bushels 9 pounds; weight per bushel, 34 pounds. Length of head, 9 to 11 inches, branching, length of straw, 42 to 46 inches. Made a medium to strong growth, fairly even, and all stood well. There was a considerable quantity of smut, and the leaves and stems were badly rusted.

American Beauty.—2½ acres. The soil and treatment was the same as in the case of the Improved Ligowo. The previous crop was barley. Sown 30th April, two bushels per acre, came up 10th May, and was ripe 1st August. The time to mature was 93 days. Yield per acre, 50 bushels 12 pounds; weight per bushel, 35½ pounds. Length of head, 7 to 9 inches, branching, length of straw, 42 to 47 inches. Made a medium but even growth; all standing well. There was some smut and the leaves and stems were badly rusted.

Mortgage Lifter.—1½ acre. The soil where this plot was located was scarcely so heavy or so good, but the treatment was the same, as that for the Improved Ligowo. Sown 30th April; two bushels per acre, came up 10th May; and was ripe 30th July. The time to mature was 91 days. Yield per acre, 39 bushels 15 pounds; weight per bushel, 41½ pounds. Length of head, 7 to 9 inches; branching, length of straw, 38 to 44 inches; the straw was soft and weak. The growth was uneven, and lodged in spots. This variety was very badly affected with smut and the leaves and stems were very much rusted.

Joanette.—1¾ acre. Soil a sandy loam of fair quality. The preparation and treatment was the same as that for the Improved Ligowo. The previous crop was barley. Sown 30th April; 1½ bushel per acre, came up 10th May; and was ripe 9th August. The time to mature was 101 days. Yield per acre, 33 bushels 3 pounds, weight per bushel, 35 pounds. Length of head, 7 to 9 inches, branching; length of straw, 24 to 32 inches. Growth rather weak, but even, and all standing well. There was some smut and the leaves and stems were badly rusted.

Holstein Prolific.—1¼ acre. Soil a sandy loam of fair quality, the preparation and treatment was the same as that for the Improved Ligowo. The previous crop was barley. Sown 30th April; 1¾ bushel per acre, came up 11th May; and was ripe 6th August. The time to mature was 98 days, Yield per acre, 46 bushels 2 pounds; weight per bushel, 33½ pounds. Length of head, 9 to 11 inches, branching; length of straw, 36 to 44 inches. Made a medium and even growth; all standing well. There was some smut and the leaves and stems were badly rusted.

Wallis.—2½ acres. Soil a sandy loam of fair quality. The preparation and treatment was the same as that for the Improved Ligowo. The previous crop was partly mangels, and partly sunflowers. Sown 1st May; 2 bushels per acre, came up 11th May, and was ripe 6th August. The time to mature was 97 days. Yield per acre, 46 bushels 32 pounds; weight per bushel, 33 pounds. Length of head, 9 to 11 inches, branching, length of straw, 40 to 48 inches. Growth medium to strong and fairly even, only a few spots lodged. There was some smut, and the leaves and stems were badly rusted.

Early Gothland.—2 acres. Soil partly clay loam, partly sandy loam, and part peaty. This land was manured in the spring of 1896, with about 12 tons of barn-yard manure per acre. The previous crop was corn. It was ploughed late in the autumn of 1896, from 7 to 8 inches deep, and in the following spring, it was disc-harrowed twice, and harrowed twice with the smoothing harrow before sowing. Sown 4th May; 1¾ bushel per acre; came up 14th May; and was ripe 3rd August. The time to mature was 91 days. Yield per acre, 40 bushels 20 pounds; weight per bushel, 34¼ pounds. Length of head, 8 to 9 inches; half sided; length of straw, 38 to 44 inches. Made a medium growth; all standing well. There was some smut, and the leaves and stems were slightly rusted.

Golden Beauty.—2 acres. This was sown adjoining the Early Gothland, and the preparation and treatment of the land was the same. Sown 4th May; 1¾ bushel per acre;

came up 14th May; and was ripe 4th August. The time to mature was 92 days. Yield per acre, 41 bushels 11 pounds; weight per bushel, 35 pounds. Length of head, 9 to 11 inches; branching; length of straw, 38 to 46 inches. Made a strong and even growth, but there were a few spots lodged. There was some smut, and the leaves and stems were badly rusted.

Columbus.—1 acre. This also was adjoining the Early Gothland, and the character of the land and the treatment were the same; sown 4th May; 1¾ bushel per acre; came up 14th May; and was ripe 7th August. The time to mature was 95 days. Yield per acre, 36 bushels 8 pounds; weight per bushel, 30 pounds; length of head, 9 to 11 inches, branching; length of straw, 40 to 47 inches. Made a strong and even growth, but some spots were lodged. There was some smut, and the leaves and stems were badly rusted.

Flying Scotchman.—1 acre. This was sown near the Early Gothland; the soil was similar, and the preparation and treatment of the land the same. Sown 4th May; 1¾ bushel per acre; came up 14th May; and was ripe 30th July. The time to mature was 87 days. Yield per acre, 35 bushels 22 pounds; weight per bushel, 38 pounds. Length of head, 7 to 10 inches, branching; length of straw, 38 to 42 inches. Made a medium and even growth; all standing well. There was some smut, and the leaves and stems were badly rusted.

White Schonen.—1 acre. The soil and its treatment and preparation were the same as for Early Gothland. Sown 4th May; 1¾ bushel per acre; came up 14th May; and was ripe 7th August. The time to mature was 95 days. Yield per acre, 38 bushels 23 pounds; weight per bushel, 33¼ pounds. Length of head, 8 to 9 inches, branching; length of straw, 38 to 44 inches. Made a medium but even growth; all standing well. There was some smut, and the leaves and stems were badly rusted.

Early Golden Prolific.—1 acre. The soil was part sandy loam and part peaty. The land was manured in the spring of 1896 with about 12 tons of barn-yard manure per acre. It was ploughed late in the autumn of 1896 from 7 to 8 inches deep, and in the following spring it was disc-harrowed twice and harrowed twice with the smoothing harrow before sowing. The previous crop was Indian corn. Sown 4th May; 1¾ bushel per acre; came up 14th May; and was ripe 7th August. The time to mature was 95 days. Yield per acre, 37 bushels 6 pounds; weight per bushel, 31 pounds. Length of head, 7 to 9 inches, branching; length of straw, 33 to 41 inches. Growth medium and even; all standing well. There was some smut, and the leaves and stems were considerably rusted.

Early Archangel.—1 acre. The soil was similar and the preparation and treatment the same as for the Early Golden Prolific. Sown 4th May; 1¾ bushel per acre; came up 14th May; and was ripe 2nd August. The time to mature was 90 days. Yield per acre, 34 bushels 23 pounds; weight per bushel, 33¼ pounds. Length of head, 7 to 9 inches, branching; length of straw, 38 to 44 inches. Medium to strong growth; all standing well excepting in one spot, which was lodged. There was some smut, and the leaves and stems were badly rusted.

Hazlett's Seizure.—1 acre. The soil was sandy loam of a poor quality; its preparation and treatment the same as for the Early Golden Prolific. Sown 4th May; 1¾ bushel per acre; came up 14th May; and was ripe 6th August. The time to mature was 94 days. Yield per acre, 26 bushels 26 pounds; weight per bushel, 30 pounds. Length of head, 9 to 11 inches, branching; length of straw, 38 to 46 inches. Growth medium; all standing well. There was some smut, and the leaves and stems were very badly rusted.

Mennonite.—1 acre. The soil was sandy loam of a poor quality; its preparation and treatment the same as for the Early Golden Prolific. Sown 4th May; 1¾ bushel per acre; came up 14th May; and was ripe 3rd August. The time to mature was 91 days. Yield per acre, 30 bushels 18 pounds; weight per bushel, 29 pounds. Length of head, 7 to 10 inches, branching; length of straw, 36 to 41 inches. Growth medium; all standing well. There was some smut, and the leaves and stems were badly rusted.

Wallis.—1½ acre The soil was sandy loam of poor quality; its preparation and treatment the same as for the Early Golden Prolific. Sown 4th May; 2 bushels per acre; came up 15th May; and was ripe 7th August. The time to mature was 95 days. Yield per acre, 26 bushels 26 pounds; weight per bushel, 33 pounds. Length of head, 8 to 10 inches, branching; length of straw, 41 to 46 inches. Growth medium and even; some spots lodged. There was some smut, and the leaves and stems were badly rusted.

Bavarian.—6½ acres. Soil sandy loam of variable character; part of it of fair quality, and part of poor quality. This land was manured in the autumn of 1896 with about 12 tons of barn-yard manure per acre, and then ploughed under about 8 inches deep. The previous crop was Indian corn. In the spring of 1897, the land was disc-harrowed twice, and harrowed with the smoothing harrow twice before sowing. Sown 6th May; 2 bushels per acre; came up 15th May; and was ripe 12th August. The time to mature was 98 days. Yield per acre, 35 bushels 17 pounds; weight per bushel, 32 pounds. Length of head, 8 to 10 inches, branching; length of straw, 38 to 44 inches. Growth medium and even; all standing well. There was some smut, and the leaves and stems were considerably rusted.

Banner.—5½ acres. Soil sandy loam of poor quality, a part of it peaty. The preparation and treatment was the same as that for the Bavarian. Sown 6th May; 2 bushels per acre; came up 15th May, and was ripe 12th August. The time to mature was 98 days. Yield per acre, 29 bushels 12 pounds; weight per bushel, 31 pounds. Length of head, 8 to 10 inches, branching; length of straw, 38 to 44 inches. Growth medium, rather weak in the lower spots; all standing well. There were a few heads of smut, and the leaves and stems were considerably rusted.

Abundance—4½ acres. The soil was a sandy loam of fair quality, which was manured in the spring of 1896 with about 10 tons of barn-yard manure per acre. The previous crop was barley. This was not ploughed in the autumn, but was ploughed about 6 inches deep in the spring of 1897, and harrowed three times with the smoothing harrow before sowing. Sown 8th May; 2 bushels per acre; came up 16th May; and was ripe 10th August. The time to mature was 94 days. Yield per acre, 49 bushels 14 pounds; weight per bushel, 34¼ pounds. Length of head, 8 to 11 inches; branching, length of straw, 44 to 49 inches. Growth strong and even, but badly lodged. There was some smut, and the leaves and stems were badly rusted.

EXPERIMENTS WITH BARLEY.

Experiments have been conducted during 1897 with 52 varieties of barley, 23 of which were 2-rowed sorts, and 29 were 6-rowed. These were all sown in plots of $\frac{1}{20}$th acre each. The soil was a sandy loam of good quality, which received a dressing of barn-yard manure during the winter of 1895-96, the manure being placed on the land during the winter in small piles of about half a cart load each and spread in the spring. The previous crop was part flax and part oats. The land was ploughed in the autumn of 1896 from 7 to 8 inches deep, disc-harrowed once in the spring of 1897 and harrowed 3 times with the smoothing harrow before sowing. The 2-rowed varieties were sown from the 1st to 3rd of May, and the 6-rowed on 30th April and 1st May.

TWO-ROWED BARLEY—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
				Inches.	Inches.	Bush.	Lbs	Lbs	
1 Newton	Aug.	2	91	30 to 39	2½ to 3	41	7	45½	Slightly.
2 Logan	"	2	93	40 to 51	3 to 3¾	38	31	47	"
3 Canadian Thorpe	"	1	92	33 to 43	2½ to 3	38	26	46¾	"
4 Kirby	July	30	90	36 to 48	2¾ to 3½	38	21	45¼	"
5 Dunham	"	30	90	45 to 53	3¼ to 4	37	18	47	Considerably.
6 Sidney	Aug.	1	92	40 to 48	3 to 3½	35	41	46	Slightly.
7 Leslie	"	1	93	40 to 48	3 to 3½	35	30	48	"
8 Danish Chevalier	"	2	91	30 to 38	3½ to 4½	34	38	45¼	Considerably.
9 Victor	"	1	92	34 to 46	3¼ to 4	34	28	48	Slightly.
10 Beaver	"	1	90	46 to 50	3½ to 4	34	8	48¼	"
11 Warren	"	1	92	42 to 48	3 to 3¾	33	6	47	Considerably.
12 Pacer	"	1	92	41 to 48	2½ to 3	32	41	49	Slightly.
13 Nepean	"	1	92	43 to 48	2½ to 3¼	31	27	48	"
14 Bolton	"	1	92	42 to 45	3 to 4	31	23	48½	"
15 Jarvis	July	30	90	48 to 53	3½ to 4½	31	9	48¼	"
16 Harvey	"	30	90	36 to 52	3 to 3¾	29	28	47	"
17 Gordon	Aug.	1	92	43 to 48	2½ to 3	29	18	47	"
18 French Chevalier	"	2	93	31 to 39	3¾ to 4¾	24	28	44	"
19 Prize Prolific	"	3	94	33 to 40	3½ to 4½	22	24	44	"
20 Thanet	"	1	90	36 to 44	4 to 4½	21	17	47	Badly,
21 Kinver Chevalier	"	2	91	36 to 44	3¾ to 4¾	19	28	42	Considerably.
22 Monck	"	7	98	36 to 46	3½ to 4	18	26	47	
23 Rigid	"	8	97	36 to 42	2¾ to 3	14	8	46¼	"

Included in the foregoing list are 14 new hybrid sorts of two-rowed barley which have been produced at the experimental farms. The names and parentage of 13 of these were given in the Annual Report of the Experimental Farms for 1896, the 14th named Warren was originated from Baxter's six-rowed fertilized with the pollen of a two-rowed variety, the Duck-bill, in 1892 by Mr. W. T. Macoun at Ottawa.

FIELD CROPS OF TWO-ROWED BARLEY.

Canadian Thorpe.—1¾ acre. Soil a sandy loam of fair quality, which received a dressing of about 12 tons of barn-yard manure, per acre, in the spring of 1895. No fertilizer has been applied since. The previous crop was oats. The land was ploughed late in the autum of 1896 about 8 inches deep and disc-harrowed twice the following spring and harrowed twice with the smoothing harrow before sowing. Sown 7th May; 2 bushels per acre; came up 15th May; and was ripe 2nd August. The time to mature was 87 days. Yield per acre, 35 bushels 27 pounds; weight per bushel, 49¾ pounds. Length of head, 3 to 3¼ inches; length of straw, 36 to 44 inches; growth uneven, medium to weak; all standing well. There was some smut, and the leaves and stems were badly rusted.

SIX-ROWED BARLEY—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
				Inches.	Inches.	Bush.	Lbs.	Lbs	
1 Odessa	July	27	87	41 to 48	2¾ to 3¼	54	3	44	Considerably.
2 Pioneer	"	26	86	48 to 55	2 to 3	50	40	48	Slightly.
3 Mansfield	"	27	88	42 to 50	2 to 3	49	24	45	"
4 Mensury	"	30	90	42 to 52	3 to 4	49	18	44¼	"
5 Trooper	"	26	86	42 to 44	2¼ to 2¾	48	41	47¼	"
6 Royal	"	25	85	36 to 46	2½ to 3	48	6	45¼	"
7 Oderbruch	"	26	86	46 to 51	2 to 3	48	6	47	"
8 Argyle	"	27	87	42 to 48	2 to 3	47	34	44½	"
9 Empire	"	27	87	46 to 50	2½ to 3¼	47	9	47	Considerably.
10 Rennie's Improved	"	25	85	36 to 48	2 to 2½	46	26	46	"
11 Stella	"	24	84	42 to 48	2 to 2½	45	25	47	Slightly.
12 Success	"	22	82	42 to 48	2 to 2½	44	15	44¼	"
13 Vanguard	"	24	84	44 to 51	2¼ to 3	44	13	45	"
14 Petschora	"	24	84	36 to 48	2¼ to 3	43	36	43½	"
15 Nugent	"	30	90	42 to 48	2¼ to 3	43	6	45½	"
16 Albert	"	30	91	36 to 48	3 to 3¼	43	1	44¼	"
17 Blue Barley	"	24	84	36 to 42	2½ to 3	42	34	42	Considerably.
18 Summit	"	26	86	41 to 48	2 to 3	41	37	48¼	Slightly.
19 Phœnix	"	25	85	44 to 50	2 to 2½	41	11	46	"
20 Excelsior	"	25	85	45 to 53	2½ to 3	40	40	43	"
21 Champion	"	26	86	52 to 56	3 to 3¾	40	10	41	Considerably.
22 Common	"	25	85	33 to 42	2 to 3	40		46¼	Slightly.
23 Surprise	"	27	87	39 to 45	2 to 2¾	38	12	47	"
24 Claude	"	26	87	36 to 48	2¼ to 3¼	37	4	43	"
25 Monde (hulless)	"	24	84	39 to 48	2½ to 3	36	2	57½	"
26 Baxters	"	27	87	38 to 48	2 to 2½	35	7	46	Considerably.
27 Brome	"	30	90	36 to 43	2½ to 3¼	33	1	47	Slightly.
28 Yale	"	30	90	40 to 52	2 to 3	32	26	44¼	"
29 Garfield	"	27	87	36 to 48	2 to 3	30	45	45¼	"

Included in this list of varieties of six-rowed barley there are seventeen new hybrid sorts which have been produced at the experimental farms. The names and parentage of 15 of these were given in the annual report for 1896, the two now added are 16 Vanguard and 17 Surprise. These were originated in 1889, at the Central Experimental Farm at Ottawa, by the Director and are both hybrids between Swedish (two-rowed) female with Baxter's (six-rowed) male.

FIELD CROPS OF SIX-ROWED BARLEY.

Royal.—2½ acres. Soil a sandy loam, rather light in character, which received a coating of barn-yard manure of about 12 tons per acre in the spring of 1895. No fertilizer has been applied since. The previous crop was oats. The land was ploughed very lightly after harvest to start weed seeds and shed grain, and again later in the autumn, about 8 inches deep. In the spring it was disc-harrowed twice, and harrowed twice with the smoothing harrow before sowing. Sown 1st May; 1¾ bushel per acre; came up 10th May; and was ripe 26th July. The time to mature was 86 days. Yield per acre, 29 bushels 42 pounds; weight per bushel, 48 pounds. Length of head, about 3 inches; length of straw, 42 to 46 inches. Growth medium to strong and even; all standing well, and the grain ripened very evenly. There was some smut but no rust.

Trooper.—2⅓ acres. This was adjoining the field of Royal barley; the soil was similar and the preparation and treatment of the land the same. Sown 1st May; 1¾ bushel per acre; came up 10th May; and was ripe 27th July. The time to mature was 87 days. Yield per acre, 26 bushels 15 pounds; weight per bushel, 49¼ pounds. Length of head, 2½ to 3 inches; length of straw, 40 to 42 inches; growth medium to weak; all standing well. There was some smut but no rust.

Mensury.—2¾ acres. This and the three following plots were adjoining that of Trooper; the soil was similar and the preparation and treatment of the land the same throughout. Sown 3rd May; 1¾ bushel per acre; came up 10th May; and was ripe 25th July. The time to mature was 83 days. Yield per acre, 36 bushels 47 pounds; weight per bushel, 48¼ pounds. Length of head, 3 to 3¼ inches; length of straw, 44 to 48 inches. Growth strong and even; all standing well. There was some smut but no rust.

Champion.—½ acre. Sown 3rd May; 1¾ bushel per acre; came up 11th May, and was ripe 25th July. The time to mature was 83 days. Yield per acre, 43 bushels 46 pounds; weight per bushel, 44 pounds. Length of head, 3 to 3¼ inches; beardless; length of straw, 42 to 44 inches. Growth medium to strong; standing fairly well. There was some smut, and the leaves and stems were somewhat rusted.

Success.—½ acre. Sown 3rd May; 1¾ bushel per acre; came up 11th May, and was ripe 22nd July. The time to mature was 81 days. Yield per acre, 43 bushels 29 pounds; weight per bushel, 45¼ pounds. Length of head, 2 to 2¼ inches; beardless; length of straw, 36 to 40 inches. Growth medium and even; all standing well. No smut or rust.

Odessa.—¾ acre. Sown 3rd May; 1¾ bushel per acre; came up 11th May, and was ripe 26th July. The time to mature was 84 days. Yield per acre, 37 bushels 10 pounds; weight per bushel, 48 pounds. Length of head 2¾ to 3 inches; length of straw, 32 to 41 inches. Growth strong and even; standing fairly well, only one spot lodged. There was some smut, and the leaves and stems were slightly rusted.

EXPERIMENTS WITH SPRING WHEAT.

Fifty-six varieties of spring wheat were tested during the season of 1897, grown on plots of $\frac{1}{20}$th acre each. The land selected for the wheat plots was adjoining that used for the test of varieties of barley, the soil was similar and the preparation and treatment of the land the same. The previous crop was barley. The plots were all sown on the 29th and 30th April at the rate of one and a half bushel per acre.

SPRING WHEAT—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
				Inches.	Inches.		Bush.	Lbs.	Lbs.	
1 Plumper	Aug.	3	95	46 to 50	2½ to 3¼	Bearded	26	42	59	Considerably.
2 Roumanian	"	9	102	48 to 52	2¼ to 2¾	"	26	30	57¼	Slightly.
3 Wellman's Fife	"	9	102	52 to 56	4 to 4½	Beardless.	24	55	53	"
4 Blair	"	2	94	42 to 48	2½ to 3	"	24	10	58	"
5 Mason	"	2	94	42 to 47	2½ to 3½	"	23	20	59¼	Considerably.
6 White Fife	"	8	100	39 to 48	3 to 3½	"	23	5	54¼	Slightly.
7 Harold	July	27	89	43 to 52	2 to 3	Bearded	22	50	56	Considerably.
8 Colorado	Aug.	4	94	44 to 51	2¾ to 3½	"	22	15	58½	"
9 Monarch	"	9	102	48 to 52	4 to 5	Beardless.	22	7	54	Slightly.
10 Rio Grande	"	8	101	36 to 54	4 to 5	Bearded	22		58	Considerably.
11 Laurel	"	9	101	42 to 54	3½ to 4	Beardless.	22		51	Slightly.
12 White Connell	"	10	102	44 to 51	3¼ to 4	"	21	30	52¼	"
13 Old Red River	"	9	102	42 to 48	3½ to 4	"	21	27	52	"
14 Crawford	"	2	94	42 to 50	2½ to 3½	"	21	20	55¼	Considerably.
15 Huron	"	3	96	42 to 50	3 to 3½	Bearded	21		55	Slightly.
16 Advance	"	3	96	42 to 51	3 to 3½	"	20	40	55	"
17 White Russian	"	9	101	42 to 55	3½ to 4½	Beardless.	20	35	52	"

SPRING WHEAT—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
				Inches.	Inches.		Bush.	Lbs.	lbs.	
18 Cartier	Aug.	2	94	36 to 46	2½ to 3	Bearded	20	25	59½	Considerably.
19 Hungarian	"	5	98	48	3 to 3½	"	20	20	54½	"
20 Blenheim	"	5	98	42 to 48	3 to 4	"	20	17	55	"
21 Preston	"	5	98	42 to 48	3 to 4	"	20	10	55	Slightly.
22 Pride of Baropa	"	5	97	42 to 48	2¾ to 3½	Beardless.	20	10	56½	"
23 Dufferin	"	2	95	43 to 52	2½ to 3	Bearded	19	55	57	Considerably.
24 Countess	"	3	95	42 to 46	2½ to 3½	Beardless.	19	55	58½	Slightly.
25 Dawn	"	2	95	42 to 46	2¾ to 3½	"	19	55	56	Considerably.
26 Rideau	"	2	95	42 to 52	2¼ to 3	"	19	55	53	"
27 Crown	"	3	96	42 to 48	3 to 3½	Bearded	19	45	55	"
28 Bishop	"	2	95	42 to 50	2½ to 3½	Beardless.	19	30	58	"
29 Goose	"	6	99	42 to 48	2 to 2½	Bearded	19	15	58½	Slightly.
30 Red Fife	"	9	102	40 to 48	3¼ to 4	Beardless.	19	15	52	"
31 Pringle's Champlain	"	4	97	40 to 48	3½ to 4½	Bearded	19		56	"
32 Progress	"	6	99	48 to 51	3 to 4	Beardless.	18	55	54½	"
33 Essex	"	8	100	42 to 48	3½ to 4	"	18	55	52	Considerably.
34 Ebert	"	3	95	39 to 48	2½ to 3	"	18	45	56½	Badly.
35 Stanley	"	5	98	48	3 to 4	"	18	10	53½	Slightly.
36 Angus	"	2	94	40 to 48	2½ to 3	"	17	50	58	"
37 Admiral	"	8	100	48 to 52	....	"	17	30	52	"
38 Dawson	"	6	98	42 to 48	3½ to 4	"	17	25	54	Considerably.
39 Alpha	"	6	99	48 to 52	3 to 4	"	17	10	53	Slightly.
40 Vernon	"	8	101	42 to 48	2¾ to 3¼	Bearded	16	50	53	Considerably.
41 Captor, Red Chaff	"	5	98	44 to 51	3 to 4	Beardless.	16	50	52	Slightly.
42 Percy	"	5	98	42 to 51	3 to 3½	"	16	39	54	"
43 Fraser	"	1	93	36 to 44	2½ to 3	Bearded	16	10	59½	Considerably.
44 Campbell's White Chaff	"	7	100	48 to 51	3 to 3½	Beardless.	16		51	Badly.
45 Black Sea	"	3	96	42 to 48	3 to 3½	Bearded	15	55	52	Considerably.
46 Jordan	"	6	98	46 to 50	3 to 4	Beardless.	15	37	51	"
47 Golden Drop	"	4	96	43 to 48	2½ to 3	"	15		51	"
48 Ladoga	"	3	96	48 to 53	3 to 3½	Bearded	14	55	53	"
49 Beauty	"	8	101	48 to 52	3½ to 4½	Beardless.	14	35	50	"
50 Captor	"	3	96	36 to 48	2½ to 3½	"	14	13	52	"
51 Beaudry	"	3	96	48 to 53	3 to 3½	Bearded	14		54½	Slightly.
52 Herisson Bearded	"	5	98	45 to 51	1½ to 2	"	13	50	52½	"
53 Percy, White Chaff	"	5	98	42 to 51	3 to 4	Beardless.	13	37	50	"
54 Red Fern	"	8	101	36 to 48	3½ to 4½	Bearded	12	59	52½	Considerably.
55 Dions	"	8	101	48 to 52	3½ to 4½	"	12	50	52	"
56 Emporium	"	8	101	50 to 54	3½ to 4½	"	10	21	51½	"

In the foregoing list there are included thirty-one of the new cross-bred sorts which have been originated at the experimental farms. A list of the names and parentage of fifteen of these was given in the annual report for 1896, a continuation of this list will be found below :—

16. Angus—Early Sonora	Female	with	Red Fife	Male.
17. Dawson—White Connell	do		Hard Red Calcutta	do
18. Fraser—Alpha	do		Hard Red Calcutta	do
19. Crawford—Alpha	do		Gehun	do
20. Jordan—Red Fife	do		Anglo Canadian	do
21. Laurel—Red Fife	do		Gehun	do
22. Plumper—Colorado	do		Gehun	do
23. Blair—Colorado	do		Gehun	do
24. Mason—Colorado	do		Gehun	do
25. Cartier—Colorado	do		Gehun	do
26. Bishop—Ladoga	do		Gehun	do
27. Ebert—Gehun	do		Ladoga	do
28. Harold—Gehun	do		Onega	do

29. Essex—White Fife........	Female with	Stewart..............	Male.
30. Countess—Early Sonora....	do	Red Fife.............	do
31. Rideau—Spiti Valley......	do	Red Fife.............	do

Of these results in cross-fertilizing six were originated at the Central Experimental Farm by the Director, three in 1889, Nos. 16, 30 and 31, two in 1890, Nos. 20 and 29, and one in 1891, No. 23. Seven were the results of the work of Mr. W. T. Macoun also at the Central Farm; six were produced in 1891, Nos. 22, 24, 25, 26, 27 and 28, and one in 1892, No. 19. Three were originated by Dr. A. P. Saunders, in 1892, two of them Nos. 17 and 21 at the branch experimental farm at Brandon, Manitoba and one No. 18 at the branch farm at Agassiz, British Columbia.

FIELD PLOTS OF WHEAT.

Preston.—½ acre. Soil a sandy loam of fair quality, which received a dressing of barn-yard manure in the spring of 1896, of about 12 tons per acre. The previous crop was potatoes. The land was ploughed in the autumn of 1896, about 8 inches deep, and in the following spring disc-harrowed twice and harrowed twice with the smoothing harrow before sowing. Sown 1st May; 1½ bushel per acre; came up 11th May; and was ripe 7th August. The time to mature was 98 days. Yield per acre, 28 bushels 42 pounds; weight per bushel, 56½ pounds. Length of head, 3 to 3¼ inches; length of straw, 36 to 40 inches. Growth medium to strong and even; all standing well. There was no smut, but the leaves and stems were badly rusted.

Advance.—½ acre. This and the next plot referred to were both adjoining the Preston; the soil was similar and the preparation and treatment of the land the same Sown 1st May; 1½ bushel per acre; came up 11th May; and was ripe 7th August. The time to mature was 98 days. Yield per acre, 25 bushels 1 pound; weight per bushel, 55 pounds. Length of head, 3¾ to 4 inches; length of straw, 36 to 41 inches. Growth tolerably even; standing fairly well; some of the straw was broken about a foot from the ground. There was no smut, but the leaves and stems were badly rusted.

Herisson Bearded.—½ acre. Sown 1st May; 1½ bushel per acre; came up 11th May; and was ripe 9th August. The time to mature was 100 days. Yield per acre, 25 bushels 58 pounds; weight per bushel, 57½ pounds. Length of head, 2 to 2¼ inches; length of straw, 36 to 40 inches. Growth medium to strong and even; all standing well. There was no smut, but the leaves and stems were badly rusted.

EXPERIMENTS WITH PEASE.

During the season of 1897, seventy-nine varieties of pease have been tested on uniform plots of $\frac{1}{20}$th acre each, and the results are given in the appended table. The land on which these pease were sown was adjoining that used for the plots of barley, the soil however was a lighter sandy loam and not so good in quality. The preparation and treatment of the land was the same as that used for the barley plots. The land was occupied in 1896 with experimental plots of wheat, oats and barley. The plots of pease were all sown on the 3rd and 4th of May with the following results:—

PEASE—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Yield per Acre.		Weight per Bushel.
				Inches.	Inches.	Bush.	Lbs.	Lbs.
1 Canadian Beauty	Aug. 24	112	Strong	60 to 96	2½ to 3¼	31	50	63
2 Oddfellow	" 6	95	"	36 to 48	1½ to 2	30	30	66
3 Arthur	" 7	95	"	....	....	30	20	63
4 Creeper	" 21	109	"	48 to 72	1¾ to 3½	29	40	63¼
5 King	" 20	109	"	60 to 84	2 to 2½	29	35	62
6 Cooper	" 14	103	"	36 to 60	1¾ to 2½	29		62
7 Picton	" 12	101	"	60 to 84	2½ to 3	28	9	63
8 Macoun	" 31	119	"	72 to 96	2¼ to 3	27	40	61
9 Fergus	" 20	109	"	72 to 84	2 to 2½	27	40	61½
10 Prussian Blue	" 12	100	"	72 to 96	2¼ to 2¾	27	20	63¼
11 Gregory	" 17	106	"	48 to 60	2 to 2¾	27	20	61
12 Lanark	" 9	98	"	48 to 72	2½ to 3	27	15	60¼
13 Fenton	" 12	100	"	60 to 72	2½ to 3¼	27	10	60¼
14 Prince Albert	" 28	117	"	84 to 96	2 to 2½	27	5	63½
15 Pearl	" 30	119	"	72	2½ to 3	27		62
16 Crown	" 14	103	"	60 to 72	2 to 2½	26	50	63¼
17 Harrison's Glory	" 9	98	Medium	30 to 36	2¼ to 3	26	40	60¼
18 Forbes	" 14	103	Strong	72 to 84	1½ to 2½	26	40	62
19 Early Britain	" 7	95	"	48	2¼ to 2¾	26	30	59
20 Dixon	" 19	108	"	72 to 84	2½ to 3	26	20	62¼
21 Perth	" 9	97	"	48 to 60	2¼ to 3	26	20	61
22 Victoria	" 30	118	"	72 to 96	2¼ to 2¾	26	..	61¼
23 Lisgar	" 18	107	"	60 to 84	2¼ to 3	25	50	62½
24 Vincent	" 10	98	"	42 to 48	2½ to 3	25	50	61½
25 Weston	" 28	117	"	72 to 84	2¼ to 3	25	40	62½
26 Carleton	" 19	107	"	60 to 72	2 to 2½	25	40	63
27 New Potter	" 27	115	"	72 to 96	2½ to 3	25	20	62
28 Dover	" 24	113	"	60 to 72	2¼ to 3	25		62½
29 Alma	" 20	109	"	60 to 84	2 to 2¾	25		63
30 Agnes	" 9	98	"	48 to 60	2½ to 3	24	45	61½
31 Prospect	" 17	106	"	60 to 72	2¼ to 2¾	24	40	60
32 Derby	" 28	117	"	60 to 72	2¼ to 3	24	40	61
33 Elephant Blue	" 9	97	"	36 to 48	2 to 2¾	24	40	62
34 Kent	" 26	114	"	48 to 72	2½ to 3¼	24	30	62
35 Duke	" 23	111	"	48 to 72	2¼ to 3	24	30	63
36 Black Eyed Marrowfat	" 19	108	"	60 to 84	2½ to 3	24	20	62¼
37 Elliott	" 12	101	"	48 to 72	2½ to 3	24	5	61
38 Dexter	" 14	103	"	48 to 60	2¼ to 3	24	3	61¼
39 Chelsea	" 18	107	"	60 to 72	1¾ to 2½	23	50	63
40 Mummy	" 7	95	Medium	36 to 48	2 to 2½	23	50	64¼
41 Kerry	" 27	116	Strong	84 to 96	2½ to 3¼	23	50	61¼
42 Nelson	" 7	95	"	36 to 42	2 to 2¾	23	45	64¼
43 Elder	" 27	116	"	48 to 72	1¾ to 2½	23	45	62¼
44 German White	" 6	94	"	42 to 48	2½ to 3	23	40	61
45 Clarke	" 18	107	"	48 to 72	1¾ to 2½	23	30	64
46 Ogden	" 29	118	"	84 to 96	2 to 2½	23	20	62½
47 Herald	" 17	106	"	60	2 to 2½	23	10	64
48 Hazen	" 12	101	"	72 to 84	2½ to 3	23	10	63
49 Dover	" 24	113	"	60 to 72	2¼ to 3	23	10	63
50 Grant	" 16	105	"	60 to 84	2¼ to 3	23	10	61½
51 Paragon	" 29	117	"	72 to 84	2½ to 3¼	22	50	61¼
52 Bedford	" 30	118	"	84 to 108	2 to 2½	22	50	62½
53 Tracey	" 17	105	"	60 to 72	2¼ to 3	22	50	62
54 Jackson	" 15	104	"	72	1¾ to 2½	22	45	63
55 Leader	" 18	106	"	72 to 84	2½ to 3¼	22	30	60
56 Chancellor	" 5	93	"	48 to 72	1 to 2	22		61¾
57 Comet	" 23	112	"	72 to 84	2 to 3	22		60½
58 Surrey	" 28	116	"	72 to 84	2¼ to 3	21	50	62¼
59 Bruce	" 20	108	"	60	2½ to 3¼	21	30	60¼
60 Multiplier	" 18	106	"	60	2 to 2½	21		63¼
61 Golden Vine	" 18	106	Medium	30 to 54	1½ to 2¼	20	50	63
62 Nixon	" 18	107	Strong	60 to 72	2 to 3	20	40	62¼
63 Large White Marrowfat	" 12	100	"	48 to 60	2½ to 3	20	30	
64 Bright	" 29	117	"	60 to 84	2¼ to 3	20	20	63
65 Centennial	" 21	109	"	60	2 to 2¾	20	20	62¼

PEASE—TEST OF VARIETIES—*Continued.*

Name of Variety.	Date of Ripening.	No. of days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Yield per Acre.		Weight per Bushel.
				Inches.	Inches.	Bush.	Lbs.	Lbs.
66 Moore	Aug. 7	96	Strong	48	2½ to 3	20		59½
67 Archer	" 18	106	"	60 to 72	2 to 2½	20		63¼
68 Vasey	" 26	114	"	60 to 72	2½ to 3¼	19	50	61¼
69 Albion	" 20	108	"	60 to 72	2 to 2½	19	40	63
70 Mackay	" 14	102	"	36 to 60	2¼ to 3	17	40	62
71 Elva	" 23	111	"	72	2¼ to 3	17	5	63
72 Trilby	" 30	118	"	60 to 72	2½ to 3¼	15	40	61
73 Prince	" 18	106	"	60 to 72	2½ to 3	15		62
74 Kingsford	" 9	98	"	36 to 48	2 to 2½	14	55	63½
75 Luther	" 23	111	"	60 to 84	2½ to 3	14	30	61½
76 Excelsior	" 24	112	"	60 to 72	2 to 2½	14	20	62
77 Daniel O'Rourke	" 5	93	Medium	36 to 42	2 to 2¾	14		61½
78 White Wonder	" 5	93	"	18 to 30	2¼ to 2¾	9	5	62
79 Pride	" 6	94	"	24 to 30	2 to 2½	7	40	60

The Pease, White Wonder and Pride, are both low growers and happened to be sown on a rather low spot, on which weeds grew unusually rank, and hence the vines were partly smothered, and the yields very small. Hitherto both these varieties have given good crops. Mackay also which was near the head of the list last year has not given a satisfactory return. The vines were very thin on the plot, due either to faulty germination of the seed, or to the ravages of cut worms.

The following new varieties included in the above list have been tested for the first time, Oddfellow, Harrison's Glory, Elephant Blue and German White.

FIELD CROPS OF PEASE.

Creeper.—½ acre. Soil sandy loam of medium quality, which received a dressing of barnyard manure of about 12 tons per acre in the spring of 1895. No fertilizer has been applied since. The previous crop was hay. The land was ploughed in the spring of 1897 about 6 inches deep, disc-harrowed once and harrowed twice with the smoothing harrow before sowing. Sown 13th May; 2 bushels per acre; came up 22nd May, and was ripe 23rd August. The time to mature was 102 days. Yield per acre, 38 bushels 9 pounds; weight per bushel, 63½ pounds. Growth medium and even; pods small, fairly abundant. Length of straw, 46 to 52 inches.

Agnes.—½ acre. This plot and that of Arthur, which follows, were sown adjoining Creeper; the soil was similar and the preparation and treatment of the land the same. Sown 13th May; 2½ bushels per acre; came up 22nd May and was ripe 25th August. The time to mature was 104 days. Yield per acre, 33 bushels 24 pounds; weight per bushel, 62 pounds. Growth medium and even; pods large. Length of straw, 41 to 52 inches.

Arthur.—½ acre. Sown 13th May; 2 bushels per acre; came up 22nd May, and was ripe 19th August. The time to mature was 98 days. Yield per acre, 38 bushels 14 pounds; weight per bushel, 64 pounds. Well podded; pods small and in clusters, like the Mummy; the straw also resembles the Mummy in thickness and in its upright growth. Length of straw, 39 to 48 inches.

RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

These experiments have all been conducted on similar land on $\frac{1}{10}$th acre plots, the plots adjoining each other.

OATS SOWN AT DIFFERENT DATES.

Name of Variety.	Date of Sowing.	Date of Ripening	No. of Days Maturing.	Length of Straw.	Weight of Straw per acre.	Yield of grain per acre.		Weight per bushel.	Rusted.
				Inches.	Lbs.	Bush.	lbs.		
Banner............	April 13	Aug. 2	111	44 to 48	3,220	70	..	34¾	Slightly.
"	" 21	" 3	104	44 to 51	2,350	77	22	34¼	Considerably.
"	" 28	" 9	103	46 to 51	2,330	69	24	34¾	Badly.
"	May 5	" 11	98	38 to 48	2,350	66	6	29	"
"	" 12	" 14	94	36 to 48	2,790	54	24	29¼	"
"	" 19	" 14	87	38 to 42	3,050	42	22	24	"
Abundance.........	April 13	" 1	110	44 to 46	3,100	44	14	37	Slightly.
"	" 21	" 2	103	48 to 51	3,720	58	8	34	Considerably.
"	" 28	" 7	101	46 to 49	3,850	53	8	34¾	Badly.
"	May 5	" 9	96	34 to 44	3,350	50	10	33	"
"	" 12	" 12	92	46 to 49	3,890	40	10	35	"
"	" 19	" 14	87	36 to 41	3,190	37	12	24	"

BARLEY SOWN AT DIFFERENT DATES.

Canadian Thorpe ..	April 13	July 26	104	42 to 46	3,200	35	40	49	No rust.
" ..	" 21	" 26	96	46 to 49	3,610	46	42	44	"
" ..	" 28	" 30	93	32 to 38	2,830	35	10	48¼	Considerably.
" ..	May 5	Aug. 2	89	46 to 47	2,630	36	2	48¼	"
" ..	" 12	" 6	86	44 to 47	2,245	19	32	44	Badly.
" ..	" 19	" 11	84	... .	1,880	21	12	42	"
Odessa	April 13	July 23	101	40 to 46	3,720	40	20	47	No rust.
"	" 21	" 23	93	40 to 42	3,230	53	36	47	"
"	" 28	" 26	89	40 to 42	2,830	41	22	47	"
"	May 5	" 27	83	42 to 48	2,910	36	42	47	"
"	" 12	Aug. 2	82	28 to 36	2,340	31	32	47	Considerably.
"	" 19	" 5	78	26 to 31	2,270	27	34	42¼	Badly.

SPRING WHEAT SOWN AT DIFFERENT DATES.

Red Fife..........	April 13	Aug. 4	113	38 to 43	1,900	19	20	51⅓	Considerably.
"	" 21	" 7	108	38 to 44	4,120	20	40	55⅓	"
"	" 28	" 9	103	38 to 45	3,640	18	50	50⅓	Badly.
"	May 5	" 12	99	35 to 39	3,370	16	50	54⅓	"
"	" 12	" 14	94	35 to 39	2,430	10	50	52¼	Very badly.
"	" 19	" 16	89	24 to 36	1,680	7		54¼	"
Stanley............	April 13	" 2	111	36 to 38	1,200	16	50	51¾	Badly.
"	" 21	" 6	107	38 to 44	3,770	20	30	54¼	Considerably.
"	" 28	" 7	101	36 to 44	3,260	17	20	52½	Badly.
"	May 5	" 9	96	34 to 38	2,660	12	40	51	Very badly.
"	" 12	" 12	92	36 to 42	2,230	7	30	51	Badly.
"	" 19	" 14	87	24 to 36	2,480	6	20	54¼	Very badly.

PEASE SOWN AT DIFFERENT DATES.

Name of Variety.	Date of Sowing.	Date of Ripening	No. of Days Maturing.	Length of Straw.	Weight of Straw per acre.	Yield of grain per acre.		Weight per bushel.
				Inches.	Lbs.	Bush.	lbs.	
Mummy	April 13	Aug. 2	111	48 to 52	2,220	23	40	63¼
"	" 21	" 4	105	48 to 54	1,680	28	20	63
"	" 28	" 6	100	48 to 54	1,340	27	.	64
"	May 5	" 7	94	48 to 54	1,530	24	40	65
"	" 12	" 8	88	42 to 48	1,335	23	25	64¼
"	" 19	" 14	87	40 to 48	930	22	50	61
Golden Vine	April 13	" 4	113	55 to 60	2,330	25	50	63
"	" 21	" 7	108	50 to 58	1,680	29	40	63½
"	" 28	" 9	103	50 to 54	1,360	24	50	63
"	May 5	" 13	100	50 to 56	1,270	28	20	63¾
"	" 12	" 14	94	50 to 55	1,230	23	20	64
"	" 19	" 18	91	50 to 55	1,570	19	10	63½

SUMMARY OF RESULTS OF EARLY, MEDIUM, AND LATE SOWINGS FOR THE WHOLE PERIOD.

The following are the average crops which have been obtained, during the full period these tests have been continued—that is eight years with the oats, barley and spring wheat, and three years with the pease :—

Tests continued for Eight Years.									Tests continued for Three Years.		
Oats.	Average Yield per acre.		Barley.	Average Yield per acre.		Spring Wheat.	Average Yield per acre.		Pease.	Average Yield per acre.	
	Bush.	lbs.		Bush.	lbs.		Bush.	lbs.		Bush.	lbs.
1st Sowing	54	31	1st Sowing	39	43	1st Sowing	18	23	1st Sowing	29	21
2nd "	59	8	2nd "	41	30	2nd "	19	23	2nd "	32	45
3rd "	50	2	3rd "	32	29	3rd "	14	19	3rd "	33	25
4th "	44	14	4th "	29	10	4th "	12	28	4th "	29	14
5th "	39	17	5th "	25	3	5th "	10	34	5th "	26	19
6th "	29	23	6th "	22	33	6th "	8	56	6th "	24	6

EXPERIMENTS WITH INDIAN CORN.

During the season of 1897, twenty-eight varieties of Indian corn have been tested side by side on fairly uniform land. The soil was a sandy loam of fair quality which received in the spring of 1894, an application of about 12 tons of barn-yard manure per acre. No fertilizer has been applied since. The previous crop was pease. The land was ploughed in the autumn of 1896, about 8 inches deep and again in the spring of 1897, about 6 inches deep and harrowed twice with the smoothing harrow before planting. The varieties were all planted 25th May, and were cut for ensilage 17th September. The yield per acre has been calculated from the weight of the crop cut from two rows each 66 feet long.

INDIAN CORN—TEST OF VARIETIES.

Name of Variety.	Character of Growth.	Description of Variety.	Height.	Leafiness.	When Tasselled.	In Silk.	Early Milk.	Condition when cut.	Weight per acre grown in rows. Tons.	Lbs.
			Inches.							
1 Selected Leaming	Very strong.	Red and yellow dent	132 to 144	Leafy	Aug. 6	Aug. 11		Early milk	36	1,260
2 Giant Prolific Ensilage	"	White dent	132 to 144	"	" 7	" 12		"	36	1,062
3 Cloud's Early Yellow	"	Red and yellow dent	120 to 132	"	" 4	" 12		"	32	416
4 Mammoth Cuban	"	"	120 to 144	"	" 6	" 16		"	31	1,228
5 Red Cob Ensilage	"	White dent	126 to 144	"	" 15	" 23		"	30	1,512
6 Cuban Giant	"	Red and yellow dent	120 to 144	"	" 3	" 11		"	26	800
7 Thoroughbred White Flint	"	White flint	120 to 132	Very leafy	" 9	" 18		Nearly in early milk	26	767
8 Champion White Pearl	"	White dent	132 to 144	Leafy	" 8	" 17		"	25	556
9 North Dakota White	Strong	White flint	96 to 102	"	July 31	" 8		Glazed	25	292
10 Mammoth Eight-rowed Flint	"	Yellow flint	96 to 108	"	" 27	" 4	Aug. 27	Late milk	24	708
11 Ninety Day	Very strong.	White dent	114 to 126	"	Aug. 4	" 9		Early milk	23	992
12 Wisconsin White Dent	"	"	120 to 132	"	" 3	" 9		Late milk	23	596
13 Longfellow	Strong	Yellow flint	96 to 114	Very leafy	July 30	" 8	Sept. 1	"	22	1,870
14 Pride of the North	Very strong.	Red and yellow dent	120 to 132	Leafy	" 30	" 5	Aug. 31	"	22	1,804
15 North Dakota Yellow	Strong	Yellow flint	90 to 102	"	" 29	" 4	" 27	Glazed	22	165
16 Early Butler	"	Red and yellow dent	96 to 108	"	" 31	" 5		Late milk	21	1,296
17 Sanford	"	White flint	96 to 108	"	" 27	" 4	Aug. 27	"	21	1,164
18 Extra Early Huron Dent	"	Red and yellow dent	108 to 120	"	" 31	" 4	" 29	"	20	1,976
19 Compton's Early	"	Yellow flint	96 to 120	"	Aug. 2	" 11		"	20	1,976
20 Angel of Midnight	"	"	96 to 108	Very leafy	July 27	" 4	Aug. 27	Glazed	20	1,580
21 White Cap Yellow Dent	Very strong.	Yellow and white dent.	120 to 144	"				Late milk	19	1,290
22 Canada White Flint	Strong	White flint	96 to 108	Leafy	July 26	Aug. 1	Aug. 24	Glazed	18	1,818
23 Wisconsin Yellow Dent	"	Red and yellow dent	102 to 114	"	" 30	" 5		Late milk	18	102
24 King of the Earliest	"	"	96 to 108	Fairly leafy	" 29	" 5	Aug. 31	"	17	980
25 Pearce's Prolific	"	Yellow flint	84 to 108	Leafy	" 27	" 6	" 27	Glazed	17	848
26 Mitchell's Extra Early	Medium	White flint	60 to 72	Fairly leafy	" 24	July 26	" 15	Ripe	16	736
27 Mammoth Sweet Fodder	"	Sweet	78 to 96	"	" 24	" 26	" 17	Nearly ripe	13	1,720
28 Kendall's Giant	"	"	66 to 84	"	" 25	" 30	" 25	Late milk	13	400

FIELD CROPS OF INDIAN CORN.

The following varieties were sown in larger field plots :—

Mammoth Eight-rowed Flint.—2 acres. Soil, sandy loam of fair quality, with patches of heavier soil which were partly clay. The land was ploughed in the autumn of 1896 about 8 inches deep and received an application of barn-yard manure of about 15 tons per acre, distributed in small piles of about one-third of a cart-load each, during the winter, and spread in the spring, after which it was ploughed under about 6 inches deep and harrowed twice with the smoothing harrow before sowing. The previous crop consisted partly of pease and partly of buckwheat. Planted 27th May, in hills 3 feet apart each way, 4 to 5 kernels in each hill; came up 10th June; and was cut for ensilage 22nd September. The growth was strong and even, leafy from top to bottom, and 7 to 8 feet high; the ears were well advanced in the glazed condition, some beginning to harden. Yield per acre, 19 tons 38 pounds.

Compton's Early.—2½ acres. This and the three following field plots were adjoining the Mammoth Eight-rowed Flint; the soil was similar, excepting that on which the Angel of Midnight was planted, and the preparation and treatment of the land in each case the same.' Planted 27th May, in hills; came up 10th June; and was cut for ensilage on 21st September. Growth, strong and even; leafy from top to bottom; 7 to 8 feet high; stalks extra well eared; and the ears well advanced in the glazed condition, some beginning to harden. Yield, 15 tons 1,190 pounds per acre.

Angel of Midnight.—2 acres. Part of the land in this field was low and clayey, and hence less suitable for this crop. Planted 26th May, in hills; came up 10th June; and was cut for ensilage 22nd September. Growth, strong and even; leafy from top to bottom; height, 7 to 8 feet; stalks extra well eared, and the ears well advanced in the glazed condition. Yield per acre, 12 tons 1,877 pounds.

White Cap Yellow Dent.—2 acres. Planted 26th May, in hills; came up 10th June; and was cut for ensilage 24th September. Growth, strong and even; leafy, especially towards the top; height, 10 to 12 feet; stalks well eared, and the ears in the late milk. Yield per acre, 17 tons 1,797 pounds.

Extra Early Huron.—½ acre. Soil sandy loam of good quality; treatment and preparation the same as that for Mammoth Eight-rowed Flint. Planted 26th May, in hills; came up 9th June; and was cut for ensilage 24th September. Growth strong and even; leafy at top and fairly leafy below; height, 9 to 10 feet; stalks well eared, and ears in the late milk. Yield per acre, 18 tons 730 pounds.

Canada White Flint.—½ acre. This and the thirteen following one-half acre plots, were all in the same field as Extra Early Huron; the soil was similar, and the preparation and treatment of the land the same as for that variety. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 24th September. Growth strong and even; leafy from top to bottom; height, 7½ to 8½ feet; stalks well eared, ears beginning to ripen. Yield per acre, 16 tons 1,460 pounds.

Sanford Flint.—½ acre. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 24th September. Growth very strong and even; leafy throughout; height 7½ to 8 feet; stalks well eared, ears in late milk. Yield per acre, 18 tons 930 pounds.

Rural Thoroughbred White Flint.—½ acre. Planted 22nd May, in hills; came up 11th June; and was cut for ensilage 27th September. Growth very strong and even; leafy from top to bottom; height 9 to 10 feet; stalks well eared, ears in the early milk stage. Yield per acre, 23 tons 1,934 pounds

Pride of the North.—½ acre. Planted 22nd May, in hills; came up 9thJune; and was cut for ensilage 24th September. Growth, strong and even; leafy from top to bottom; height, 9 to 10 feet; stalks well eared, grain beginning to harden. Yield per acre, 16 tons 320 pounds.

Red Cob Ensilage.—½ acre. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 27th September. Growth strong and even; fairly leafy at top, with few leaves at bottom; height, 12 to 14 feet; ears not plentiful, in early milk. This variety is too late in ripening here to make ensilage of best quality. Yield per acre, 24 tons 134 pounds.

Selected Leaming.—½ acre. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 27th September. Growth strong and even; leafy at top, few leaves at bottom; stalks well eared, ears in late milk. Yield per acre, 23 tons 910 pounds.

Early Butler.—½ acre. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 24th September. Growth strong and even; leafy at top, fewer leaves at bottom; stalks well eared, ears beginning to harden. Yield per acre, 17 tons 1,970 pounds.

North Dakota White.—½ acre. Planted 22nd May, in hills; came up 10th June; and was cut for ensilage 27th September. Growth strong and even; leafy throughout; height, 8 to 10 feet; stalks well eared, ears in the glazing stage, beginning to harden. Yield per acre, 19 tons 1,600 pounds.

Ninety-day Corn.—½ acre. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 28th September. Growth strong and even; leafy throughout; height, 10 to 12 feet; stalks well eared, ears in late milk. Yield per acre, 17 tons 590 pounds.

Cloud's Early Yellow Dent.—½ acre. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 28th September. Growth strong and even; leafy above, with very few leaves below; height 10 to 12 feet; stalks well eared, ears in late milk. Yield per acre, 23 tons 1,520 pounds.

Mammoth Cuban.—½ acre. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 28th September. Growth strong and even; leafy above, very few leaves below; stalks well eared, ears in late milk. Yield per acre, 21 tons 434 pounds.

Mammoth Giant Fodder.—½ acre. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 28th September. Growth medium and even; very leafy throughout; stalks well eared, ears in early milk. This variety is rather too late in ripening to be useful in this district. Yield per acre, 14 tons 1,236 pounds.

Giant Prolific Ensilage.—½ acre. Planted 22nd May, in hills; came up 9th June; and was cut for ensilage 28th September. Growth very strong and even; leafy above, with few leaves below; height, 12 to 14 feet; stalks well eared, ears in early milk. This variety is too late in ripening here to make ensilage of the best quality. Yield per acre, 18 tons 870 pounds.

Champion White Pearl.—1¾ acre. The soil was a light sandy loam, which was manured in the spring of 1893 with about 18 tons of barn-yard manure per acre. No fertilizer has been applied since. The previous crop was oats. The land was ploughed in the spring of 1897, disc-harrowed once, and harrowed with the smoothing harrow twice before planting. Planted 18th May, in hills 3 feet apart each way, 4 or 5 kernels to the hill; came up 4th June; and was cut for ensilage 30th September. Growth strong and even; leafy above, with few leaves below; height, 12 to 13 feet; stalks well eared, ears in the glazed condition. Yield per acre, 16 tons 938 pounds.

King of the Earliest.—2 acres. Soil a sandy loam of poor quality, which received an application of barn-yard manure in the spring of 1897, of about 10 tons per acre. After the manure was spread the land was ploughed about 6 inches deep, disc-harrowed once, and harrowed with the smoothing harrow twice before planting; planted 27th May, in rows 3 feet apart; came up 11th June; and was cut for ensilage 17th September. Growth medium to weak; leafy from top to bottom; height, 8 to 9 feet; stalks well eared, ears in the late milk. Yield per acre, 11 tons 105 pounds. In this and the following plot (Longfellow) the soil was not as good nor as suitable for the crop, and for this reason the yield was less than it would have been under more favourable conditions.

Longfellow.—2 acres. This was planted adjoining the King of the Earliest, on similar soil, which had the same preparation and treatment. Planted 27th May, in rows 3 feet apart; came up 11th June; and was cut for ensilage 17th September. Growth medium to weak; leafy throughout; height, 7 to 8 feet; stalks well eared, ears in glazing stage. Yield per acre, 13 tons 945 pounds.

EXPERIMENTS WITH TURNIPS.

Nineteen varieties of turnips were tested during the past season in plots, side by side, all having the same treatment. The soil was a heavy sandy loam of good quality, more or less mixed with clay. The previous crop was hay. The land was manured in the spring of 1893, with about 18 tons of barn-yard manure per acre; no fertilizer has been applied since. It was ploughed very shallow after the hay crop was taken off, and again later in the autumn about 8 inches deep. In the spring of 1897, it was ploughed again about 8 inches deep and harrowed twice with the smoothing harrow. The land was then made up in drills two feet apart and subsequently rolled with a heavy land roller which flattened the drills nearly one-half leaving a firm seed bed. Three sowings of turnips were made at the rate of about 3 pounds of seed per acre. The first sowing was on the 8th of May, the second on 21st May, and the third on 13th of June. The roots from the first two sets were pulled on the 13th and 14th October, and those from the third set on the 14th October. The yield per acre in each case has been calculated from the weight of roots pulled from two rows each 99 feet long.

TURNIPS—TEST OF VARIETIES.

Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 3rd Plot.	
	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1 Shamrock Purple Top	44	1,100	27	1,770	29	245
2 Purple Top Swede	44	770	26	965	18	465
3 Great Mogul	43	130	33	1,650	....	.....
4 Perfection Swede	42	1,965	25	1,315	21	75
5 Giant King	41	5	30	885	20	590
6 Marquis of Lorne	40	1,510	26	1,845	25	1,920
7 Jumbo or Monarch	40	905	28	925	29	115
8 Prize Winner	40	850	26	855	21	1,835
9 Mammoth Clyde	39	1,915	28	815	27	1,110
10 Carter's Elephant	38	1,220	34	1,300	31	260
11 East Lothian	38	230	30	445	26	470
12 Prize Purple Top	36	1,975	24	510	14	1,040
13 Hall's Westbury	36	1,590	26	910	27	1,880
14 Hartley's Bronze	36	765	27	780	32	717
15 Skirving's	36	600	28	1,915	21	240
16 Sutton's Champion	35	1,280	22	55	23	282
17 Halewood's Bronze Top	35	345	24	235	17	1,337
18 Bangholm Selected	34	1,300	27	890	23	1,300
19 Selected Champion	32	1,395	27	1,110	22	385

These turnips were all sown in rows varying from 200 to 400 feet in length, which gave opportunity for further experiments, after the two rows of 99 feet each, used to ascertain the yield in the first place, had been pulled. A portion of the roots in this area, were left in the ground until the 3rd of November, to gain information as to the advantage, if any, which arises from the leaving of the roots in the ground, after the middle of October. Nineteen plots were so left until the 3rd of November, which allowed 20 and 21 days for additional growth for the roots, from the first and second sowings, and 20 days for those of the third sowing.

Results of leaving Turnips in the ground as long as practicable after the usual time of pulling :

YIELD OF ROOTS PER ACRE FROM EARLY AND LATE PULLING.

	Name of Variety.	1st pulling, 13th October, from 1st sowing, 8th May.		2nd pulling, 3rd Novem'r, from 1st sowing, 8th May.		1st pulling, 13th October, from 2nd sowing, 21st May.		2nd pulling, 3rd Novem'r, from 2nd sowing, 21st May.		1st pulling, 13th October, from 3rd sowing, 13th June.		2nd pulling, 3rd Novem'r, from 3rd sowing, 13th June.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Shamrock Purple Top	44	1,100	45	1,080	27	1,770	31	370	29	245	32	707
2	Purple Top Swede	44	770	47	1,040	26	965	30	1,215	18	465	22	522
3	Great Mogul	43	130	42	480	33	1,650	44	1,870	29	520	31	1,177
4	Perfection Swede	42	1,965	41	1,160	25	1,315	32	1,395	21	75	30	555
5	Giant King	41	5	39	1,420	30	885	29	1,675	20	590	29	300
6	Marquis of Lorne	40	1,510	42	315	26	1,845	28	1,750	25	1,920	30	280
7	Jumbo or Monarch	40	905	40	520	28	925	27	1,615	29	115	31	370
8	Prize Winner	40	850	39	375	26	855	28	155	21	1,835	27	1,137
9	Mammoth Clyde	39	1,915	40	1,180	28	815	28	1,365	27	1,110	32	350
10	Carter's Elephant	38	1,220	42	150	34	1,300	32	735	31	260	35	1,940
11	East Lothian	38	230	40	1,840	30	445	28	430	26	470	31	480
12	Prize Purple Top	36	1,975	38	560	24	510	24	675	14	1,040	17	650
13	Hall's Westbury	36	1,590	40	850	26	910	34	1,300	27	1,880	29	557
14	Hartley's Bronze	36	765	41	830	27	780	29	1,015	32	717	32	277
15	Skirvings	36	600	37	148	28	1,915	27	1,220	21	240	30	1,710
16	Sutton's Champion	35	1,280	35	1,885	22	55	26	470	23	282	30	307
17	Halewood's Bronze Top	35	345	37	1,900	24	235	30	1,710	17	1,337	32	1,862
18	Bangholm Selected	34	1,300	38	1,990	27	890	28	100	23	1,300	28	320
19	Selected Champion	32	1,395	35	1,610	27	1,110	27	395	22	385	26	1,487

		Tons.	Pounds.
Average yield per acre from	1st sowing 1st pulling..	38	1,782
" "	1st sowing 2nd pulling..	40	807

An average gain in 20 to 21 days of 1 ton 1,025 pounds per acre.

		Tons.	Pounds.
Average yield per acre from	2nd sowing 1st pulling..	27	1,537
" "	2nd sowing 2nd pulling.	30	182

An average gain in 20 to 21 days of 2 tons 646 pounds per acre.

		Tons	Pounds.
Average yield per acre	3rd sowing 1st pulling	24	673
" " "	3rd sowing 2nd pulling	30	182

An average gain in 20 days of 5 tons 432 pounds per acre.

The results of these experiments show that growth in turnips late in the season proceeds rapidly as long as the weather remains open, and point to the importance of allowing these roots to remain in the ground as long as is practicable, especially if the seed has been sown late ; on the other hand a farmer who leaves a large area of roots in the ground to a very late date is liable to be caught by severe frost when the pulling of such a crop is disagreeable, difficult and expensive.

EXPERIMENTS WITH MANGELS.

The number of varieties of mangels under test during 1897 was twenty. These were all sown side by side adjoining the turnips, the land was similar and the treatment and preparation the same. The drills were made up two feet apart and rolled with a heavy land roller to make a firm bed before the seed was sown. Two sowings were made, the first on the 8th May, the second on the 21st May, and the roots from both were pulled on the 13th October.

MANGELS—TEST OF VARIETIES.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per acre, 1st plot. Tons.	Lbs.	Yield per acre, 1st plot. Bush.	Lbs.	Yield per acre, 2nd plot Tons.	Lbs.	Yield per acre, 2nd plot Bush.	Lbs.
1 Giant Yellow Intermediate (Steele)	May 8	May 21	Oct. 11	Oct. 11	46	1060	1551		37	305	1238	25
2 Gate Post	″ 8	″ 21	″ 11	″ 11	44	1815	1496	55	35	1335	1188	55
3 Canadian Giant	″ 8	″ 21	″ 11	″ 11	40	1345	1355	45	28	1420	957	
4 Golden Tankard	″ 8	″ 21	″ 11	″ 11	35	950	1182	30	22	605	743	25
5 Mammoth Long Red	″ 8	″ 21	″ 11	″ 11	34	1960	1166		28	485	941	25
6 Champion Yellow Globe	″ 8	″ 21	″ 11	″ 11	34	1630	1160	30	22	605	743	25
7 Selected Mammoth Long Red.	″ 8	″ 21	″ 11	″ 11	34	845	1080	45	23	1850	797	30
8 Yellow Intermediate	″ 8	″ 21	″ 11	″ 11	33	715	1111	55	21	1560	726	
9 Red Fleshed Tankard	″ 8	″ 21	″ 11	″ 11	32	1010	1083	30	28	815	946	55
10 Red Fleshed Globe	″ 8	″ 21	″ 11	″ 11	32	405	1073	25	23	365	772	45
11 Giant Yellow Globe	″ 8	″ 21	″ 11	″ 11	31	1855	1064	15	26	1790	896	30
12 Prize Mam. Long Red	″ 8	″ 21	″ 11	″ 11	31	1690	1061	30	25	655	844	15
13 Golden Fleshed Tankard	″ 8	″ 21	″ 11	″ 11	30	1050	1017	30	21	240	704	
14 Warden Orange Globe	″ 8	″ 21	″ 11	″ 11	29	1730	995	30	27	835	913	55
15 Selected Mammoth Long Red Extra	″ 8	″ 21	″ 11	″ 11	29	850	980	50	18	1950	632	30
16 Giant Yellow Half Long	″ 8	″ 21	″ 11	″ 11	29	740	979		19	1765	662	45
17 Ward's Large Oval-shaped	″ 8	″ 21	″ 11	″ 11	28	155	935	55	19	280	638	
18 Giant Yellow Intermediate (Pearce)	″ 8	″ 21	″ 11	″ 11	25	1535	858	55	16	395	539	55
19 Giant Yellow Globe Special	″ 8	″ 21	″ 11	″ 11	24	840	814		17	980	583	
20 Norbitan Giant	″ 8	″ 21	″ 11	″ 11	19	1325	655	25	10	130	335	30

FIELD PLOTS OF MANGELS.

The following four half-acre plots were all sown in the same field with the smaller plots reported on. The soil was similar and its preparation and treatment the same.

Giant Yellow Intermediate.—½ acre. Sown 7th May; came up 16th May; and the roots were pulled 12th October. Yield per acre, 18 tons 1,100 pounds.

Mammoth Long Red.—½ acre. Sown 7th May; came up 17th May; and the roots were pulled 12th October. Yield per acre, 17 tons 600 pounds.

Gate Post.—½ acre. Sown 7th May; came up 17th May; and the roots were pulled 12th October. Yield per acre, 21 tons 80 pounds.

Champion Yellow Globe.—½ acre. Sown 8th May; came up 17th May; and the roots were pulled, 13th October. Yield per acre, 23 tons 550 pounds.

EXPERIMENTS WITH CARROTS.

Sixteen varieties of carrots were sown side by side on land adjoining that used for the turnips, the soil was similar and the treatment of the land the same. The seed was sown on ridges 2 feet apart, at the rate of 3 to 4 pounds per acre. Two sowings were made of each sort—the first on 8th May; the second on 21st May; and the roots from both were pulled on the 11th October. After the drills were made, they were rolled with a heavy hand roller at the time of the first sowing, and before the second set of plots was sown, the surface of the drills was worked with a hand wheel hoe to destroy any weeds which had germinated. The yield per acre has been calculated from the weight of roots gathered from two rows each 99 feet long.

CARROTS—TEST OF VARIETIES.

	Name of Variety.	1st Plot Sown.		2nd Plot Sown.		1st Plot Pulled.		2nd Plot Pulled.		Yield per acre, 1st plot.		Yield per acre, 1st plot.		Yield per acre, 2nd plot		Yield per acre, 2nd plot	
										Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Mammoth White Intermediate	May	8	May	21	Oct.	11	Oct.	11	24	180	803		19	445	640	45
2	Green Top White Orthe......	"	8	"	21	"	11	"	11	23	1850	795	30	20	95	668	15
3	Giant White Vosges..........	"	8	"	21	"	11	"	11	23	200	770		19	940	649	
4	Iverson's Champion	"	8	"	21	"	11	"	11	21	1230	720	30	16	1000	550	
5	Improved Short White	"	8	"	21	"	11	"	11	21	570	709	30	21	240	704	
6	Half Long White.............	"	8	"	21	"	11	"	11	20	1305	688	25	17	980	583	
7	Half Long Chantenay	"	8	"	21	"	11	"	11	19	1270	654	30	14	1810	496	50
8	Guerande or Oxheart.........	"	8	"	21	"	11	"	11	19	5	633	25	12	475	407	55
9	Early Gem	"	8	"	21	"	11	"	11	18	1345	622	25	14	1755	495	55
10	White Belgian	"	8	"	21	"	11	"	11	18	740	612	20	15	1680	528	
11	Yellow Intermediate	"	8	"	21	"	11	"	11	17	45	567	25	15	195	503	15
12	Cooper's Yellow Intermediate.	"	8	"	21	"	11	"	11	14	490	474	50	11	1430	390	30
13	Carter's Orange Giant	"	8	"	21	"	11	"	11	13	400	440		10	1505	358	25
14	Long Orange or Surrey... ...	"	8	"	21	"	11	"	11	11	1595	393	15	10	625	343	45
15	Scarlet Intermediate..........	"	8	"	21	"	11	"	11	9	1140	319		7	1510	258	30
16	Long Scarlet Altringham.....	"	8	"	21	"	11	"	11	8	1490	291	30	8	1380	289	40

As in the case of the turnips a part of the carrot crop was allowed to remain in the ground until the 3rd November to ascertain what advantage would accrue to the weight of the crop by adopting such a course.

YIELD OF ROOTS PER ACRE FROM EARLY AND LATE PULLING.

Name of Variety.	1st Pulling 11th October from 1st Sowing 8th May.		2nd Pulling 3rd Nov. from 1st Sowing 8th May.		1st Pulling 11th October from 2nd Sowing 21st May.		2nd Pulling 3rd Nov. from 2nd Sowing 21st May.	
	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
Mammoth White Intermediate	24	180	31	1140	19	445	25	490
Green Top White Orthe	23	1850	24	510	20	95	22	605
Giant White Vosges	23	200	28	1420	19	940	23	530
Iverson's Champion...............................	21	1230	28	265	16	1000	21	570
Improved Short White...........	21	570	26	360	21	240	20	1580
Half Long White.	20	1305	26	1955	17	980	20	1635
Half Long Chantenay	19	1270	19	1380	14	1810	17	660
Guerande or Ox-heart.......	19	5	22	1210	12	475	19	280
Early Gem..	18	1345	19	280	14	1755	19	1765
White Belgian	18	740	16	670	15	1680	14	1370
Yellow Intermediate	17	45	17	980	15	95	15	1405
Carter's Orange Giant	13	400	16	1990	10	1505	13	1720
Long Orange or Surrey	11	1595	18	1785	10	625	14	1260
Scarlet Intermediate....	9	1140	10	790	7	1510	8	60
Long Scarlet Altringham	8	1490	10	1450	8	1380	7	1015

YIELD OF ROOTS PER ACRE, FROM EARLY AND LATE PULLING—*Concluded.*

	1st Sowing 1st Pulling.		1st Sowing 2nd Pulling.		2nd Sowing 1st Pulling		2nd Sowing 2nd Pulling.	
	Ton.	Lbs.	Tons	Lbs.	Tons	Lbs.	Tons	Lbs.
Average yield per acre from ...	18	91	21	412				
An average gain in 23 days of 3 tons 331 lbs. per acre..								
Average yield per acre from...					14	1,902	17	1,263
An average gain in 23 days of 2 tons 1,361 lbs. per acre..								

The results of these experiments point to the advantage of leaving carrots in the ground as long as it is safe to do so before they are pulled.

FIELD PLOTS OF CARROTS,

The following six half-acre plots, were all sown in the same field, with the smaller plots of carrots. The soil was similar, and the preparation and treatment of the land the same.

Mammoth White Intermediate.—½ acre. Sown 8th May; came up 19th May; and the roots were pulled on the 19th October. Yield per acre, 19 tons 200 pounds.

Improved Short White.—½ acre. Sown 8th May; came up 19th May; and the roots were pulled 20th October. Yield per acre, 19 tons 1,762 pounds.

White Belgian.—½ acre. Sown 8th May; came up 19th May; and the roots were pulled 21st October. Yield per acre, 15 tons 1,580 pounds.

Guerande or Ox-heart.—½ acre. Sown 8th May; came up 19th May; and the roots were pulled 22nd October. Yield per acre, 17 tons 170 pounds.

Half Long White.—½ acre. Sown 8th May; came up 19th May; and the roots were pulled 23rd October. Yield per acre, 20 tons 220 pounds.

Iverson's Champion.—½ acre. Sown 8th May; came up 19th May; and the roots were pulled 25th October. Yield per acre, 22 tons 232 pounds.

EXPERIMENTS WITH SUGAR BEETS.

Twelve varieties of sugar beets were tested in 1897. The land was adjoining that of the test plots of carrots and mangels, the soil was similar, and the preparation and treatment of the land the same.

SUGAR BEETS—TEST OF VARIETIES.

Name of Variety.	1st Plot Sown.		2nd Plot Sown.		1st Plot Pulled.		2nd Plot Pulled.		Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot		Yield per Acre. 2nd Plot	
									Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Danish Improved, Private Stock..	May	8	May	21	Oct.	11	Oct.	11	25	820	847		18	850	614	10
Rennie's No. 98	"	8	"	21	"	11	"	11	25	160	836		16	1220	553	40
Rennie's No. 96 Red Top.........	"	8	"	21	"	11	"	11	23	200	770		18	960	616	
Improved Imperial.............	"	8	"	21	"	11	"	11	23	90	768	10	15	30	500	30
Rennie's No. 95	"	8	"	21	"	11	"	11	21	1890	731	30	20	1690	694	50
Rennie's No. 97	"	8	"	21	"	11	"	11	21	570	709	30	12	1960	432	40
Danish Red Top.......	"	8	"	21	"	11	"	11	20	1745	695	45	14	1755	495	55
Danish Improved,...	"	8	"	21	"	11	"	11	19	5	633	25	13	1060	451	
Red Top Sugar	"	8	"	21	"	11	"	11	18	1620	627		16	1110	551	50
Wanzleben......................	"	8	"	21	"	11	"	11	18	1015	616	55	14	1205	486	45
Rennie's No. 99 Green Top......	"	8	"	21	"	11	"	11	15	1790	529	50	12	750	412	30
Vilmorin's Improved.....	"	8	"	21	"	11	"	11	15	1680	528		15	745	512	25

EXPERIMENTS WITH POTATOES.

One hundred and ten varieties of potatoes have been under test during 1897, grown side by side, in similar soil, for the purpose of gaining information, as to their relative productiveness, and earliness of maturing. The soil in which they were planted, was a sandy loam of fair quality, which received in the spring of 1894, an application of about 12 tons of barn-yard manure per acre. No fertilizer has been applied since. The previous crop was pease. The land was ploughed in the autumn of 1896, about 8 inches deep, and again in the spring of 1897, about 6 inches deep, and harrowed twice with the smoothing harrow before planting.

The potatoes for seed were cut into pieces of from two to three eyes in each, and planted in rows 2½ feet apart, with the sets about a foot apart in the rows. They were all planted on the 21st and 22nd of May and were dug from the 4th, to the 7th of October. The yield per acre has been calculated from the weight of tubers obtained from one row 132 feet long.

POTATOES—TEST OF VARIETIES.

Name of Variety.	Total Yield per Acre.		Yield per Acre of Sound.		Yield per Acre of Rotten.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Colour.
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Holborn Abundance....	402	36	400	24	2	12	356	24	44		White.
Seedling No. 230........	400	24	400	24			380	36	19	48	"
French Red	392	42	382	48	9	54	317	54	64	54	Red.
From N. Bergeron.....	389	24	386	6	3	18	349	48	36	18	Light pink.
Seedling No. 7.	381	42	380	36	1	6	343	12	37	24	Bright pink.
Irish Daisy.............	372	54	369	36	3	18	341		28	36	White.
Chicago Market.........	356	24	333	18	23	6	284	54	48	24	Pink.
Dreer's Standard.......	346	38	346	38			324	38	22		White.
Earliest of All..........	346	30	331	6	15	24	257	24	73	42	Pink and white.
Northern Spy...	346	30	346	30			306	54	39	36	Bright pink.
From S. Sabean.........	343	12	336	36	6	36	319		17	36	White.
Early Thorburn.........	341		325	36	15	24	258	30	67	6	Pink and white.
Rose No. 9.............	338	48	334	24	4	24					Pink.
Reeve's Rose...........	336	36	308		28	36	246	24	61	36	"
Vanier	333	18	333	18			256	18	77		Red.
Daisy......	332	37	328	13	4	24	285	19	42	54	Pink and white.
Irish Cobbler...........	321	12	321	12			259	36	61	36	White.
Flemish Beauty Seedling	315	42	301	24	14	18	218	54	82	30	Bright pink.
London	315	42	304	42	11		255	12	49	30	Pink.
Everett..........	311	18	302	30	8	48	239	48	62	42	"
Early Sunrise..........	309	47	298	47	11		244	53	53	54	"
Reading Giant..........	302	30	302	30			221	6	81	24	Red and white.
Sharpe's Seedling......	300	18	292	36	7	42	213	24	79	12	Pink and white.
Blue Cup...............	298	6	298	6			254	6	44		Blue and white.
Troy Seedling........	297	44	297	44			266	56	30	48	White.
Delaware	296	38	295	54		44	282	42	13	12	"
Charles Downing.......	292	36	292	36			226	36	66		"
Late Puritan.....	287	22	282	58	4	24	234	34	48	24	"
Wonder of the World...	287	6	277	12	9	54	213	24	63	48	Pink and white.
New Variety No. 1.....	284	21	284	21			227	9	57	12	White.
State of Maine.........	283	15	283	15			254	39	28	36	"
Crown Jewel......	280	8	265	50	14	18	217	26	48	24	Pink and white.
Early Six Weeks.......	280	22	268	16	12	6	204	28	63	48	Pink.
Seattle	278	34	278	34			216	58	61	36	White.
Clarke's No. 1..........	278	18	275		3	18	237	36	37	24	Pink.
Early Ohio....	277	53	273	29	4	24	242	41	30	48	"
Seedling No. 2, Edwards	270	19	270	19			248	19	22		White.
Vick's Extra Early.....	269	30	267	18	2	12	210	6	57	12	Pink and white.
White Beauty.........	268	24	268	24			160	36	107	48	White.
Lightning Express......	268	24	266	12	2	12	248	36	17	36	Pink.
McKenzie	267	18	266	12	1	6	243	6	23	6	White.
Great Divide...........	266	12	258	30	7	42	206	48	51	42	"
Green Mountain........	266	12	261	48	4	24	246	24	15	24	"
American Wonder......	266	12	258	30	7	42	242		16	30	"

POTATOES—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Total Yield per Acre.		Yield per acre of Sound.		Yield per acre of Rotten.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Colour.
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Early Rose	265	31	261	7	4	24	228	7	33		Pink.
Carman No. 1	265	22	265	22			249	58	15	24	White.
Dakota Red	264		264				243	6	20	54	Red.
Hale's Champion	264		264								White.
Money Maker	264		260	42	3	18	234	18	26	24	"
Early Gem	261	48	261	48			204	36	57	12	Pink.
American Giant	261	31	256	1	5	30	220	49	35	12	White.
Lizzie's Pride	260	42	254	6	6	36	225	30	28	36	Pink, red eye.
Freeman	260	42	260	42			207	54	52	48	White.
Burpee's Extra Early	259	36	254	6	5	30	204	36	49	30	Pink and white.
Algoma No. 1	258	22	252	52	5	30	206	40	46	12	Pink.
Ideal	255	12	222	12	33		212	18	9	54	"
Early White Prize	254	39	252	27	2	12	213	57	38	30	White.
Russell's Seedling	253		253				48	24	204	36	"
Thorburn	251	54	245	18	6	36	216	42	28	36	Pink and white.
Early Harvest	250	48	247	30	3	18	201	18	46	12	White.
Lee's Favourite	248	36	248	36			182	36	66		Pink.
Polaris	248	36	242		6	36	216	42	25	18	White.
Columbus	244	12	244	12			213	24	30	48	Pink and white.
King of the Roses	244	12	217	48	26	24	204	36	13	12	"
From E. Lortie	243	6	243	6			209		34	6	Light pink.
Record	243	6	214	30	28	36	177	6	37	24	White.
Rochester Rose	242		236	30	5	30	205	42	30	48	Pink.
Early Norther	240	54	237	36	3	18	173	48	63	48	"
Prize Taker	238	42	236	30	2	12	207	54	28	36	"
Quaker City	237	36	237	36							White.
Bill Nye	237	36	237	36			206	48	30	48	"
Pride of the Table	237	3	235	57	1	6	220	33	15	24	Pink.
Beauty of Hebron	235	40	225	46	9	54	212	34	13	12	Pink and white.
Burnaby Seedling	234	1	226	19	7	42	196	37	29	42	"
Brown's Rot Proof	233	45	233	45			187	33	46	12	Pink.
Satisfaction	233	12	233	12			173	48	59	24	White.
Monroe County	232	6	227	42	4	24	181	30	46	12	Pink.
Fillbasket	231		211	12	19	48	184	48	26	24	Bright pink.
Pride of the Market	224	24	224	24			189	12	35	12	White.
Early Puritan	223	18	221	6	2	12	168	18	52	48	"
Victor Rose	218	54	210	6	8	48	179	18	30	48	Pink.
New Queen	218	46	213	16	5	30	192	22	20	54	Pink and white.
Queen of the Valley	218	37	214	13	4	24	204	19	9	54	Bright pink.
Napoleon	218	21	215	3	3	18	197	27	17	36	Pink.
Honeoye Rose	217	48	215	36	2	12	204	36	11		"
Harbinger	216	50	216	50			153	2	63	48	Pale pink.
Rural, No. 2	216	42	216	42			202	24	14	18	White.
Pearce's Extra Early	216	1	211	37	4	24	165	25	46	12	Pink.
Maggie Murphy	216	25	212	1	4	24	203	13	8	48	Bright pink.
World's Fair	214	55	214	55			181	55	33		White.
Hopeful	213	49	208	19	5	30	198	25	9	54	"
Empire State	211	53	211	53			148	5	63	48	"
Rural Blush	211	12	210	6	1	6	167	12	42	54	Pink.
Good News	209		209				143		66		"
Ohio Junior	209		202	24	6	36	151	48	50	36	"
Clay Rose	206	48	204	36	2	12	184	48	19	48	"
Carman No. 3	202	24	202	24			179	18	23	6	"
Brownell's Winner	202	24	202	24			147	24	55		Red.
Peerless Junior	187		183	42	3	18	159	30	24	12	White.
Houlton Rose	184	48	184	48							"
Table King	182	36	89	6	93	30	64	54	24	12	"
I. X. L.	179	18	179	18			166	6	13	12	Pink and white.
General Gordon	176	16	176	16			119	4	57	12	Pink.
Stourbridge Glory	161	42	161	42			117	42	44		White.
Sutton's Main Crop	159	30	158	24	1	6	143		15	24	"
Sutton's Abundance	151	48	151	48			112	12	39	36	"
Orphans	149	3	149	3			146	51	2	12	"
Seedling No. 214	139	42	139	42			134	12	5	30	"
Martins	106	42	106	42			58	18	48	24	Purple.
White Kidney	29	42	29	42			25	18	4	24	White.

FIELD PLOTS OF POTATOES.

The following fourteen plots of potatoes were grown in one field, the land was similar throughout, and the preparation and treatment was the same for all. The soil was a light sandy loam, which was manured in the spring of 1893, with about 18 tons of barn-yard manure per acre. No fertilizer has been applied since. The previous crop was oats. The land was ploughed in the spring of 1897, about 6 inches deep, and disc-harrowed once, and harrowed with the smoothing harrow once, then made into drills $2\frac{1}{2}$ feet apart for planting. In the following table the particulars are given of the results obtained :—

Name of Variety.	Size of Plot.	When planted.	Came up.	When dug.	Yield per Acre.	
	Acre.	1897.	1897.	1897.	Bush.	Lbs.
Early Rose	$\frac{1}{4}$	May 18	June 12	Oct. 5	228	32
Burpee's Extra Early	$\frac{1}{7}$	" 8	" 1	Sept. 30	202	47
Wonder of the World	$\frac{1}{3}$	" 18	" 12	Oct. 4	191	51
Dakota Red	$\frac{1}{20}$	" 18	" 13	" 5	191	32
May Queen Early	$\frac{1}{4}$	" 18	" 12	" 5	187	42
American Wonder	$\frac{1}{11}$	" 18	" 12	" 2	167	32
Early Harvest	$\frac{1}{10}$	" 18	" 12	Sept. 30	167	18
Carman No. 1	$\frac{1}{11}$	" 18	" 12	Oct. 1	163	18
Burnaby Seedling	$\frac{1}{11}$	" 18	" 13	" 2	155	59
Queen of the Valley	$\frac{2}{5}$	" 18	" 12	" 5	152	53
Late Puritan	$\frac{1}{11}$	" 18	" 12	" 2	149	57
Everett	$\frac{1}{11}$	" 18	" 12	" 2	141	11
Rochester Rose	$\frac{1}{11}$	" 18	" 12	Sept. 30	137	19
I. X. L.	$\frac{1}{11}$	" 18	" 14	Oct. 3	108	20

EXPERIMENTS WITH CLOVER.

To maintain the fertility of his land is the aim of every good farmer. A judicious rotation of crops, will economize the stores of plant food in the soil, but, where additions require to be made, of these elements of fertility, there are only two methods by which this can be accomplished—one is by applying to the land barn-yard manure, or artificial fertilizers, the other is the ploughing under of green crops, among which there are none so generally useful and valuable as clover. The great value of clover for ploughing under, to enrich the land has long been known, but it is only within the past few years, that the reason has been discovered why it is better for this purpose, than many other plants. The reason is that clover, in common with most other leguminous plants, has the power of taking nitrogen from the air, and laying up the store thus gathered in its roots and leaves, and when turned under, the added fertility becomesimmediately available for subsequent crops. If a clover plant is dug, it will be found to have a mass of fine branching roots, which spread in every direction, and penetrate deeply in the soil. If these roots are carefully examined, there will be found attached to them, many little nodules or swellings, each of which contains a colony of microbes, and these microscopic organisms are the active agents employed in taking nitrogen from the air, and converting it into plant food.

Further, the extensive root system which clover has, enables it to penetrate to depths in the soil and subsoil, which few other plants can reach and to bring from these lower strata, supplies of the mineral elements which growing plants require, and when the clover is turned under the decay of its roots and leaves, places within reach of subsequent crops, the additional stores of plant food gathered in the most readily available forms.

The ploughing under of green crops also improves the texture of the soil, and the organic matter thus added, makes the soil more retentive of moisture, thus giving more favourable conditions for subsequent plant growth. The ploughing under of any green crop will thus improve the soil, and besides this every plant used for this purpose, has the power of converting certain proportions of plant food, existing in the soil in insoluble forms, into soluble and available forms, and thus materially adding to the stores of food within reach of the next crop. Clover, however, in common with other leguminous plants, has great advantages over buckwheat, and other crops used for this purpose, from its power of permanently enriching the soil, by adding nitrogen from an extraneous source, and also of bringing from the lower strata of the soil, and subsoil, supplies of mineral food which other plants are unable to reach.

In the reports of the Director for 1895, pages 26 to 30, and 1896, pages 37 to 40, particulars were given of the results obtained from a series of important tests in the field, with different varieties of clover. These were planned and carried out with the object of gaining further information, as to the growth of different sorts of clover within given periods, what quantities of root and top were produced, when clover seed was sown in the spring with a grain crop, and ploughed under in October, also, the quantities turned under, when the clover was allowed to stand over and grow until the third week in the following May, then ploughed under for a crop of Indian corn or potatoes. Experiments were also carried on to determine what quantities of clover seed should be sown, to produce the best results, also to find out whether clover can be sown with grain, from year to year to plough under in the autumn, without lessening the crop of grain. If this can be done, the advantage to the land will be very great, for in addition to the benefits already referred to, the clover will serve as an excellent catch crop, absorbing and appropriating the nitrogenous fertilizers brought down by the rain, during late summer and autumn.

Since experiments of this nature need to be several times repeated in order to eliminate chances of error, arising from peculiarities of season and other conditions, a somewhat similar series of tests have been again made during the past season. It is not the purpose of the writer to discuss here, the relative economy of feeding clover to stock as compared with ploughing it under. There is no doubt that, when the clover area is limited, and the farmer has the stock to feed, it is more economical to pasture a field before ploughing it under, as the farmer will then make a profit on the cattle and still retain in the manure the cattle will give, nearly nine-tenths of the elements of fertility accumulated by the clover. The main object of these experiments, is to encourage the growing of clover generally with grain crops, as it is believed that large areas of land may thus be greatly improved, and rendered much more fertile—with a comparatively small outlay. In the annual report of the Experimental Farms for 1896, p. 39, mention is made of five acres of land devoted to plots, to show the effect of the ploughing under of clover. This field was divided into 20 one-quarter acre plots. These were all sown with grain, two plots of each sort, one with and one without clover, the grain used being wheat, two-rowed barley, six-rowed barley, oats and pease. Particulars as to the yield of grain from these plots, with and without clover, are given in the report referred to. The winter of 1896-97 was very severe, and when these plots were examined in the spring of 1897 the clover was almost entirely winter killed, and as it was not likely that the clover in this condition would give a fair indication as to what such a crop would do for the land under more favourable conditions it was thought best to begin these experiments over again somewhat modified.

PLOTS OF GRAIN SOWN WITH AND WITHOUT CLOVER.

Eight plots of $\frac{1}{20}$th acre each were used for this experiment. The soil was a sandy loam of fair quality, which was manured during the winter of 1895-96 with about 15 tons of barn-yard manure per acre, distributed over the ground in small heaps of about one-third of a cart load each. These were spread in the spring of 1896 and ploughed under about 5 or 6 inches deep. The previous crop was roots. The land was ploughed in the autumn of 1896 about 8 inches deep and disc-harrowed once in the spring, and harrowed twice with the smoothing harrow before sowing. The plots were all sown on 5th May, two plots with each sort of grain, one of these in each case with Mammoth Red clover in the proportion of 10 pounds per acre, the other without clover. The wheat at the rate of 1½ bushel barley 6-rowed, 1¾ bushel barley 2-rowed, 2 bushels and oats 2 bushels per acre. The wheat ripened 9th August, 6-rowed barley July 26th, 2-rowed barley 2nd August and the oats 9th August.

The following gives particulars of the crop:—

	Bushels.	Pounds.
No. 1—Preston wheat with 10 pounds clover per acre..	16	30
No. 2— " without clover................	19	00
No. 3—Odessa barley, 6-rowed, with clover...........	42	24
No. 4— " " without clover..........	37	34
No. 5—Bolton barley, 2-rowed, with clover............	37	4
No. 6— " " without clover...	35	00
No. 7—Banner oats, with clover.	57	32
No. 8— " without clover..................	61	6

It is proposed to sow the whole area next year with one sort of grain and ascertain the yield from each of these plots.

EXPERIMENTS TO GAIN INFORMATION AS TO THE VALUE OF ROLLING AND HARROWING LAND SOWN WITH CLOVER, ALSO WITH DIFFERENT QUANTITIES OF CLOVER SEED PER ACRE.

The first four plots of $\frac{1}{20}$th acre each were sown on the 6th May with Banner oats, 2 bushels to the acre—10 pounds per acre of Mammoth Red clover was sown in each case with the grain. Notes were taken regarding the clover at the time of the cutting of the grain, 26th July, and again at the close of the season on the 27th October.

Plot 1. Not rolled or harrowed after sowing. Clover seed sown with grain, with attachment behind seed drill. Rain occurred four days after sowing, which afforded favourable conditions for the germination of the seed. 26th July, clover thick and even, some plants about 10 inches high. 27th October, growth strong and even, from 10 to 14 inches high, forming a thick mat for ploughing under; no bloom; yield of oats per acre, 55 bushels 10 pounds.

No. 2. Harrowed only after sowing, not rolled. 26th July, clover thin and uneven, 6 to 7 inches high. 27th October, growth strong and even, 10 to 14 inches high, forming a fine mat for ploughing under; yield of oats per acre, 56 bushels 6 pounds.

No. 3. Harrowed and rolled after sowing. 26th July, growth medium and even, 7 to 8 inches high. 27th October, growth strong and even; height, 10 to 14 inches, forming a dense mat of foliage for ploughing under; yield of oats, 50 bushels 20 pounds. per acre.

No. 4. Rolled only after sowing, not harrowed. 26th July, growth medium and even, 7 to 9 inches high. 27th October, growth very strong and even; height, 10 to 14 inches, forming a very dense mat of foliage for ploughing under; yield of oats per acre, 54 bushels 4 pounds.

Plots 5 to 19 were sown with Odessa barley, using different quantities of clover seed per acre, and on three plots left as check plots no clover seed was used. The soil was a sandy loam of fair quality, which received about 12 tons of barn-yard manure per acre in the fall of 1896, after which the land was ploughed about 8 inches deep. In the spring it was disc-harrowed once and harrowed twice with the smoothing harrow before sowing.

Plot 5. Sown 6th May with Odessa barley, 1¾ bushel per acre; grain sown with drill; 4 pounds Mammoth Red clover per acre sown by hand. 26th July, growth thin and even, 5 to 6 inches high. 27th October, growth fairly strong and even, but too thin either for meadow or for ploughing under; no bloom; yield per acre of barley, 38 bushels 46 pounds.

Plot 6. Sown 6th May with Odessa barley only, no clover used. Yield of grain per acre, 40 bushels 20 pounds.

Plot 7. Sown 6th May with Odessa barley, with 6 pounds Mammoth Red clover per acre. 26th July, growth even and medium, 6 to 7 inches high. 27th October, growth medium, but very even; height, 10 to 12 inches; thick enough to leave for meadow, but not thick enough for ploughing under; yield of barley, 39 bushels 18 pounds per acre.

Plot 8. Sown 6th May with Odessa barley, with 8 pounds Mammoth Red clover per acre. 26th July, growth medium and even, 6 to 7 inches high. 27th October, growth strong and very even; almost too thick for meadow, but scarcely thick enough for best results when ploughed under; yield of barley 40 bushels per acre.

Plot 9. Sown 6th May with Odessa barley, with 10 pounds Mammoth Red clover per acre. 26th July, growth even but thin, 5 to 6 inches high. 27th October, growth very strong and even; height, 10 to 12 inches; too thick to leave for meadow; made a fine thick mat for ploughing under; yield of barley, 43 bushels 36 pounds per acre.

Plot 10. Sown 6th May with Odessa barley, with 12 pounds of Mammoth Red clover per acre. 26th July, growth fairly even; 6 to 7 inches high. 27th October, growth strong and very even; height 10 to 14 inches, making a compact mat for ploughing under. Yield of barley, 46 bushels 2 pounds per acre.

Plot 11. Sown 6th May with Odessa barley, with 14 pounds Mammoth Red clover per acre. 26th July, growth medium and even, 6 to 7 inches high. 27th October, growth very strong and even, forming a thick mat but did not appear to be any better for ploughing under than where 10 or 12 pounds of clover seed had been used. Yield of barley, 45 bushels per acre.

Plot 12. Sown 6th May with Odessa barley, with 10 pounds of Common Red clover per acre. 26th July, growth strong and even, 9 to 10 inches high. 27th October, growth strong, even and thick, making a very fine mat of foliage for ploughing under; height 12 to 14 inches; a large number of the plants were in bloom. Yield of barley, 43 bushels 46 pounds per acre.

Plot 13. Sown 6th May with Odessa barley only, no clover used. Yield of grain, 42 bushels 14 pounds per acre.

Plot 14. Sown 6th May with Odessa barley, with 14 pounds Alfalfa per acre. 26th July, growth even but rather thin, 9 to 10 inches high. 27th October, growth strong and even, but thin; thick enough for meadow but not thick enough for ploughing under. Stalks rather woody and tough, height 12 to 14 inches. Yield of barley, 31 bushels 32 pounds per acre. In this instance the barley was thin on the ground due possibly to variation in the soil.

Plot 15. Sown 6th May with Odessa barley only, no clover used. Yield of grain, 41 bushels 32 pounds per acre.

Plot 16. Sown 6th May with Odessa barley, with 24 pounds Crimson clover per acre. 26th July, growth thin. 27th October, growth thin and even, height 6 to 8 inches; not thick enough for ploughing under. Yield of barley, 36 bushels 22 pounds per acre.

Plot 17. Sown 6th May with Odessa barley, with 6 pounds Alsike clover per acre. 26th July, growth thin but even, and about 5 inches high. 27th October, growth medium and even, height about 6 inches; not thick enough for meadow nor for ploughing under with advantage. Yield of barley, 45 bushels 20 pounds per acre.

Plot 18. Sown 6th May with Odessa barley, with 6 pounds Alsike clover and 14 pounds Orchard grass per acre. 26th July, growth medium and even, height 5 to 6 inches. 27th October, growth medium and even, height 6 to 8 inches; both clover and grass thick enough to make a good meadow. Yield of barley, 43 bushels 16 pounds per acre.

Plot 19. Sown 6th May with Odessa barley, with 14 pounds Alfalfa and 14 pounds Orchard grass per acre. 26th July, growth of Alfalfa thin and even and 10 to 11 inches high, orchard grass fairly even, 7 to 8 inches high. 27th October, Alfalfa fairly thick and even, average height 14 inches; orchard grass 8 to 9 inches, thick enough to make a good meadow. Yield of barley 37 bushels 24 pounds per acre.

SOWING OF FIELDS OF GRAIN WITH CLOVER.

Since our experiments have shown that clover can be grown with fields of grain in the manner described without lessening the yield of grain for the year, the following fields were thus treated, all being sown with Mammoth Red clover in the proportion of 10 pounds to the acre.

Improved Ligowo oats. A field of 4½ acres of a clay loam was sown with this variety of oats on 30th April and 10 pounds of Mammoth Red clover seed used per acre. The oats were cut on 2nd August and gave a crop of 44 bushels 10 pounds per acre. By the middle of October the clover had made a thick and even growth about 10 or 12 inches high. Although the catch of clover in this case was very fair the plants were not so thick on the ground as those in the plots where the land was lighter, the clover roots, however, were stronger and thicker.

			Bushels.	Pounds.
Oats—Early Gothland,	2 acres;	yield per acre	40	20
" Golden Beauty,	2 "	"	41	11
" Flying Scotchman,	1 acre	"	35	22
" Columbus,	1 "	"	36	8
" Early Golden Prolific,	1 "	"	37	6
" White Schonen	1 "	"	38	23
" Early Archangel,	1 "	"	34	23
" Siberian,	1¾ "	"	48	9
" American Beauty,	2½ "	"	50	12
" Mortgage Lifter,	1½ "	"	39	15
" Joanette,	1¾ "	"	33	3
" Holstein Prolific,	1¼ "	"	46	2
" Wallis	2½ "	"	46	32
Wheat—Advance,	½ "	"	25	1
" Herisson Bearded,	½ "	"	25	58
" Preston,	½ "	"	28	42
Barley—Royal, 6-rowed,	2½ "	"	29	42
" Trooper "	2½ "	"	26	15
" Mensury "	2¾ "	"	36	47
" Champion "	½ "	"	43	46
" Success "	½ "	"	43	29
" Odessa "	¾ "	"	37	10

This makes a total of 35½ acres of field plots of grain which were sown with clover for ploughing under, in addition to 16½ acres seeded for meadow. In every case the clover made a strong and even growth, and formed a good mat of foliage, which filled the soil well with fibrous roots. The clover, with one or two exceptions, was all ploughed under about the end of October.

WEIGHT OF CLOVER LEAVES, STEMS AND ROOTS PER ACRE.

In the field of Improved Ligowo oats—on clay loam—a small area, 4 feet by 4 (16 square feet), was dug to the depth of 9 inches and all the roots and tops of the clover carefully gathered and weighed. The same was done with nine of the smaller plots, and the weight of the material thus gathered estimated per acre.

From field sown 30th April with Ligowo oats, with 10 pounds Mammoth Red clover per acre:—

	Tons.	Pounds.
Dug 20th Oct.—Weight of clover leaves and stems per acre	5	209
" roots per acre	3	296
Total	8	505

From the following plots, all on sandy loam, the appended results were obtained :—

Plot 5. Sown with Odessa barley, 6th May, with 4 pounds Mammoth Red clover per acre :—

	Tons.	Pounds.
Dug 20th Oct.—Weight of clover leaves and stems per acre.	2	1,445
" roots per acre..........	2	1,105
Total	5	550

Plot 7. Sown with Odessa barley, 6th May, with 6 pounds Mammoth Red clover per acre :—

	Tons.	Pounds.
Dug 20th Oct.—Weight of clover leaves and stems per acre.	3	849
" roots per acre..........	2	1,147
Total	5	1,996

Plot 8. Sown with Odessa barley, 6th May, with 8 pounds Mammoth Red clover per acre :—

	Tons.	Pounds.
Dug 20th Oct.—Weight of clover leaves and stems per acre.	3	934
" roots per acre..........	3	40
Total	6	974

Plot 9. Sown with Odessa barley, 6th May, with 10 pounds Mammoth Red clover per acre :—

	Tons.	Pounds.
Dug 20th Oct.—Weight of clover leaves and stems per acre.	4	508
" roots per acre..........	2	1,785
Total	7	293

Plot 10. Sown with Odessa barley, 6th May, with 12 pounds Mammoth Red clover per acre.

	Tons.	Pounds.
Dug 20th Oct.—Weight of clover leaves and stems per acre.	3	1,997
" roots per acre..........	2	1,615
Total........................	6	1,612

Plot 11. Sown with Odessa barley, 6th May, with 14 pounds Mammoth Red clover per acre.

	Tons.	Pounds.
Dug 20th Oct.—Weight of clover leaves and stems per acre.	3	1,657
" roots per acre..........	2	849
Total..............................	6	506

Plot 12. Sown with Odessa barley, 6th May, with 10 pounds Common Red clover per acre.

	Tons.	Pounds.
Dug 20th Oct.—Weight of clover leaves and stems per acre.	5	209
" roots per acre.........	3	296
Total..............................	8	505

Plot 14. Sown with Odessa barley, 6th May, with 14 pounds Alfalfa per acre.

	Tons.	Pounds.
Dug 20th Oct.—Weight of Alfalfa leaves and stems per acre	1	1,745
" roots per acre........	1	1,572
Total..............................	3	1,317

Plot 17. Sown with Odessa barley, 6th May, with 6 pounds Alsike clover per acre.

	Tons.	Pounds.
Dug 20th Oct.—Weight of clover leaves and stems per acre	2	847
" roots per acre.........	2	1,360
Total..............................	5	207

Some idea may be formed of the value of this crop turned under when we consider that each ton of the mixed leaves, stems and roots will add as much nitrogen to the soil as 2 tons of average barn-yard manure, while the essential mineral fertilizing constituents gathered from depths to which the roots of many other plants do not reach, make the clover plant an important enricher of the soil in these ingredients also.

EXPERIMENTS WITH HORSE BEANS.

Two field plots were sown with horse beans during 1897. The soil was a sandy loam of fair quality, rather heavy, which was manured during the winter of 1896-97 with about 15 tons of barn-yard manure per acre. The manure was put out in small heaps of about one-third of a cart load each and spread in the spring and ploughed under about 6 inches deep, then harrowed with the smoothing harrow twice before planting. The beans were planted with the seed drill in rows three feet apart, using about 50 pounds of seed per acre.

Plot 1. One acre. Tick Beans, imported seed. Sown 14th May, came up 31st May, and was cut for ensilage 18th September, when the plants were still green. The growth was medium to strong, vines well podded, a few beginning to ripen. Height 4 to 5 feet. Blight was first noticed on the vines on 7th July but afterwards almost disappeared. Yield per acre, 9 tons 320 pounds.

Plot 2. $1\frac{1}{4}$ acres. This was adjoining plot 1, on similar soil and the land had similar preparation and treatment. The seed was also of the variety known as "Tick," but Canadian grown. Sown 14th May, came up 31st May, and was cut for ensilage 20th and 21st September. The growth was medium to strong and even. Height 4 to $4\frac{3}{4}$ feet, vines well podded and a larger proportion ripe than on the vines grown from the imported seed. Yield per acre, 7 tons 525 pounds.

Horse beans were grown on the Central Experimental Farm first in 1892, but that year they were sown mixed with corn. None were sown separately, and no estimate was made that season as to the weight of fodder produced per acre by the horse beans. The $\frac{41}{100}$th acre plot mentioned on page 80, Report 1892, were Broad Windsor beans. In 1893 horse beans were again sown with Indian corn to the extent of 12 acres, and the average weight of the fodder produced by the beans was 1 ton 765 pounds per acre. Two acres were also sown as a separate field crop that year with much better returns, and since then horse beans have been grown each year as a separate field crop.

The average returns have been as follows:—

	Tons.	Pounds.
1893, average yield per acre..........................	8	927
1894 "	12	896
1895 "	7	276
1896 "	2	1,918
1897 "	8	423

The very light crop in 1896 was mainly due to the prevalence of blight

EXPERIMENTS WITH SOJA BEANS.

(Soja hispida.)

The Soja or Soya bean is an annual leguminous plant, somewhat resembling the upright varieties of the cow pea. These beans are extensively used in Japan as food, both for men and animals. They may also be utilized as a soiling crop, as hay, and as ensilage. There are several varieties of these beans, some of which are much earlier than others, one late variety was tried which appears to be of little or no value, and one early variety which gave a large crop and promises to be exceedingly useful.

The soil on which the late variety was sown was adjoining the horse beans, the land was of similar character, and had the same treatment, the early variety was sown on a light sandy loam, which was manured in the autumn of 1895 with about 12 tons of barn-yard manure per acre. The previous crop was pease. This land was ploughed late in the autumn of 1896, about 9 inches deep, and disc-harrowed in the spring, and harrowed with smoothing harrow before sowing.

Soja beans, late variety, sown 14th May, came up 3rd June, and was cut for ensilage 24th September. The growth was strong and even, but the plants had been slightly injured by frost. There were no pods on the vines. Height 42 to 48 inches. Yield per acre, 1 ton 1,957 pounds. This variety is too late to be of value here.

Early Soja beans. These were received from Peter Henderson & Co., seedsmen, of New York, in the spring of 1897. The seed was sown in rows nine inches apart, and enough was received to sow a plot of 12 by 15 feet. Sown 25th May; came up 6th June, and was cut 25th September. The plants made very strong growth, they were very leafy and grew to an average height of 3 feet 9 inches. The vines were well podded, pods thickly distributed on branches from 18 inches above ground to the tips. The beans in the pods were more than half grown at the time of cutting. The weight of green fodder cut from this plot was 127½ pounds, equal to a yield of 15 tons 855 pounds per acre. As this plant is said to endure hot, dry weather, it is hoped that it may be found useful to grow for ensilage in those districts where horse beans have not succeeded. As a nutritious and nitrogenous food for animals, the analyses which have been published of this plant, show that it compares favourably with the horse bean. We hope to give this promising fodder plant a more extended trial during the coming season.

EXPERIMENTS WITH SUNFLOWERS.

Two field plots covering 1½ acre were sown with this crop. The soil was a sandy loam which was manured in the spring of 1895 with about 12 tons of barn-yard manure per acre; no fertilizer has been applied since. The previous crop was oats. After the oats were harvested in 1896 the land was ploughed shallow and harrowed with the smoothing harrow to start weed seeds and shed grain and ploughed later in the autumn about 8 inches deep. In the spring of 1897 the land was disc-harrowed twice, harrowed twice with the smoothing harrow and rolled before sowing. The seed was sown with a Planet Junior hand seed drill in rows 3 feet apart, using 3 to 4 pounds of seed per acre, and the plants were thinned out when they were 3 or 4 inches high so as to leave them from 16 to 18 inches apart in the rows.

Plot 1.—One acre. Mammoth Russian Sunflowers—black-seeded variety. Sown 1st May; came up 10th May and the heads were cut for the silo on 18th September. The plants were of strong and even growth and the yield of heads was 7 tons 237 pounds per acre.

Plot 2.—One-half acre. Mammoth Russian Sunflowers—light coloured seed. Sown 1st May; came up 10th May and the heads were cut for the silo 17th September. The growth was strong and even and the seeds fairly well ripened. Yield of heads per acre, 7 tons 580 pounds.

Sunflower heads were first grown as a field crop at the Central Experimental Farm in 1892, and have been grown each year since and used to advantage in a mixed ensilage known as the Robertson Mixture, composed of Indian corn, horse beans and sunflower heads. In harvesting the sunflowers the heads only have been cut and have yielded as follows:—

	Tons.	Pounds.
1892, ½ acre. Yield of heads per acre	7	486
1893, 3 acres—stalks levelled to the ground by a severe storm—average yield per acre................	3	295
1894, 6½ acres " "	3	1,998
1895, 3 acres " "	5	1,924
1896, 1½ acre " "	7	1,823
1897, 1½ acre " "	7	350

An average for the 6 years of 5 tons 1,813 pounds per acre.

In 1894 three experiments were tried to ascertain the proportion of seeds contained in sunflower heads. In the first 315¾ pounds were shelled giving 74¾ pounds of clean seed, or about 24 per cent. In the second 474¾ pounds of heads were used giving 112¼ pounds of clean seed, rather less than 24 per cent. In the third experiment 165 pounds of heads were used giving 33¼ pounds of clean seed, a fraction over 20 per cent. The first two experiments were with the black variety of the Russian seed, the last was with the light coloured variety. The average yield from the three experiments was about 23 pounds of seeds from each 100 pounds of sunflower heads. The seeds are said to contain 20½ per cent of oil and 15·88 of albuminoids.

EXPERIMENT WITH BUCKWHEAT.

One plot of about $\frac{6}{10}$ths of an acre was sown with buckwheat. The soil was a sandy loam which had been used as a nursery for young forest trees for the past 10 years and had not received any manure or other fertilizer. The land was ploughed in the autumn of 1896 about 8 inches deep and disc-harrowed and harrowed with the smoothing harrow several times before sowing. Sown 23rd June, 3 pecks per acre of the variety known as Silver Hull, came up 28th June and was ripe 15th September. The time to mature was 79 days. Yield per acre 30 bushels 16 pounds.

EXPERIMENTS WITH FLAX.

The experiments with flax, begun in 1896, were repeated in 1897. This year, however, none of the flax was pulled but all was cut with the scythe which, as the flax was fully ripe, caused the seed to shed badly and thus reduced the yield. The soil was a sandy loam of medium to poor quality, which received a dressing of about 12 tons per acre of barn-yard manure during the winter of 1895-96. No fertilizer has been applied since. The previous crop was roots. The land was ploughed in the autumn of 1896 about 8 inches deep and disc-harrowed once in the spring and harrowed twice with the smoothing harrow before sowing each set of plots. The seed was sown broadcast by hand and lightly harrowed to cover it, after which the land was rolled.

FIRST SOWING.

Plot 1. Forty pounds of seed per acre. Sown 5th May, came up 12th May and was ripe 14th August. Made a strong and even growth, all standing well.

Weight of straw per acre........................ 3,220 pounds.
Yield of seed per acre......... .... 8 bushels 42 pounds.

Plot 2. Eighty pounds of seed per acre. Seed sown and ripened same dates as plot 1. Made a strong and even growth but was considerably lodged.

Weight of straw per acre..........................	3,530 pounds.
Yield of seed per acre....................	6 bushels 34 pounds.

SECOND SOWING.

Plot 3. Forty pounds of seed per acre. Sown 12th May, came up 19th May and was ripe 16th August. Made a strong and even growth; all standing well.

Weight of straw per acre.....................	3,130 pounds
Yield of seed per acre......................	8 bushels 52 pounds.

Plot 4. Eighty pounds of seed per acre. Seed sown and ripe on same dates as plot 3. Made a strong and even growth; a few spots lodged.

Weight of straw per acre	4,420 pounds.
Yield of seed per acre......................	6 bushels 44 pounds.

THIRD SOWING.

Plot 5. Forty pounds of seed per acre. Sown 19th May; came up 25th May, and was ripe 17th August. Made a strong and even growth; a few spots lodged.

Weight of straw per acre.....................	3,770 pounds.
Yield of seed per acre......................	9 bushels 26 pounds.

Plot 6. Eighty pounds of seed per acre. Seed sown and ripe on same dates as plot 5. Made a strong and even growth, all standing well.

Weight of straw per acre....................	3,230 pounds.
Yield of seed per acre......................	7 bushels 48 pounds.

FOURTH SOWING.

Plot 7. Forty pounds of seed per acre. Sown 26th May; came up 1st June, and was ripe 25th August. Made a medium and even growth, all standing well.

Weight of straw per acre....................	3,520 pounds.
Yield of seed per acre	10 bushels 30 pounds.

Plot. 8. Eighty pounds of seed per acre. Sown 26th May; came up 1st June, and was ripe 23rd August. Made a strong and even growth; a few small spots lodged.

Weight of straw per acre......................	3,460 pounds.
Yield of seed per acre.........................	9 bushels 16 pounds.

The cutting with the scythe, as compared with pulling in 1896, very much lessened the weight of the straw, as well as diminishing the quantity of seed saved.

BROMUS INERMIS.

AWNLESS BROME GRASS.

One acre of this grass was sown in the spring of 1896 with Odessa barley. This was reported on in the annual report of the Experimental Farms for 1896, page 40. This grass wintered well and made a rapid and early growth in the spring, the field being quite green before timothy had made a start. The plants, however, were too thin to entirely cover the ground. The quantity of seed sown per acre was 18 pounds, which is usually sufficient to make a thick mat of growth the second year. Possibly in this instance the seed did not all germinate, some of it may have been too deeply covered. A crop of hay was cut on the 6th of July when the brome grass measured on an average three feet high and yielded 1 ton 1,210 pounds of cured hay to the acre. Timothy gave about 1½ ton per acre. Had this grass been thicker on the ground, the crop would no doubt have been considerably heavier. Later in the season a good aftermath was produced, and the grass thickened up and covered the ground better. The farm animals eat the hay made from this grass very readily. It seems altogether probable that Awnless Brome grass in the eastern parts of Canada will prove valuable, as it has already done in the North-west, both for hay and pasture.

TESTS OF THE ACTION OF FERTILIZERS ON SOME CROPS.

In the annual report of the Experimental Farms for 1893, details were given on pages 8 to 24 of the results of a series of tests which were carried on during the previous five or six years with the object of gaining information regarding the effects which follow the application of certain fertilizers and combinations of fertilizers on the more important crops. The particulars there given covered the results of six years' experience with crops of wheat and Indian corn, and five years' experience with crops of oats, barley, turnips and mangels. The results of similar tests conducted for three years with carrots and one year with sugar beets were also given.

These experiments have been continued; and as explanatory regarding the preparations made and the general plan, together with the way in which they have been carried on, the following paragraphs are quoted from the report of 1893:

"A piece of sandy loam, more or less mixed with clay, which was originally covered with heavy timber, chiefly white pine, was chosen for these tests. The timber was cut many years ago, and among the stumps still remaining when the land was purchased, there had sprung up a thick second growth of trees, chiefly poplar, birch and maple, few of which exceeded six inches in diameter at the base. Early in 1887, this land was cleared by rooting up the young trees and stumps and burning them in piles, on the ground from which they were taken, the ashes being afterwards distributed over the soil as evenly as possible, and the land ploughed and thoroughly harrowed. Later in the season it was again ploughed and harrowed, and most of it got into fair condition for cropping."

"The plots laid out for the experimental work with fertilizers were one-tenth of an acre each, 21 of which were devoted to experiments with wheat, 21 to barley, 21 to oats, 21 to Indian corn or maize, and 21 to experiments with turnips and mangels. Owing to the difficulty and unavoidable delay attending the draining of some wet places, it was not practicable to undertake work on all the plots the first season. The tests were begun in 1888 with 20 plots of wheat and 16 of Indian corn; and in 1889 all the series were completed excepting six plots of roots, Nos. 16 to 21 inclusive, which were available for the work in 1890." In all cases the plots in each series have been sown on the same day.

"In 1890 it was found that all the grain plots had become so weedy that the growth of the crops was much interfered with, and with the view of cleaning the land one-half of each of the wheat and oat plots was sown with carrots in 1891, and one-half of each of the barley plots with sugar beets. In 1892 the other half of each plot in each of these series was sown with carrots. In 1893 it was thought desirable to continue this cleaning process, and carrots were again sown on the half of the wheat and oat plots occupied with this crop in 1891, and also on the half of the barley plots cropped with sugar beets that year." In 1894, 1895, 1896 and 1897 the one-half of the oat plots were sown again with carrots and the half of the plots devoted to wheat and barley were planted with potatoes.

TREATMENT OF SOIL.

"The treatment of the soil on all the grain plots has been to gang-plough soon after harvest, and after the shed grain and weeds have well started to plough again about seven inches deep. In spring the plots have been disc-harrowed twice or gang-ploughed once before applying the fertilizers, and again harrowed with the toothed or smoothing harrow before sowing. On those plots where barn-yard manure has been used, the manure has been lightly ploughed under as soon as possible after it has been spread on the land and harrowed with the smoothing harrow before sowing. Wherever barn-yard manure is spoken of, it is understood to be a mixture of horse and cow manure in about equal proportions."

It is proposed to give each year in the annual report a summary of these permanent fertilizer plots, taking the average yield of the whole of the previous period, adding the results of the current year, and then giving the average yield for the full time. The experience of each year will add materially to the value and reliability of the tests for the whole period.

WHEAT PLOTS.

The seed sown on each of these plots from the beginning has been in the proportion of 1½ bushel per acre, excepting in 1894; and the varieties used were as follows. In 1888-89-90 and 1891 White Russian, and in 1892-93 Campbell's White Chaff. In 1894 the Rio Grande wheat was used, and shortly before sowing, it was tested as to vitality and found to be very deficient in germinating power, less than half the kernels sprouted. As it was not practicable then to secure better seed, double the usual quantity of seed was sown, namely, three bushels per acre, which gave a proportion of growth on each plot of about the usual thickness. In 1895, 1896 and 1897 the Red Fife wheat was used in the usual quantity of 1½ bushel per acre. In 1897 the Red Fife was sown 5th May, came up 12th May and was harvested 10th August, requiring from the date of sowing to maturity a period of 97 days.

The season of 1897 at Ottawa has been fairly good for the growing of spring wheat, and has given crops somewhat above the average. This year the plot on which the fresh manure was used has yielded 1 bush. and 50 lbs. per acre more than that on which the rotted manure was used. This gain has been more than sufficient to offset the gain of the rotted manure plot in 1895, and the fresh manure plot now averages a little higher than any other plot in the series.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT $\frac{1}{10}$TH ACRE EACH.

No. of Plot.	Fertilizers applied each Year.	Average Yield for Nine Years. Yield of Grain. Per acre.		Average Yield for Nine Years. Yield of Straw. Per acre	10th Season, 1897. Variety, Red Fife. Yield of Grain. Per acre.		10th Season, 1897. Variety, Red Fife. Yield of Straw. Per acre	Average Yield for Ten Years. Yield of Grain. Per acre.		Average Yield for Ten Years. Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre in 1888; 15 tons per acre each year since....	19	$36\frac{6}{9}$	3,486	23	30	4,070	20	..	3,544
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre in 1888; 15 tons per acre each year since.........	19	29	3,528	25	20	4,230	20	$4\frac{1}{10}$	3,598
3	Unmanured........................	10	$24\frac{4}{9}$	1,855	12	20	2,000	10	36	1,869
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre..............	10	$23\frac{3}{9}$	1,828	12	..	2,430	10	$33\frac{5}{10}$	1,893
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre..	12	$22\frac{2}{9}$	2,851	15	50	3,290	12	43	2,895
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed, and allowed to heat for several days before using...	17	$11\frac{6}{9}$	3,007	24	40	2,980	17	$56\frac{5}{10}$	3,004
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre......	12	$38\frac{2}{9}$	2,096	14	40	3,020	12	$50\frac{4}{10}$	2,188
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre..........................	10	$37\frac{2}{9}$	1,715	13	..	1,490	10	$51\frac{5}{10}$	1,693
9	Mineral superphosphate, No. 1, 500 lbs. per acre	11	$46\frac{1}{9}$	1,699	12	10	2,090	11	$48\frac{5}{10}$	1,738
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre.. ...	12	$53\frac{3}{9}$	2,928	15	29	3,320	13	8	2,967
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre...........	13	10	2,603	19	30	3,330	13	48	2,676
12	Unmanured..............................	10	$1\frac{1}{9}$	1,651	9	30	1,490	9	58	1,635
13	Bone finely ground, 500 lbs. per acre......	11	$13\frac{6}{9}$	1,812	17	..	1,765	11	$48\frac{3}{10}$	1,807
14	Bone finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre...........	14	$29\frac{1}{9}$	2,182	22	20	2,620	15	$16\frac{5}{10}$	2,225
15	Nitrate of soda, 200 lbs. per acre..........	13	$31\frac{6}{9}$	2,316	15	30	2,330	13	$43\frac{6}{10}$	2.316
16	Muriate of potash, 150 lbs. per acre.	15	$20\frac{6}{9}$	1,944	18	..	2,310	15	$36\frac{3}{10}$	1,981
17	Sulphate of ammonia, 300 lbs. per acre....	11	$35\frac{7}{9}$	2,343	15	40	2.260	12	$0\frac{3}{10}$	2,335
18	Sulphate of iron, 60 lbs. per acre..........	12	$18\frac{3}{9}$	1,911	17	30	1,230	12	$49\frac{5}{10}$	1,843
19	Common salt (Sodium chloride) 300 lbs. per acre	12	$28\frac{8}{9}$	1,693	20	25	1,015	13	$16\frac{5}{10}$	1,625
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre......................	12	$36\frac{6}{9}$	1,925	16	..	1,450	12	57	1,878
21	Unmanured in 1889, mineral superphosphate, No. 2, 500 lbs. per acre, each year since......................... .	12	12	1,846	15	50	1,890	12	$33\frac{8}{10}$	1,850

BARLEY PLOTS.

The quantity of seed sown per acre on the barley plots was 2 bushels in 1889, 1890 and 1891, $1\frac{1}{2}$ bushel in 1892 and 1893, and 2 bushels in 1894, 1895, 1896 and 1897. Two-rowed barley has been used for seed throughout the whole period. The varieties used were as follows: 1889, 1890 and 1891, Saale; 1892, Goldthorpe; 1893, Duck-bill; and in 1894, 1895, 1896 and 1897 Canadian Thorpe, a selected form of the Duck-bill. In 1897 the Canadian Thorpe was sown 5th May, came up 12th May and was harvested 3rd August, requiring from the date of sowing to maturity a period of 90 days.

In 1897 the yield of all the barley plots but one was higher than the average of past seasons. The plot fertilized with fresh barn-yard manure has given a better yield than the plot where the manure was used rotted; and this plot still averages 1 bush. 3 lbs. higher than that of the rotted manure for the nine years these tests have been continued.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY, $\frac{1}{10}$TH ACRE.

No. of Plot.	Fertilizers applied each Year.	Average Yield for Eight Years.			9th Season, 1897. Variety, Canadian Thorpe.			Average Yield for Nine Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre	32	$36\frac{1}{8}$	2,954	42	44	3,840	33	$42\frac{3}{9}$	3,052
2	Barn-yard manure, fresh, 15 tons per acre	33	43	3,252	43	21	3,725	34	$45\frac{8}{9}$	3,305
3	Unmanured	14	$8\frac{5}{8}$	1,592	15	10	1,590	14	$14\frac{1}{9}$	1,592
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre	14	$15\frac{7}{8}$	1,446	16	12	1,600	14	$26\frac{1}{9}$	1,463
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre	19	$15\frac{1}{8}$	2,191	23	16	2,490	19	$36\frac{5}{9}$	2,224
6	Barn-yard manure, partly rotted, and actively fermenting, 6 tons per acre: mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using	26	$29\frac{1}{8}$	2,468	41	2	2,450	28	$10\frac{1}{9}$	2,466
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	22	$5\frac{5}{8}$	2,472	30	..	1,860	22	$47\frac{6}{9}$	2,404
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	18	$25\frac{3}{8}$	1,725	29	18	1,520	19	$35\frac{4}{9}$	1,702
9	Mineral superphosphate No. 1, 500 lbs. per acre	21	7	2,023	27	24	2,020	21	$36\frac{4}{9}$	2,023
10	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre	25	$21\frac{7}{8}$	2,428	37	4	2,645	26	$35\frac{3}{9}$	2,452
11	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	24	$12\frac{3}{8}$	2,521	42	24	2,940	26	$13\frac{6}{9}$	2,568
12	Unmanured	13	$20\frac{3}{8}$	1,233	16	22	1,310	13	$36\frac{5}{9}$	1,242
13	Bone, finely ground, 500 lbs. per acre	14	8	1,340	13	46	1,660	14	$6\frac{2}{9}$	1,376
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	21	$16\frac{3}{8}$	2,012	28	16	2,080	22	$5\frac{4}{9}$	2,020
15	Nitrate of soda, 200 lbs. per acre	21	$40\frac{6}{8}$	2,508	30	10	2,150	22	$37\frac{3}{9}$	2,468
16	Muriate of potash, 150 lbs. per acre	22	4	1,994	25	40	1,570	22	24	1,947
17	Sulphate of ammonia, 300 lbs. per acre	17	$45\frac{7}{8}$	2,144	19	8	1,460	18	$4\frac{3}{9}$	2,068
18	Sulphate of iron, 60 lbs. per acre	18	$20\frac{3}{8}$	1,842	21	2	1,410	18	$31\frac{3}{9}$	1,794
19	Common salt (Sodium chloride) 300 lbs. per acre	27	$15\frac{2}{8}$	2,071	39	8	2,720	28	$30\frac{4}{9}$	2,143
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre	20	$18\frac{1}{8}$	1,786	23	26	1,610	20	35	1,766
21	Mineral superphosphate No. 2, 500 lbs. per acre	20	$31\frac{2}{8}$	1,711	29	28	1,800	21	$30\frac{5}{9}$	1,721

OAT PLOTS.

The quantity of seed sown per acre on the oat plots was 2 bushels in 1889 and 1890; $1\frac{1}{2}$ bushel in 1891, 1892 and 1893, and 2 bushels in 1894, 1895, 1896 and 1897. The varieties used were as follows: In 1889, Early English; 1890, 1891, 1892, 1893, Prize Cluster; and in 1894, 1895, 1896 and 1897, Banner. In 1897 the Banner was sown 5th May, came up the 13th May, and was harvested 9th August, requiring from the date of sowing to maturity a period of 96 days. In every instance this year, excepting that of plots Nos. 4 and 12, the yield of oats has been considerably above the average of the previous eight years. The crop of plot 2 fertilized with fresh barn-yard manure has again exceeded that of plot 1, treated with rotted manure and the average of the former for nine years now stands 6 bushels 26 pounds higher than that of the latter.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS, $\frac{1}{10}$TH ACRE.

No. of Plot.	Fertilizers applied each Year.	Average Yield for Eight Years.			9th Season, 1897. Variety Banner.			Average Yield for Nine Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre....	43	23	3,039	70	30	4,410	46	$23\frac{7}{9}$	3,191
2	Barn-yard manure, fresh, 15 tons per acre.	50	$8\frac{6}{8}$	3,318	80		4,520	53	$19\frac{1}{9}$	3,452
3	Unmanured....	30	$3\frac{1}{8}$	1,608	37	32	1,170	30	$32\frac{7}{9}$	1,559
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre....	30	$24\frac{6}{8}$	1,843	28	33	1,545	30	$18\frac{1}{9}$	1,810
5	Mineral phosphate, untreated, finely ground; 500 lbs., nitrate of soda, 200 lbs. per acre....	46	31	2,837	58	8	2,240	48	$5\frac{7}{9}$	2,771
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using....	40	$28\frac{6}{8}$	2,670	68	18	2,590	43	$31\frac{3}{9}$	2,661
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre....	42	$23\frac{7}{8}$	3,316	57	22	2,705	44	$12\frac{3}{9}$	3,248
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre....	37	$11\frac{3}{8}$	2,442	64	14	1,850	40	$11\frac{6}{9}$	2,376
9	Mineral superphosphate, No. 1, 500 lbs. per acre....	33	$9\frac{7}{8}$	2,022	52	2	2,010	35	$12\frac{7}{9}$	2,021
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre....	43	$11\frac{6}{8}$	2,941	65	30	2,460	45	$28\frac{3}{9}$	2,888
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre....	35	$5\frac{1}{8}$	2,373	43	8	3,210	36	$1\frac{4}{9}$	2,466
12	Unmanured....	22	$19\frac{4}{8}$	1,632	18	18	1,310	22	$4\frac{2}{9}$	1,596
13	Bone, finely ground, 500 lbs. per acre....	31	26	2,023	45	30	1,890	33	$11\frac{3}{9}$	2,008
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre....	35	$10\frac{5}{8}$	2,237	57	12	2,470	37	$25\frac{8}{9}$	2,263
15	Nitrate of soda, 200 lbs. per acre....	43	$31\frac{1}{8}$	2,725	60		2,840	45	$23\frac{8}{9}$	2,738
16	Muriate of potash, 150 lbs. per acre....	33	23	2,265	51	16	2,180	35	$22\frac{2}{9}$	2,256
17	Sulphate of ammonia, 300 lbs. per acre....	41	$30\frac{3}{8}$	3,165	56	16	2,740	43	$17\frac{1}{9}$	3,118
18	Sulphate of iron, 60 lbs. per acre....	34	$15\frac{2}{8}$	2,210	54	29	2,335	36	$24\frac{8}{9}$	2,224
19	Common salt (Sodium chloride) 300 lbs. per acre....	33	$16\frac{6}{8}$	2,025	53	18	2,300	35	$24\frac{1}{9}$	2,056
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre....	31	$7\frac{2}{8}$	2,137	49	4	2,010	33	$6\frac{3}{9}$	2,123
21	Mineral superphosphate, No. 2, 500 lbs. per acre....	30	$3\frac{1}{8}$	1,924	57	22	2,060	33	$5\frac{4}{9}$	1,939

CORN PLOTS.

The experiments with the plots of Indian corn have been conducted with the object of obtaining the largest weight of well matured green fodder for the silo, and to have the corn so far advanced when cut, that the ears shall be in the late milk, or glazed condition. Each plot has been divided from the outset into two equal parts, on one of which—known as No. 1—one of the stronger growing and somewhat later ripening sorts has been tried, and on the other, marked No. 2, one of the earlier maturing varieties. During the first four years one of the dent varieties was tested under No. 1. The Mammoth Southern Sweet was tried in 1888, 1889 and 1890. In 1891 the Red Cob Ensilage was used, and in 1892, 1893, 1894, 1895, 1896 and 1897 a free growing flint variety, the Rural Thoroughbred White Flint, was tested. On the other half of the plot (No. 2) the Canada Yellow Flint was used in 1888, 1889 and 1890, the Thoroughbred White Flint in 1891, Pearce's Prolific in 1892, 1893 and 1894, and the Mammoth Eight Rowed Flint in 1895, 1896 and 1897. For the first four years the No. 1 series was planted in drills three feet apart, using about 24 pounds of seed to the acre and thinning the plants, when up, to 6 or 8 inches, and the No. 2 in hills 3 feet apart each way and 4 or 5 kernels in a hill. During the past six years both sorts have been grown in hills. The corn in both series of plots was planted in 1897 on 19th May, and cut 16th September. In most instances the yield of fodder on these plots during the past season has been below the average of past years.

With Indian corn the rotted manure has given in both plots a larger return this year than the fresh manure, but the average of ten years tests still shows the fresh manure in advance of the rotted in plot 1 by 1 ton 787 pounds per acre, while in plot 2 the advantage is with the rotted manure by 1,965 pounds per acre.

EXPERIMENTS WITH FERTILIZERS, ON PLOTS OF INDIAN CORN, $\frac{1}{10}$TH ACRE EACH, CUT GREEN FOR ENSILAGE.

No. of Plot.	Fertilizers applied each year.	Average Yield for Nine Years.				10th Season, 1897.				Average Yield for Ten Years.			
		½ Plot No. 1—weight of green fodder		½ Plot No. 2—weight of green fodder		½ Plot No. 1—Thoroughb'd White Flint, weight of green fodder		½ Plot No. 2—Mam. 8 rowed, weight of green fodder		½ Plot No. 1—weight of green fodder		½ Plot No. 2—weight of green fodder	
		Per acre.		Per acre		Per acre.		Per acre		Per acre.		Per acre	
		Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs
1	Barn-yard manure, well rotted, 12 tons per acre ...	15	1,172	12	107	21	440	15	900	16	299	12	786
2	Barn-yard manure, fresh, 12 tons per acre.	17	1,739	11	1,175	14	1,210	9	1,640	17	1,086	11	821
3	Unmanured..	8	1,356	5	1,866	3	860	4	1,040	8	306	5	1,583
4	Mineral phosphate untreated, finely ground, 500 lbs. per acre in 1888—800 lbs. per acre each year since.	7	647	5	190	3	605	3	1,190	6	1,843	4	1,890
5	Mineral phosphate untreated, finely ground, 500 lbs. per acre in 1888—800 lbs. per acre each year since ; nitrate of soda, 200 lbs. per acre	11	467	8	1,074	6	540	8	1,610	10	1,474	8	1,128
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre ; mineral phosphate, untreated, finely ground, 500 lbs. per acre ; composted together, intimately mixed and allowed to heat for several days before using	16	1,095	11	1,293	15	810	10	1,500	16	866	11	1,114
7	Mineral phosphate untreated, finely ground, 500 lbs. ; nitrate of soda, 200 lbs. ; wood ashes, unleached, 1,000 lbs. per acre	15	560	10	1,389	14	1,805	13	800	15	484	10	1,930

EXPERIMENTS WITH FERTILIZERS, ON PLOTS OF INDIAN CORN—*Concluded.*

No. of Plot.	Fertilizers applied each year.	Average Yield for Nine Years.				10th Season, 1897.				Average Yield for Ten Years.			
		¼ Plot No. 1—weight of green fodder		¼ Plot No. 2—weight of green fodder		¼ Plot No. 1—Thoroughb'd White Flint, weight of green fodder		¼ Plot No. 2—Mam. 8 rowed, weight of green fodder		¼ Plot No. 1—weight of green fodder		¼ Plot No. 2—weight of green fodder	
		Per acre.		Per acre		Per acre.		Per acre		Per acre.		Per acre	
		Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs
8	Mineral phosphate untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre....	11	1,747	8	982	11	700	10	380	11	1,642	8	1,322
9	Mineral superphosphate No. 1, 500 lbs. per acre...	10	1,947	8	206	8	1,010	8	300	10	1,453	8	215
10	Mineral superphosphate No. 1, 350 lbs. per acre; nitrate of soda, 200 lbs. per acre..	13	1,762	10	1,040	10	960	9	1,380	13	1,082	10	874
11	Mineral superphosphate No. 1, 350 lbs.; nitrate of soda, 200 lbs; wood ashes, unleached, 1,500 lbs. per acre.............	16	165	12	746	17	1,440	14	810	16	492	12	1,152
12	Unmanured.........	11	291	9	368	8	1,370	7	...	10	1,799	8	1,931
13	Bone, finely ground, 500 lbs. per acre.....	11	1,534	9	8	11	210	9	1,010	11	1,402	9	108
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre.........	12	284	8	1,592	14	205	10	1,405	12	676	8	1,973
15	Nitrate of soda, 200 lbs. per acre..........	13	303	10	132	9	1,540	8	700	12	1,627	9	1,789
16	Sulphate of ammonia, 300 lbs. per acre....	13	1,024	10	136	10	1,490	8	800	13	471	9	1,802
17	Mineral superphosphate No. 1, 600 lbs.; muriate of potash, 200 lbs.; sulphate of ammonia, 150 lbs. per acre.............	13	3	9	703	14	600	12	1,250	13	263	9	1,358
18	Muriate of potash, 300 lbs. per acre......	9	618	5	1,992	8	1,310	6	300	9	487	6	23
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and '90; (muriate of potash, 200 lbs., substituted each year since); dried blood, 300 lbs.; mineral superphosphate No. 1, 500 lbs. per acre..	11	1,244	7	1,800	12	660	7	1,400	11	1,386	7	1,760
20	Wood ashes, unleached, 1,900 lbs. per acre.	10	401	7	83	8	1,650	7	1,060	10	126	7	181
21	Bone, finely ground, 500 lbs.; sulphate of ammonia, 200 lbs.; muriate of potash, 200 lbs. per acre........................	13	634	9	266	11	700	7	1,910	13	241	9	31

PLOTS OF MANGELS AND TURNIPS.

In conducting these experiments the roots only have been taken from the land, the tops have always been cut off and left on the ground to be ploughed under so that the plant food they have taken from the soil may be returned to it. One-half of each one-tenth acre plot in the series has been devoted to the growth of mangels, and the other half to turnips. The preparation of the land has been the same for both these roots. It has been ploughed in the autumn after the crop is gathered, disc-harrowed or gang-ploughed once in the spring, harrowed with smoothing harrow once, then ridged, rolled and sown.

In 1889, the variety of mangel used was the Mammoth Long Red. In 1890, three varieties were sown: 15 rows of Mammoth Long Red, 6 of Mammoth Long Yellow, and 6 of Golden Intermediate on each plot. In 1891, each plot again had three varieties: 18 rows of Mammoth Long Red, 3 of Yellow Fleshed Tankard, and 6 of Golden Tankard. In 1892, 1893, 1894, 1895, 1896 and 1897 one variety only has been used, namely, the Mammoth Long Red. From 4 to 6 pounds of seed have been sown per acre, each year, in rows 2½ feet apart. In 1897 the mangels were sown 5th May, came up 17th May, and were pulled 11th October.

Two varieties of turnips were sown on the half plots devoted to these roots in 1889: 25 rows of Carter's Prize Winner, and 2 rows of Carter's Queen of Swedes; and in 1890, a single variety, Carter's Elephant Swede. In 1891, six varieties were sown; 6 rows of Lord Derby Swede, 4 of New Giant King, 3 of Imperial Swede, 6 of Champion Swede, 4 of Purple Top Swede, and 4 of East Lothian Swede. In 1892, the Improved Purple Top Swede only was sown, in 1893 and 1894 the Prize Purple Top Swede, in 1895 the Imperial Swede, and in 1896 and 1897 the Prize Purple Top Swede. The land used for the turnips, which are usually sown later than the mangels, is allowed to stand after disc-harrowing or gang-ploughing, then cultivated once and ridged and rolled immediately before sowing. In 1897, the turnips were sown 10th June, came up 15th June, and were pulled 16th October. The crops of turnips have been larger during the past season on all the plots excepting 17 and 21 than the average of previous years, while in the case of the mangels all of the plots excepting 1, 2, 5, 6, 7 and 18 have given a smaller yield than the average of the past eight years. The rotted manure has averaged better results than the fresh manure with the mangels, but the turnips have given better results with the fresh manure.

EXPERIMENTS WITH FERTILIZERS ON ROOTS; PLOTS OF MANGELS AND TURNIPS $\frac{1}{10}$TH ACRE EACH.

No. of Plot.	Fertilizers applied each Year.	Average Yield for Eight Years. Mangels, Weight of Roots. Per Acre.	Average Yield for Eight Years. Turnips, Weight of Roots. Per Acre	9th Season, 1897. Varieties. West Half Plot. Mangels, Mammoth Long Red: Weight of Roots. Per Acre.	9th Season, 1897. Varieties. East Half Plot. Turnips, Purple Top Swede: Weight of Roots. Per Acre.	Average Yield for Nine Years. Mangels, Weight of Roots. Per Acre.	Average Yield for Nine Years. Turnips, Weight of Roots. Per Acre.
		Tons. Lbs.	Tons. Lbs.	Tons. Lbs.	Tons. Lbs.	Tons. Lbs.	Tons. Lbs.
1	Barn-yard manure, well rotted, 20 tons per acre	22 800	13 1,285	27 1,180	24 1,020	22 1,953	14 1,700
2	Barn-yard manure, fresh, 20 tons p. ac.	21 1,594	14 864	25 1,030	23 140	22 420	15 784
3	Unmanured	9 933	7 422	7 1,260	9 1,860	9 525	7 1,026
4	Mineral phosphate, untreated, finely ground, 1,000 lbs. per acre	8 1,419	7 704	8 810	10 310	8 1,351	7 1,327
5	Mineral phosphate, untreated, finely ground, 1,000 lbs.; nitrate of soda, 250 lbs.; wood ashes, unleached, 1,000 lbs. per acre	13 632	8 1,244	16 870	13 1,350	13 1,325	9 367
6	Barn-yard manure, partly rotted and actively fermenting, 12 tons per acre; mineral phosphate, untreated, finely ground, 1,000 lbs per acre, composted together, intimately mixed and allowed to heat for several days before using	18 196	12 632	20 1,800	20 1,590	18 819	13 516
7	Mineral phosphate, untreated, finely ground, 1,000 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890, (substituted by muriate of potash, 250 lbs. in 1891 and subsequent years); nitrate of soda, 200 lbs. per acre	9 1,668	8 1,497	14 170	12 1,520	10 613	9 389
8	Mineral superphosphate, No. 1, 500 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890, (substituted by muriate of potash, 250 lbs. in 1891 and subsequent years); nitrate of soda, 200 lbs. per acre	14 1,628	11 1,271	11 480	15 280	14 834	12 50
9	Mineral superphosphate, No. 1, 500 lbs. per acre	9 1,594	8 1,558	7 370	12 740	9 1,014	9 356

EXPERIMENTS WITH FERTILIZERS ON ROOTS; PLOTS OF MANGELS AND TURNIPS—*Concluded.*

No. of Plot.	Fertilizers applied each Year.	Average Yield for Eight Years. Mangels, Weight of Roots. Per Acre.	Average Yield for Eight Years. Turnips, Weight of Roots. Per Acre.	9th Season, 1897. Varieties. West Half Plot. Mangels, Mammoth Long Red: Weight of Roots. Per Acre.	9th Season, 1897. Varieties. East Half Plot. Turnips, PurpleTop Swede: Weight of Roots. Per Acre.	Average Yield for Nine Years. Mangels, Weight of Roots. Per Acre.	Average Yield for Nine Years. Turnips, Weight of Roots. Per Acre.
		Tons. Lbs.	Tons. Lbs.	Tons. Lbs.	Tons. Lbs.	Tons. Lbs.	Tons. Lbs.
10	Nitrate of soda, 300 lbs. per acre....	14 1,209	8 1,305	14 470	12 590	14 1,127	9 114
11	Sulphate of ammonia, 300 lbs. per ac.	11 1,181	10 62	11 620	14 1,950	11 1,119	10 1,161
12	Unmanured	7 1,377	6 1,968	4 1,470	8 1,860	7 721	7 400
13	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,000 lbs. per acre	10 1,041	8 165	9 840	12 300	10 796	8 1,069
14	Wood ashes, unleached, 2,000 lbs. p.ac	11 1,096	7 1,916	8 1,680	8 420	11 494	7 1,972
15	Common salt (Sodium chloride), 400 lbs. per acre....	10 95	7 1,011	8 1,790	7 1,750	9 1,839	7 1,093
16	Mineral superphosphate, No. 1, 500 lbs.; nitrate of soda, 200 lbs. per ac.	13 1,589	10 1,226	12 670	11 950	13 1,265	10 1,418
17	Mineral superphosphate, No. 1, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre.	12 1,415	9 1,243	12 120	8 670	12 1,271	9 957
18	Mineral superphosphate, No. 1, 500 lbs.; muriate of potash, 200 lbs. p.ac.	12 657	10 1,033	12 1,550	10 1,410	12 756	10 1,075
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and 1890 (muriate of potash, 200 lbs., substituted each year since); dried blood, 250 lbs.; mineral superphosphate, No. 1, 1,500 lbs. per acre...	14 493	11 816	12 1,190	13 1,290	14 126	11 1,313
20	Wood ashes, unleached, 1,500 lbs.; common salt (Sodium chloride), 300 lbs. per acre	14 1,440	10 1,052	13 690	10 1,470	14 1,134	10 1,098
21	Mineral superphosphate, No. 2, 500 lbs. per acre............	15 898	10 1,808	13 910	10 1,500	15 455	10 1,774

CARROT PLOTS.

Carrots have been sown on alternate halves of the oat plots for the past seven years, for the purpose of cleaning the land from weeds. This work was begun in 1891, and the plots have been sown each year with the variety known as the Improved Short White. In 1897, carrots occupied the east half of the plots. The seed was sown 5th May, came up 18th May, and the roots were pulled 18th October. The crop this year on plots 1, 2, 6, 7, 8, 9, 10, 11 were above the average of the preceding years. The other plots were all below the average.

EXPERIMENTS WITH FERTILIZERS ON HALF PLOTS ($\frac{1}{20}$TH ACRE) OF CARROTS (IMPROVED SHORT WHITE), AFTER OATS.

No. of Plot.	Fertilizers applied each Year.	Average Yield for six years. Weight of roots per acre.		7th Season, 1897. Improved Short White. Weight of roots per acre.		Average Yield for seven years. Weight of roots per acre.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre........ ...	18	1,875	25	990	19	1,749
2	Barn-yard manure, fresh, 15 tons per acre..................	20	1,003	24	120	21	20
3	Unmanured	12	1,990	10	1,870	12	1,401
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre	13	511	9	1,890	12	1,565
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre	15	1,633	12	60	15	551
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed, and allowed to heat for several days before using	19	61	19	330	19	99
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	15	305	18	1,470	15	1,329
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre.	12	345	14	370	12	920
9	Mineral superphosphate, No. 1, 500 lbs. per acre	9	1,798	10	360	9	1,878
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre	12	81	13	1,570	12	579
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.: wood ashes, unleached, 1,500 lbs. per acre........	15	1,160	15	1,840	15	1,257
12	Unmanured	11	541	*4	790	10	577
13	Bone, finely ground, 500 lbs. per acre......................	12	183	*7	800	11	843
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre...................................	17	1,630	*9	850	16	1,233
15	Nitrate of soda, 200 lbs. per acre......................	15	359	13	1,240	14	1,913
16	Muriate of potash, 150 lbs. per acre	16	1,093	15	190	16	678
17	Sulphate of ammonia, 300 lbs. per acre.....................	11	331	9	1,530	10	1,931
18	Sulphate of iron, 60 lbs. per acre....	12	173	10	1,480	11	1,788
19	Common salt (Sodium chloride), 300 lbs. per acre	14	68	11	1,340	13	1,393
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre..	14	738	9	1,060	13	1,355
21	Mineral superphosphate, No. 2, 500 lbs. per acre	11	1,525	8	1,670	11	689

* Plots 12, 13 and 14 were on a piece of rising ground on light soil and were injured by wind; plot 12 suffered more than the others.

POTATO PLOTS.

The alternate halves of the wheat and barley plots which were occupied by carrots and sugar beets in 1891, 1892 and 1893 were planted with potatoes in 1894, 1895, 1896 and 1897. These were planted in rows $2\frac{1}{2}$ feet apart, with the sets about one foot apart in the rows.

Those grown in 1897 after wheat were planted 14th May, came up 9th June and were dug 10th October. On each of these plots there were nine rows each of Empire State, Early Sunrise and Clarke's No. 1.

Those grown after barley were planted 14th May, came up 9th June, and were dug 29th September. On these plots there were nine rows each of Vanier, Lee's Favorite and Northern Spy. In the tables following, the yield of each variety for each plot is given, also the crop, in bushels, per acre.

EXPERIMENTS WITH FERTILIZERS ON HALF PLOTS ($\frac{1}{20}$th ACRE) OF POTATOES AFTER WHEAT.

No. of Plot.	Fertilizers applied each Year.	West Half of Plots.				
		Yield of 9 rows Empire State.	Yield of 9 rows Early Sunrise.	Yield of 9 rows Clarke's No. 1.	Total Yield per Acre.	
		Lbs.	Lbs	Lbs.	Bush.	Lbs.
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre in 1888; 15 tons per acre each year since....	196½	251	285	244	10
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre in 1888; 15 tons per acre each year since..........	207½	258	280	248	30
3	Unmanured....................................	103½	103½	100	102	20
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre..	108½	108½	73½	96	50
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre..............................	116½	113½	110½	113	30
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using...............	194½	223½	229½	215	50
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre..	153	178	160½	163	50
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre.......................	124½	127	131	127	30
9	Mineral superphosphate, No. 1, 500 lbs. per acre..	112	74½	127	104	30
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre....	143½	137½	155	145	20
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre.............	184	222½	223	209	50
12	Unmanured..	120½	86½	89	98	40
13	Bone, finely ground, 500 lbs. per acre.........................	133½	103	90	108	50
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	162½	153	136	150	30
15	Nitrate of soda, 200 lbs. per acre............................	113½	108½	111½	111	10
16	Muriate of potash, 150 lbs. per acre	136½	135	114½	128	40
17	Sulphate of ammonia, 300 lbs. per acre...............	109	84½	82	81	50
18	Sulphate of iron, 60 lbs. per acre............	117	105½	92½	105	00
19	Common salt (Sodium chloride), 300 lbs. per acre..............	127½	103	72½	101	00
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre...	152½	98	88	112	50
21	Unmanured in 1889, mineral superphosphate, No. 2, 500 lbs. per acre each year since............................	135½	117½	103½	118	50

EXPERIMENTS WITH FERTILIZERS ON HALF PLOTS ($\frac{1}{20}$TH ACRE) OF POTATOES AFTER BARLEY.

No. of Plot.	Fertilizers applied each Year.	East Half of Plots.				
		Yield of 9 rows Vanier.	Yield of 9 rows Lee's Favourite.	Yield of 9 rows Northern Spy.	Total Yield per Acre.	
		Lbs.	Lbs.	Lbs.	Bush.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre.	317	230	329	292	
2	Barn-yard manure, fresh, 15 tons per acre........	273½	217	293½	261	20
3	Unmanured.......	134½	95	141	123	30
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre.	84½	73	154	103	50
5	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs. per acre.................	112½	60½	143½	105	30
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using.......................	235½	142½	266	214	40
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre..............................	179	94	203½	158	50
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre.........	195¼	93	202½	163	31
9	Mineral superphosphate, No. 1, 500 lbs. per acre......	162	124	183½	156	30
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre................................	178½	137	202	172	30
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	215	130½	198½	181	20
12	Unmanured....................................	121½	59½	104½	95	10
13	Bone, finely ground, 500 lbs. per acre..................	122½	71½	154½	116	10
14	Bone, finely ground, 500 lbs.; wood ashes, unleacbed, 1,500 lbs. per acre...............................	232½	122½	233½	196	10
15	Nitrate of soda, 200 lbs. per acre	96	72½	134½	101	
16	Muriate of potash, 150 lbs. per acre..................	147	79	142½	122	50
17	Sulphate of ammonia, 300 lbs. per acre................	98	74	162	111	20
18	Sulphate of iron, 60 lbs. per acre.....................	150	88½	150½	129	40
19	Common salt (Sodium chloride), 300 lbs. per acre	133½	63	121	105	50
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre.....	142½	76½	191½	136	50
21	Mineral superphosphate, No. 2, 500 lbs. per acre.......	154½	114½	195	154	40

In the following table particulars are given of the crops of potatoes obtained each year from 1894 to 1897, inclusive, from each of the plots devoted to experiments with fertilizers, also the average results of these tests for four years. It will be seen that plot 1, to which well rotted barn-yard manure has been applied, has given the best results in the plots after barley, while in those after wheat plot 2 on which fresh manure was used, has a very slight advantage. None of the artificial fertilizers or mixtures of these fertilizers have given results as good as those obtained from barn-yard manure. Of the single fertilizers tried, the best crops have been had from the Mineral Superphosphate of lime, and the next best from Muriate of Potash.

Table showing Crops of Potatoes obtained during four years from Fertilized Plots.

No. of Plot.	1894.				1895.				1896.				1897.				Average for four years.			
	After Wheat.		After Barley.		After Wheat.		After Barley.		After Wheat.		After Barley.		After Wheat.		After Barley.		After Wheat.		After Barley.	
	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.	Bus.	lbs.
Plot No. 1....	264	50	247	20	306	20	241	40	302	50	253	50	244	10	292	..	279	32	258	42
" " 2....	234	20	265	40	366	..	249	50	270	10	233	40	248	30	261	20	279	45	252	37
" " 3....	141	10	123	50	144	40	101	30	90	..	99	50	102	20	123	30	119	32	112	10
" " 4....	142	50	128	10	127	50	93	40	84	40	98	10	96	50	103	50	113	2	105	57
" " 5....	150	..	104	40	157	40	98	30	94	..	98	50	113	30	105	30	128	47	101	52
" " 6....	218	10	180	10	317	20	243	50	256	20	196	40	215	50	214	40	251	55	208	40
" " 7....	172	..	156	30	213	..	151	20	165	..	135	20	163	50	158	50	178	27	150	30
" " 8....	155	50	162	30	174	20	150	40	133	50	128	20	127	30	163	31	147	52	151	15
" " 9....	178	50	197	10	169	10	152	10	130	..	147	40	104	30	156	30	145	37	163	22
" " 10....	174	50	172	50	169	30	123	40	119	50	99	50	145	20	172	30	152	22	142	12
" " 11....	175	20	232	40	274	30	163	..	182	30	193	30	209	50	181	20	210	32	192	37
" " 12....	102	30	118	30	119	50	71	20	77	40	80	..	98	40	95	10	99	40	91	15
" " 13....	109	10	97	50	102	50	82	30	85	50	64	..	108	50	116	10	101	40	90	7
" " 14....	180	40	172	..	204	20	181	20	176	..	115	..	150	30	196	10	177	52	166	7
" " 15....	174	..	114	40	99	50	81	20	105	30	88	50	111	10	101	..	122	37	96	27
" " 16....	146	20	141	40	148	..	133	..	131	40	119	10	128	40	122	50	138	40	129	10
" " 17....	98	50	93	10	95	50	94	..	69	50	54	50	81	50	111	20	86	35	88	20
" " 18....	89	40	97	40	103	20	97	10	69	10	71	50	105	..	129	40	91	47	99	5
" " 19....	64	10	156	..	73	..	59	..	52	50	109	..	101	..	105	50	72	45	107	27
" " 20....	85	..	171	10	60	40	49	40	83	10	107	..	112	50	136	50	85	25	116	10
" " 21 ...	105	..	155	10	90	20	119	10	95	50	119	16	118	50	154	40	102	30	137	4

The varieties which have been tested during the four years named and the weights obtained of each sort in pounds per row are here given. These rows have in each case run through the whole series of fertilized plots, and as the conditions under which the different varieties have been grown may be considered as very similar, if not identical, the results may fairly be regarded as indicating the relative productiveness of the different sorts under trial.

Name of Variety.	1894.	1895.	1896.	1897.	Average.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Northern Spy	....	......	....	434	434
Queen of the Valley	....	462	358	....	410
Vanier	....	......	......	387	387
Early Sunrise	....	407	367	321	365
Thorburn	357	329	351	....	346
Wonder of the World	406	344	247	....	332
Empire State	......	......	....	328	328
Beauty of Hebron	406	257	308	....	323
Daisy	....	376	268	....	322
Early Rose	235	426	294	....	318
Clarke's No. 1	....	....	....	317	317
Lee's Favourite	333	284	295	247	290
Burpee's Extra Early	....	....	276	....	276
May Queen Early	....	269	259	....	264

DISTRIBUTION OF SEED GRAIN.

A further distribution of seed grain was made in the spring of 1897, chiefly of samples of the most promising sorts which had been grown at the several experimental farms. These have been sent out to farmers on application, one sample only to each applicant, with the object of placing within their reach pure samples and true to name of the best and most productive sorts in cultivation. By the careful handling of these samples the farmer can soon obtain sufficient seed for a large area and may thus be provided with the best sorts without any further cost than that of his own labour. The appreciation of this part of the experimental farm work is shown by the increasing demand for samples.

Preparations have been made for another distribution in 1898 which will consist as heretofore of promising sorts of oats, barley, wheat, pease, Indian corn and potatoes. The several branch farms will also again distribute samples to farmers residing in the provinces and territories where these farms have been established.

The samples sent out from the Central Experimental Farm at Ottawa during the early months of 1897 were distributed as follows:—

Kind of Grain.	Prince Edward Island.	Nova Scotia.	New Brunswick.	Quebec.	Ontario.	Manitoba.	North-west Territories.	British Columbia.
Oats	838	1,977	1,263	6,087	3,686	618	328	187
Barley	332	1,016	414	3,019	1,418	206	136	95
Wheat	460	926	625	2,454	1,781	314	178	87
Pease	172	457	288	920	1,223	140	117	56
Indian Corn	80	336	189	648	808	58	28	18
Potatoes	137	326	201	1,316	996	210	105	99
Total number of samples sent	2,019	5,038	2,980	14,444	9,912	1,546	892	542
Number of applicants supplied	2,016	5,035	2,978	14,416	9,906	1,536	890	529

Total number of samples distributed, 37,373. Number of applicants supplied, 37,306.

The following list shows the number of 3-pound packages of the different varieties which have been distributed :

Oats.		Barley, Six-rowed.	
Banner	2,740	Odessa	2,112
Abundance	2,571	Trooper	868
Wallis	1,843	Mensury	547
Bavarian	1,806	Royal	235
Improved Ligowo	1,198	Vanguard	163
Early Gothland	1,089		
Golden Giant	904		
American Beauty	578		
Golden Beauty	434		
Columbus	348		
Joanette	284		
White Schonen	281	Two-rowed.	
Abyssinia	232		
Holstein Prolific	230	Canadian Thorpe	1,009
Hazlett's Seizure	194	French Chevalier	646
Flying Scotchman	98	Sidney	514
Early Archangel	96	Duckbill	495
Mennonite	58	Newton	47
Total	14,984	Total	6,636

LIST of the number of 3-pound packages of the different varieties distributed—*Concluded.*

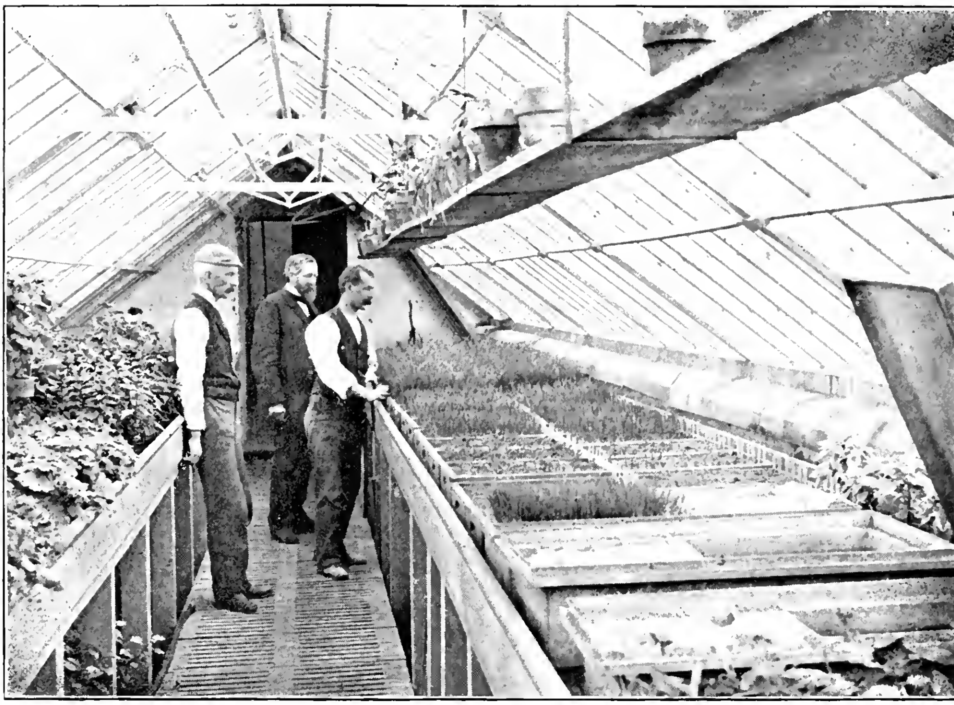
PEASE.		WHEAT—*Continued.*	
Prussian Blue	1,798	Herisson Bearded	287
Daniel O'Rourke	640	Crown	238
Large White Marrowfat	462	Huron	206
Mummy	327	White Russian	206
Black-eyed Marrowfat	89	Ladoga	201
Canadian Beauty	57	Rio Grande	180
		Advance	177
Total	3,373	Alpha	99
		Stanley	71
INDIAN CORN.		Total	6,825
Champion White Pearl	650	POTATOES.	
White Cap Yellow Dent	588		
Compton's Early	226	Northern Spy	505
90 Day Corn	223	Empire State	471
King of the Earliest	178	Clarke's No. 1	304
Longfellow	124	Lee's Favourite	250
Mammoth Early Flint	92	Early Sunrise	241
Angel of Midnight	84	Queen of the Valley	234
		Daisy	197
Total	2,165	Burpee's Extra Early	194
		Vanier	186
		Pearce's Extra Early	180
WHEAT.		May Queen Early	140
		Wonder of the World	129
Red Fife	1,184	Beauty of Hebron	123
White Fife	999	Chicago Market	121
Wellman's Fife	982	Early White Surprise	49
White Connell	685	Thorburn	46
Preston	597	Dakota Red	20
Percy	376		
Red Fern	327	Total	3,390

SPECIAL DISTRIBUTION OF CROSS-BRED CEREALS.

Some of the more promising of the cross-bred and hybrid cereals were available this year in sufficient quantity to be included to some extent in the general distribution of 3-pound bags. There were, however, others of which only a small quantity could be had. These were sent out in 1 pound bags to farmers in the several provinces, as follows :—

	Prince Edward Island.	New Brunswick.	Nova Scotia.	Quebec.	Ontario.	Manitoba.	North-west Territories.	British Columbia.
Cross-bred wheats	8	20	14	63	80	21	19	1
Cross-bred pease	52	97	127	216	267	23	24	18
Total	60	117	141	279	347	44	43	19

Making 1,050 samples in all, which, added to the distribution of the Central Farm, makes the total number of samples sent out 38,423.



Testing the vitality and germinating power of seed grain and other agricultural seeds, at the Central Experimental Farm, Ottawa.

Distribution of samples of seed grain at the Central Experimental Farm. Getting ready for the mail.

DISTRIBUTION OF SAMPLES FROM BRANCH EXPERIMENTAL FARMS.

Samples of 3 pounds each were also distributed from the branch experimental farms as follows :—

Experimental Farm, Nappan, N.S.

Oats	345
Barley	183
Wheat	91
Pease	83
Rye	6
Potatoes	302
	1,010
No. of applicants supplied	543

Experimental Farm, Brandon, Man.

Grain of all sorts	357
Potatoes	210
	567

Experimental Farm, Indian Head, N.W.T.

Oats	401
Barley	259
Wheat	253
Pease	233
Rye	18
Flax	2
Potatoes	372
	1,538

Experimental Farm, Agassiz, B.C.

Oats	57
Barley	29
Wheat	51
Pease	49
Potatoes	68
	254

This makes a total of 3,369 samples sent out by the branch experimental farms which, added to the number distributed by the Central Farm, makes a total of 41,792. Much interest is taken by farmers generally in this branch of the work, and by this means some of the better varieties are rapidly finding their way into general cultivation.

TESTS OF THE VITALITY OF GRAIN AND OTHER SEEDS FOR 1897.

The number of samples of seed grain and other seeds which were tested for their germinating power during the season of 1897 was 2,174. The following figures show the variations in the average vitality of the more important cereals during the past five years :—

	1893.	1894.	1895.	1896.	1897.	Average for the five Years.
Wheat	81·8	90·5	88	87·7	83·5	86·3
Barley	84·9	89	85·7	90·1	90	87·9
Oats	93	95·5	93·3	89·8	93·6	93

Many of the samples sent for test are much below the average in vitality, hence the figures given above do not fairly represent the vitality of grain of average quality grown in different parts of the Dominion. One of the chief objects in continuing these tests from year to year, is to give farmers the opportunity of having any samples which may be of doubtful vitality, through injury in harvesting or storing, thoroughly tested, so that their value for seed purposes may be known. Samples may be sent free through the mail, and this work is done and reported on free of charge. Samples can usually be reported on within a fortnight after they are received.

Results of Tests of Seeds for vitality, 1896-97.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	482	100·0	......	77·5	6·0	83·5
Barley	465	100·0	17·0	81·8	8·2	90·0
Oats	662	100·0	......	88·7	4·9	93·6
Rye	2	75·0	67·0	64·5	6·5	71·0
Pease	241	100·0	......	......	......	77·2
Corn	23	100·0	28·0	......	......	85·8
Clover	13	87·0	26·0	......	......	72·6
Grass	10	98·0	17·0	......	......	74·9
Turnips	13	84·0	28·0	......	......	72·4
Carrots	5	68·0	23·0	......	......	42·0
Mangels	4	78·0	18·0	......	......	43·0
Beets	10	98·0	42·0	......	......	76·6
Sunflowers	3	98·0	92·0	......	......	95·3
Lettuce	17	95·0	2·0	......	......	58·0
Onions	18	100·0	42·0	......	......	68·1
Leeks	6	75·0	27·0	......	......	51·5
Tomatoes	20	90·0	16·0	......	......	67·0
Cabbage	29	98·0	33·0	......	......	69·8
Brussel Sprouts	2	79·0	43·0	......	......	61·0
Cauliflowers	4	83·0	50·0	......	......	69·2
Radish	13	80·0	30·0	......	......	48·4
Spinach	4	55·0	31·0	......	......	43·5
Cucumbers	11	82·0	34·0	......	......	62·5
Sweet Peas	11	100·0	48·0	......	......	83·0
Musk Melon	7	96·0	24·0	......	......	66·5
Water Melon	9	82·0	......	......	......	50·0
Squash	11	100·0	4·0	......	......	66·9
Peppers	7	59·0	8·0	......	......	27·7
Celery	6	77·0	28·0	......	......	55·0
Chervil	2	28·0	9·0	......	......	18·5
Citron	2	84·0	32·0	......	......	58·0
Mustard	3	93·0	84·0	......	......	89·6
Cress	3	94·0	79·0	......	......	88·0
Parsley	4	49·0	7·0	......	......	29·2
Tobacco	3	71·0	55·0	......	......	65·0
Asparagus	6	79·0	12·0	......	......	45·8
Flax Seed	3	84·0	58·0	......	......	72·3
Buckwheat	2	96·0	93·0	......	......	94·5
Sage	2	24·0	10·0	......	......	17·0
Summer Savory	2	22·0	13·0	......	......	17·5
Thyme	2	10·0	7·0	......	......	8·5
Tares	1	86·0	86·0	......	......	86·0
Canary Seed	1	31·0	31·0	......	......	31·0
Horse Beans	1	98·0	98·0	......	......	98·0
Sweet Marjoram	1	19·0	19·0	......	......	19·0
Endive	1	30·0	30·0	......	......	30·0
Kale	1	81·0	81·0	......	......	81·0
Salsify	1	49·0	49·0	......	......	49·0
Parsnips	3	24·0	5·0	......	......	17·3
Poppy	3	89·0	53·0	......	......	71·0
Candytuft	3	97·0	59·0	......	......	84·0
Mignonette	2	36·0	7·0	......	......	21·5
Chrysanthemum	1	43·0	43·0	......	......	43·0
Salpiglossis	1	43·0	43·0	......	......	43·0
Zinnia	1	88·0	88·0	......	......	88·0
Stocks	1	1·0	1·0	......	......	1·0
Portulacca	1	8·0	8·0	......	......	8·0
Hesperis	1	13·0	13·0	......	......	13·0
Larkspur	1	80·0	80·0	......	......	80·0
Pansy	1	71·0	71·0	......	......	71·0
Pink	1	59·0	59·0	......	......	59·0
Sweet William	1	75·0	75·0	......	......	75·0
Coriander	1	36·0	36·0	......	......	36·0
Berberis	1	3·0	3·0	......	......	3·0
Mountain Ash	1	......	......	......	......	......
Caragana	1	86·0	86·0	......	......	86·0
Total number of samples tested, highest and lowest percentage.	2,174	100·0	00·0	......	......	......

TABLE showing the number of Grain Tests for each Province.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
ONTARIO.						
Wheat	140	100·0	0·0	72·9	6·9	79·8
Barley	176	100·0	60·0	78·5	10·0	88·5
Oats	190	100·0	0·0	93·6	3·5	97·1
QUEBEC.						
Wheat	61	100·0	16·0	84·7	4·5	89·2
Barley	51	100·0	56·0	84·3	6·7	91·0
Oats	54	100·0	79·0	92·2	4·2	96·4
MANITOBA.						
Wheat	57	100·0	36·0	82·5	4·9	87·4
Barley	43	98·0	17·0	75·3	9·6	84·9
Oats	103	100·0	39·0	85·4	7·1	92·5
NORTH-WEST TERRITORIES.						
Wheat	83	99·0	23·0	77·5	6·7	84·2
Barley	66	100·0	64·0	83·6	8·6	92·2
Oats	104	100·0	22·0	80·0	8·2	88·2
NOVA SCOTIA.						
Wheat	74	99·0	25·0	71·7	6·8	78·5
Barley	65	100·0	69·0	86·1	5·9	92·0
Oats	100	100·0	33·0	87·2	3·8	91·0
NEW BRUNSWICK.						
Wheat	21	100·0	66·0	88·3	3·8	92·1
Barley	15	100·0	49·0	78·8	7·5	86·3
Oats	31	100·0	77·0	90·5	3·7	94·2
PRINCE EDWARD ISLAND.						
Wheat	9	93·0	66·0	75·9	6·3	82·2
Barley	6	99·0	67·0	74·5	14·3	88·8
Oats	15	100·0	78·0	93·5	2·4	95·9
BRITISH COLUMBIA.						
Wheat	37	99·0	71·0	81·2	5·1	86·3
Barley	43	100·0	72·0	91·6	3·9	95·5
Oats	65	100·0	68·0	91·5	3·4	94·9

METEOROLOGICAL OBSERVATIONS.

TABLE of Meteorological Observations taken at the Central Experimental Farm, Ottawa, 1897; maximum, minimum and mean temperature for each month, with date of occurrence, also rainfall and snowfall.

Months.	Maximum.	Date.	Minimum.	Date.	Mean.	Rain-fall.	Snow-fall.	Number of days Precipitation.
	°		°		°	in.	in.	
January	45·5	3rd	—25·7	25th	12·2	0·38	15·50	16
February	40·0	21st	—12·0	26th	15·7	0·35	15·75	13
March	49·9	30th	—18·0	1st	23·4	1·53	28·50	16
April	77·0	23rd	13·2	20th	40·8	1·72	1·00	13
May	76·0	9th	33·5	8th	53·0	3·29	....	14
June	84·0	23rd	36·8	2nd	60·7	3·01	....	16
July	97·2	8th	55 2	27th	71·2	5·19	....	15
August	85·2	8th	42·2	24th	62·6	3·40	....	14
September	92·0	9th	32·3	28th	59·4	0·45	....	6
October	85·0	15th	22·2	10th	48·2	0 69	....	8
November	54·0	26th	6·8	30th	29·8	2·19	5·75	18
December	44·9	11th	—15 6	25th	17·3	1·98	22·50	16
						24·18	89·00	165

Rain or snow fell on 165 days during the 12 months.
Heaviest rainfall in 24 hours, 1·18 inches on July 12th.
Heaviest snowfall in 24 hours, 7 inches on March 25th.
It will be seen the highest temperature during the 12 months was 97°·2, on July 8th.
The lowest temperature during the 12 months was —25°·7, on January 25th.
During the growing season rain fell on 13 days in April, 14 days in May, 16 days in June, 15 days in July, and 14 days in August.
September shows the lowest number of days on which rain fell, viz., 6.
Rain or snow fell on 18 days during November.

WILLIAM T. ELLIS, *Observer.*

RESULTS OF EXPERIMENTS IN THE CROSS-FERTILIZING OF PLANTS, SHRUBS AND TREES.*

In the spring of 1868 the writer began a series of experiments in cross-fertilizing and hybridizing which have been continued at intervals ever since.** This work has included experiments with varieties of the gooseberry, red and white currant, black currant, raspberry, blackberry, grape, apple, pear, plum, cherry and peach; also with different sorts of wheat, barley, oats, pease and rye, and with several species of wild flowers and ornamental shrubs.

THE GOOSEBERRY AND CURRANT.

The first crosses attempted in 1868 were with the gooseberry. These were made with the object of improving the size and quality of what are known as the American gooseberries, by introducing strains of some of the best English sorts, and at the same time to obtain varieties free from the gooseberry, mildew, *Sphærotheca mors-uvæ*, which has in the past affected nearly all the English gooseberries grown here, so badly both in foliage and fruit as to discourage their culti-

* Read before the Botanical Section of the British Association for the Advancement of Science at Toronto, Ont., August, 1897.

** The term "cross-bred" is used when referring to crosses produced between different varieties of the same species, and the word "hybrid," when referring to forms produced by crossing plants which are recognized as distinct species.

vation. Those which are known as American or native sorts are believed to have resulted from crosses between the wild species and European forms, and are noted for their hardiness, productiveness, and freedom from mildew. Several hundred seedlings resulted from these efforts, some of which are still in cultivation. Two of them—one named Pearl (a cross between Downing and Aston's Seedling, or Broom Girl) and Red Jacket (a cross between Houghton and Warrington)—are both popular sorts, on account of their size, productiveness, and freedom from mildew, and are now extensively grown both in Canada and the United States. Among the early experiments some trials were made with the wild sorts—the small, smooth gooseberry, *Ribes oxyacanthoides*, and the prickly gooseberry, *Ribes Cynosbati*. No success attended the efforts with the former; but among the crosses obtained on the prickly gooseberry *R. Cynosbati* with Warrington were several interesting sorts, one of which was quite smooth, another sparingly hairy, and a third somewhat more hairy. This latter is still under cultivation at the Central Experimental Farm at Ottawa. In growth and habit the bushes resemble the female parent, but the fruit is considerably larger and much improved in quality, and the berries when ripe are tinged with red. Efforts were also made during these early years to cross the black, red and white currants with the gooseberry, but without success. After five or six years the new seedlings had increased to such an extent that their number was embarrassing, and no more work was undertaken on this line until 1890, after the establishment of the Canadian Experimental Farms, when a larger field for such work was opened. On my arrival from London, Ontario, at Ottawa, in 1887, all the surviving seedlings of all sorts of any promise—more than 800 in all—were taken to the Central Experimental Farm, and since then, with the help of assistants, many new forms have been produced. Among others, hybrids have been obtained between the cultivated black currant, *Ribes nigrum*, and a cultivated variety of the gooseberry, *Ribes Grossularia;* also between the black currant and white currant, a variety of *Ribes rubrum*. In each instance the black currant was chosen as the female. Three of the hybrids between the black currant and the white currant, and twenty-eight of those between the black currant and gooseberry, are still under trial. There are in this instance some well marked points of difference between the female and the male, and the hybrids, in many respects, are intermediate in their character. The branches of the black currant are without thorns, whereas those of the gooseberry are thorny; the hybrids have the branches thornless as in the female.

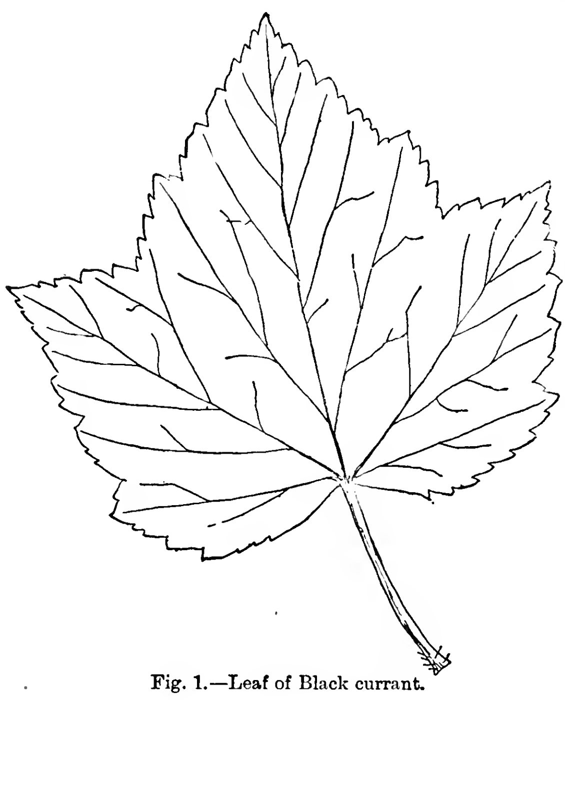


Fig. 1.—Leaf of Black currant.

The leaves of the black currant (Fig. 1) are large, three lobed, with the points of intersection between the lobes slightly notched, and the margins are serrated; the teeth coarse, somewhat irregular and pointed. (See figure.) The leaves are also supplied with a large number of oil cells, so that when bruised they exhale a strong and characteristic odour. The leaf stalks are very slightly hairy towards the base.

In the gooseberry the points of intersection between the lobes of the leaves are deeply notched (Fig. 2), and the marginal serrations are more irregular and rounded, with short, blunt points.

The leaves when bruised are odourless, and the leaf stalks are shorter and more decidedly hairy with the hairs extending further up the stalk.

In the hybrids the leaves are intermediate in form (Fig. 3), and almost as deeply cleft at the junction of the lobes as are those of the gooseberry. The serrations are also of an intermediate character, being less pointed than in the black currant and less rounded than in the gooseberry. The leaves of most of the hybrids have no odour when bruised, except in two instances where the black currant odour is faintly perceptible. The leaf stalks are more hairy than those of the black currant, but less hairy than those of the gooseberry.

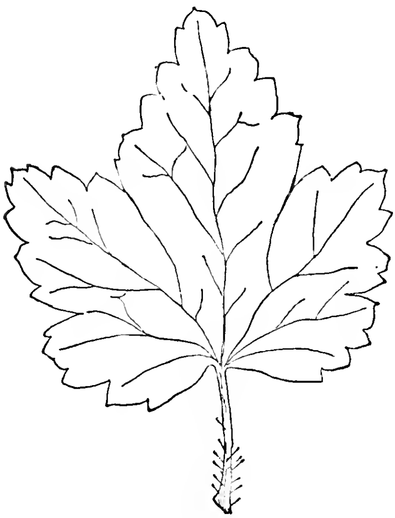


Fig. 2.—Leaf of Gooseberry.

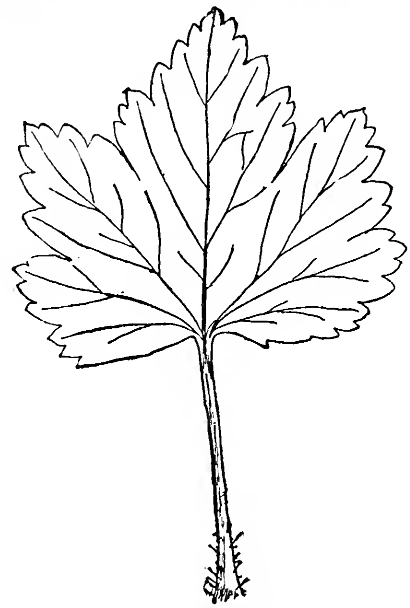


Fig. 3.—Leaf of Hybrid : Black currant with Gooseberry.

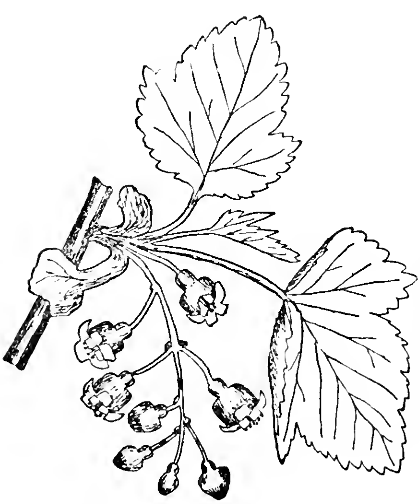


Fig. 4.—Flowers of Black currant.

The flowers of the black currant are borne on long bunches of seven to twelve (See figure 4), whereas in the gooseberry they are usually in pairs and occasionally there are three in a cluster. (Fig. 5.) In the hybrids they are borne in clusters of from four to seven. (Fig. 6.) In the structure of the pistil of the flower there is also a notable difference. In the black currant the pistil is single, smooth throughout, and somewhat thickened and robust towards the tip, which is flat and blunt (See figure 7*b*.) In the gooseberry it is longer and divided to the base, both branches being slender and very hairy for nearly half their length, the slender divisions diverging towards the tip. (See figure 7*c*.) In the hybrids the pistil is single for about half its length or more, but divided towards the tip, and the divisions divergent. (See figure 7*a*.) There are also differences in the time of blooming. The flowers of the gooseberry are open some days before those of the black currant; while those of the hybrids are intermediate in that respect.

Fig. 5.—Flowers of Gooseberry.

All the hybrids have flowered freely every season for several years past, and although no imperfection can be detected in the floral organs, no fruit could be found on any of them until last year, when two berries were found on one bush and one on another. These were borne singly, like the gooseberry, and were about the size of a large black currant, but of a dull reddish colour. The seeds these contained were carefully saved and sown, but none of them have yet germinated. This season only one specimen of fruit was found and this dropped before it was fully matured. With the view of inducing the fruit to set more freely, clusters of the flowers have been artificially fertilized with pollen from adjacent flowers on the same bush, also from flowers of the black currant and the gooseberry; but none of these experiments have been successful.

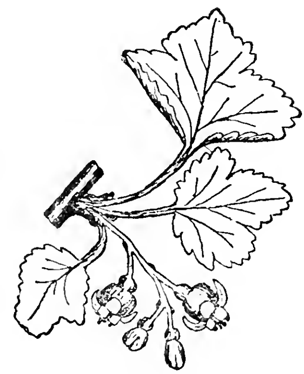
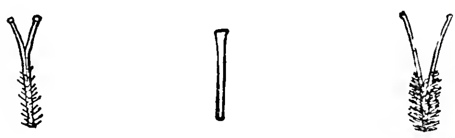


Fig. 6.—Flowers of Hybrid.



(a.) (b.) (c.)

Fig. 7.

a.—Pistil of hybrid enlarged to three diameters.
b.— " black currant " " "
c.— " gooseberry " " "

The several differences and resemblances noticed seem to establish the true hybrid character of the progeny, a point further confirmed by the fact that the gooseberry and white currant characteristics in these hybrids are recognized by insects and parsitic plants The gooseberry saw-fly (*Nematus ribesii*), which is not known to touch the foliage of the black currant, consumes, with great avidity, the leaves of the gooseberry and white currant; it also feeds freely on the hybrids, which, although raised from seed of the black currant, are thus recognized by this insect as partaking of the nature of the male parent. The gooseberry mildew, also *Sphaerotheca mors-uvae*, B. & C., which is not known to affect the black currant, attacks the hybrids freely, showing that the gooseberry characteristics which they possess are recognized also by this fungus enemy of the gooseberry.

Another group of experiments with shrubs in this genus has been the crossing of the cultivated black currant, *Ribes nigrum*, with the wild black currant of the western plains, *Ribes floridum*. From this cross a number of seedlings have been produced, partaking more or less of the characteristics of both parents, some of which promise to be worthy of cultivation for their fruit. During the past season a number of additional crosses in this genus have been successfully made, from which some further results of interest are looked for.

The Grape.

From 1868 to 1875 a large number of hybrids were produced by fertilizing prepared flowers of the native or improved native grapes with pollen of the European varieties. During this time more than 3,000 grape flowers were operated on, from which about 400 seedlings were obtained. No winter protection was given to any of these young seedlings, and a large proportion of the new introductions from year to year perished during the winter following. Many others were discarded for the reason that they produced staminate flowers only, and some on account of lack of vigour in the vines or the poor quality of the fruit. Only a few of these seedlings have survived to the present time, and of these two only are specially worthy of mention, viz., Emerald and Kensington. These are both yellowish green grapes and Kensington is specially productive.

In the case of the latter, the female was the Clinton, which is an improved form of the native frost grape, *Vitis cordifolia;* the male was Buckland's Sweetwater, a variety of *Vitis vinifera*, a large greenish white grape grown under glass. The Clinton is a vigorous grower, and very hardy, and in fruiting produces a bunch which is small to medium in size, long, narrow and very compact, somewhat lightly shouldered. The berry is small, round, and black and quite acid. The Buckland's Sweetwater is a less vigorous grower, is tender; the berries are large, pale yellowish green and oval in form; while the bunch is large and loose. The resulting hybrid resembles the Clinton in vigour of growth and hardiness of vine, also in the character of the foliage; the fruit, however, is of a pale yellowish green colour, the berries are oval, the bunch large and shouldered and moderately loose. The fruit is intermediate in size and quality, between the parents. In the fruit of the Clinton the seeds are short and plump, whereas in that of the Buckland's Sweetwater they are longer and less plump; in the hybrid the seeds resemble in form those of the Buckland's Sweetwater.

A considerable number of other crosses were made between one of the cultivated forms know as Concord, which is believed to have been derived from the fox grape, *Vitis labrusca*, and varieties of *Vitis vinifera*. The leaves of the Concord vine are thick and leathery, and downy on the under side, while the leaves of the derivatives of *Vitis vinifera* are smooth below and comparatively thin in texture. All the seedlings resembled the Concord in the character of their foliage, but there was much variation in the appearance and quality of the fruit.

The Raspberry and Blackberry.

The first crosses were made with raspberrics in 1869, and the work has been continued at intervals up to the present time. In 1869 a red variety, known as the Philadelphia, a form of *Rubus strigosus*, which was very productive but lacking in flavour, was crossed with a high-flavoured yellow sort known as Brinckle's Orange, but the progeny in this case was tender and unhealthy in character and none of them have survived. In 1870 a cultivated form of the black cap raspberry, *Rubus occidentalis*, was fertilized with pollen of the Philadelphia. This latter experiment was undertaken mainly for the purpose of gaining some information as to the influence of sex on the character and habit of the offspring. The black raspberry, *Rubus occidentalis*, which was chosen as the female, propagates by rooting from the pendulous tips of the branches, which, late in the season, touch the ground; while the male, the red raspberry, *Rubus strigosus*, sends up suckers from the buds developed on the roots, and these roots extend under the surface to a considerable distance from the base. Twenty-four plants were raised from this cross, all of which fruited in 1873, and some of them were very prolific. In every instance the seedlings rooted from the tips, but not freely, and in two or three instances an occasional sucker was thrown up from the roots, a few inches from the crown. Subsequently these plants were propagated more freely by layering in spring the canes, the growth of the previous summer, when they rooted at almost every joint. The fruit of the best of these hybrids was larger than that of either of the parents; it was intermediate in colour, being dark purple with a whitish bloom, while the flavour was a striking combination of the characteristics of both.

During the following four or five years many additional crosses were made with raspberries, and many attempts were made to cross the raspberry *Rubus strigosus* with the blackberry *Rubus villosus*, but without much success. Most of the efforts failed, but seeds were produced on several occasions. Sometimes these did not germinate, and several times, when one or two seeds did start, the young plants were weakly and died before much growth was made.

Large Fruits.

Many crosses were also made with the larger fruits, from 1889 to 1895, some of which have since borne well; but they were not sufficiently promising to justify their propagation. Many attempts have been made to cross the apple with the pear, and *vice* *versa*, but without success. Similar experiments have also been tried with the different varieties of cherries, notably those belonging to the Bigarreau class with the Duke and Morello types. Seedlings of these were grown for a time, the foliage of which was intermediate in character, but none of them lived long enough to produce fruit. Efforts were made to cross the plum with the peach, also the plum with the cherry, both without success. After the work of cross-fertilizing fruits had been continued for eight or nine years, the number of seedlings accumulated to such an extent as to be burdensome to look after, and further efforts, which would have added to their number, were for a time suspended.

Flowering Plants.

In the meantime some experiments were made with flowers. Attempts were made for several seasons to cross the wild geraniums, *Geranium maculatum* and *G. robertianum*, with several of the best cultivated pelargoniums, with the hope of obtaining improved forms of hardy perennial geraniums, but without success. A wild perennial species of verbena, *V. hastata*, was pollenized with some of the finest forms of the cultivated verbena, with a similar object ; and in this instance a number of crosses were obtained, but these were planted out in an open border without protection, where they all died during the following winter. Crosses were also made with Aquilegias, and very distinct intermediate forms obtained. Experiments were also tried to see if evidence could be had of superfoetation in this flower, the varieties of which are so easily cross-fertilized. The sorts selected for this work were a red-flowering form, *Aquilegia Canadensis*, and the double blue and white forms of *Aquilegia vulgaris*. The red was crossed with the white and the pistils touched the following day with pollen from the blue flowers ; the white with the blue, and retouched with the red ; and the blue with the red, and retouched with white. A large number of seedlings were raised, most of which showed two colours quite distinctly, but no trace of the influence of the third colour could be detected in any instance.

Wild Crab Apples.

In the spring of 1887, among other seeds received from the Royal Botanic Gardens at St. Petersburg there was a package of the seeds of a small wild Siberian crab, known as the berried crab, *Pyrus baccata*. From these a number of young trees were raised, some of which have now been tested at the branch experimental farm at Brandon, Manitoba, for six years, and at Indian Head, N.W.T., for five years, and in every instance these trees have been found quite hardy, and during the last two seasons some of them have borne good crops of fruit. This crab, although it bears abundantly, has very small fruit, not much larger than a cherry. Another variety, known as *Pyrus baccata prunifolia*, is more than double the size of *P. baccata*, and this also, although tested for a shorter time, appears to be equally hardy. These trees are dwarf in habit, with branches extending close to the ground ; they are also very sturdy and thickly branched and from their build are well adapted to resist the winds and other climatic difficulties from which many trees suffer on the North-west plains.

Having tried during the past nine years, under many different conditions as to shelter, about 200 varieties of the hardiest sorts of cultivated apples and crab apples obtainable from Northern Europe and elsewhere, at both these North-west farms without success, efforts are now being made to improve the two wild crabs referred to, in size and quality of fruit, by cross-fertilizing them with many of the hardiest sorts of apples grown at Ottawa, also with the larger crabs. The first crosses were obtained in 1894 and the young trees, which came up in 1895, were transplanted from the seed bed to a small experimental orchard on the Central Farm, in 1896, where they are now growing to the number of 175, and some of these will probably fruit within two years. The foliage of these seedlings varies much in character, some resembling that of the varieties of cultivated apples used as the male, while others are more like that of the wild type of the female. During 1896 and 1897 this work has been continued on a much larger scale and orchard plots suitably protected are being provided at each of the branch experimental farms in the North-west, large enough to admit of the testing of all the young seedlings as fast as they can be produced, and it is confidently expected that within a very few years, as a result of this work, varieties of apples will be available for cultivation in the North-west, of a hardy character and such as will be valuable to the settlers on the plains.

Cherry and Plum.

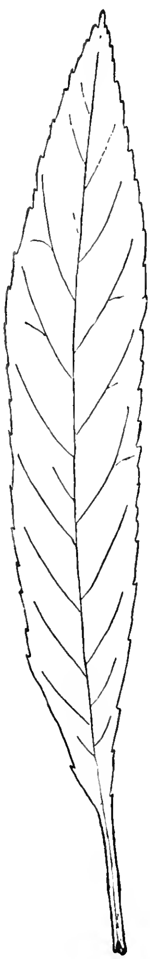


Fig. 8.

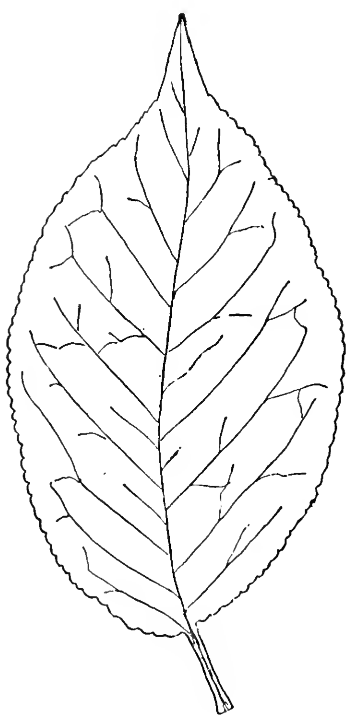


Fig. 9.

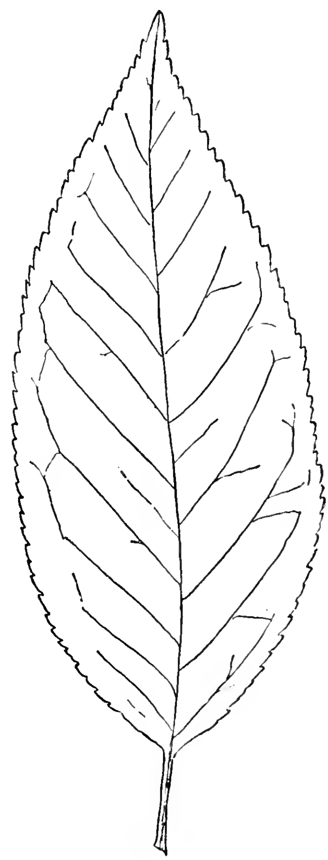


Fig. 10.

The Sand Cherry, *Prunus pumila*, a native fruit, which is very hardy and has a wide distribution, was chosen as the starting point for another line of experimental work. The usual wild form of this fruit is a small black cherry with a disproportionately large stone covered with a thin coating of juicy but astringent flesh. Specimens are, however, occasionally found having fruit fully twice the usual size, with a much larger proportion of pulp and of very fair quality. All attempts to cross this with different varieties of cherry have failed, but in 1896 a single cross was effected with a variety of cultivated plum known as Col. Wilder, an improved form of *Prunus americana*. The seed from this cross was planted in the autumn of 1896 and germinated in the spring of this year. The young tree has made a strong and vigorous growth, and at the present time is nearly 2 feet high, with leaves much wider than those of the Sand Cherry, and closely resembling those of the plum. Figure 8 represents the leaf of the Sand Cherry and 9 the leaf of the plum, while 10 shows that of the hybrid. Fruit of this interesting cross will be watched for with interest.

The wild plum, *Prunus americana*, which is found native in the river valleys in Manitoba, has been crossed during the present season with several of the improved forms of the cultivated plum, from which some good results are expected.

Spring Wheat.

In most parts of Canada the summer season is comparatively short, and hence it is very important to secure as far as is practicable, early ripening varieties of grain. In 1888 some crosses were effected with spring wheat, using a Russian variety known as the Ladoga, as female, and both the Red and White Fife varieties as male. The Ladoga was obtained from Northern Russia and ripens about a week earlier than the Fife wheats; it is, however, lacking in vigour and does not average as heavy a yield as the Red or White Fife and the grain is not so fine in quality. The object in attempting this cross was to obtain, if possible, a wheat equal in quality, vigour and productiveness to the Red Fife, and at the same time, earlier in ripening, and thus to combine the good qualities of both parents. Most of these crosses are intermediate in earliness and ripen at least three or four days earlier than the Red Fife. Some promising sorts have sprung from this source, which are rapidly growing in favour, notably Preston and Stanley from Ladoga and Red Fife, and Alpha and Percy from Ladoga and White Fife.

Another source whence early ripening grain has been obtained, is India, where, in 1889, through the kindness of Lord Dufferin, then Viceroy, a number of different sorts were collected and forwarded to Canada for test on the experimental farms. These were obtained at different altitudes in the Himalaya Mountains, of from 420 to 11,000 feet. All the Indian varieties tested have been early in ripening, and two of the earliest and most promising of the wheats—Hard Red Calcutta and Gehun—ripen as early as the Ladoga, but, in common with all the varieties tested from India, they have lacked vigour and productiveness. These have also been crossed with Red Fife and the crosses have derived earliness of ripening from the Indian blood, with increased vigour and productiveness from that of the Red Fife.

Where a bearded wheat has been used as the female and a beardless type as male, a large proportion of the progeny has at first been bearded. With the second sowing, both the bearded and beardless sorts sport, the beardless varieties frequently producing bearded heads, while the bearded ones more rarely produce those which are beardless. The bearded varieties will vary in the length and stiffness of the beards, and many of them vary in the colour of the chaff, some in the same cross having white chaff, others red; the chaff also varies as to its smooth or downy character. Any of these varieties may be made permanent by persistent selection.

In a cross between Red Fife, male, and an Indian variety of wheat named Spiti Valley, female, both of which were beardless, several bearded sorts were produced in the second generation.

Some winter wheats have been crossed with spring wheats, using the spring varieties as female. These have all ripened when sown as spring wheats, but, although the plants have had vigorous foliage, they have been slow in heading and later in ripening than most of the spring wheats, and as they have not proved specially productive, most of them have been discarded.

This work has been continued from year to year and gradually extended so as to include barley, oats and pease, and during the past nine years more than 700 new varieties have been produced among these important farm crops. All those which show a lack of vigour, or are unpromising for other reasons, are promptly discarded; but there are still under test at the Central Experimental Farm more than two hundred new varieties, all of which are of more or less promise. In a test of the comparative yield of 39 varieties of spring wheat, including all the named ones, with the cross-bred sorts, carried on last year at all the experimental farms, the Preston, one of the crosses referred to between Ladoga and Red Fife—a bearded sort—headed the list, with an average of 35 bushels 37 pounds per acre; while Stanley, a cross of the same parentage, but beardless, stood fifth in order of yield, with 31 bushels 50 pounds per acre.

Barley.

Some very distinct hybrids have been produced between the two-rowed barley *(Hordeum distichon)* and the six-rowed *(Hordeum hexastichon)*. These are ancient types and have long been regarded as distinct species. The six-rowed type has been found, according to DeCandolle, in the earlier Egyptian monuments and in the remains of the lake dwellings of Switzerland. The two-rowed barley is said to have been found wild in Western Asia, and is also of ancient origin. In the two-rowed barley, the additional rows found on the six-rowed form are represented by chaffy scales lying flat on the face of the head. In the hybrids produced by using the six-rowed form as male, these chaffy scales in some instances are all filled; in others, only a part of them are filled and the kernels at first are usually smaller and thinner than those which occupy the normal position on either side of the head. With subsequent cultivation the relative size of the kernels is more equalized and, in some cases, they become very even in size throughout. The two-rowed barley stools much more freely than the six-rowed sorts, the heads are also longer, and the objects in mind in effecting these crosses have been to produce varieties of six-rowed barley with longer heads and with an increased tendency to stooling. Several have manifested a prolific character. One produced from a single grain 4,529 grains, and the next year the crop was 28 pounds. In another instance 2,274 grains were grown from a single grain, and the crop the second year was 15½ pounds. A considerable number of these hybrid barleys are now being tested in field culture, and some of them have made promising records.

Wheat with Rye.

Many attempts have been made at the Experimental Farm to cross wheat and rye, but without success until 1892, when one of my assistants in this work, Mr. W. T. Macoun, succeeded in effecting a cross, using a variety of winter wheat as female and winter rye as the male. The one resulting kernel was sown in September, 1892, and, although to all appearance it was a wheat kernel which was sown, the plant which grew from it had the purplish appearance of rye, and the heads at the time of spearing had stripes of purple on the spikelets, as in rye, and in other respects closely resembled rye. Nineteen heads in all were produced on the plant, but there was not a single kernel found in any of them.

Oats.

Some experiments have also been made in the crossing of oats and crosses have been effected between those with branching and those with sided heads; also with white and black oats, white and yellow, and with thin hulled and thick hulled sorts. Many striking instances of intermediate forms have been secured and some of the new varieties have given excellent crops.

PEASE.

About 175 crosses have been made in this group and some promising and prolific forms originated. By rigid selection and rejecting of all the less promising sorts, the varieties under test have been reduced to less than one-third of the original number, and further testing is now limited to 56 varieties.

THE BARBERRY.

The last group of hybrids to which I propose to refer is one between *Berberis Thunbergii*, female, a Japanese species, and the common purple barberry of Europe, *Berberis vulgaris purpurea*, male. The differences between these two species are very marked and the evidences of the hybrids of which there are four partaking of the characteristics of both parents seem to be clearly shown.

In *Berberis Thunbergii* the branches are armed with thorns which are about $\frac{3}{8}$ths of an inch in length, with a short branch on either side, near the base, the branches being about one-fourth the length of the central spine. In *B. vulgaris purpurea* the thorns are long, being about $\frac{6}{10}$ths of an inch, with the side branches near the base varying from half to two-thirds the length of the centre spine. Whereas, in the hybrid the two branches which spring from the base are about equal in length with the centre, showing in this respect a departure from both parents, but more nearly resembling the male.

Fig. 11.

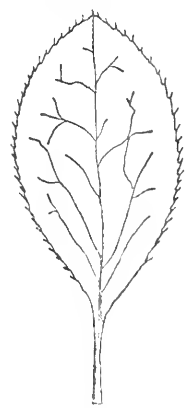


Fig. 12.

The leaves of *Berberis Thunbergii* are small, obovate, tapering towards the base, a leaf of this species is shown in figure 11, with the surface smooth on both sides and the margin entire; colour, deep green above, paler beneath. In *B. vulgaris purpurea* the leaves are larger and nearly oval, with the margin fringed with sharp spines (see figure 12). The upper surface is of a dull brownish purple colour; below it is green, with more or less of a purplish hue. In the hybrids the leaves are longer and broader than in *B. Thunbergii* with five or six short spines at wide intervals along the margin on each side and another short spine at the tip (see figure 13). The upper surface of the leaves is dark green, more or less tinged with purple, the purple shading being quite decided in the young growth. The lower surface is of a paler shade of green.

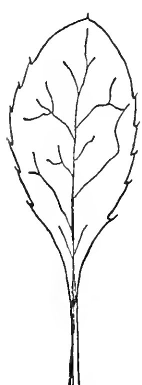


Fig. 13.

Fig. 14.

In *Berberis Thunbergii* the flowers are borne singly on the under side of the branches and are loose and open, with both calyx and corolla of a very pale yellowish colour (figure 14). The outer surface of the calyx is tinged with red and the stamens are yellow. In *B. vulgaris purpurea* the flowers are in long clusters, from 17 to 21 in a cluster (figure 15); they are of a bright yellow colour, with the outer surface of the calyx bright red and the stamens yellowish green. The flowers are smaller and more compact than in *B. Thunbergii* and are nearly a week later in time of blooming. In the hybrids the flowers are borne in clusters of from five to nine in each (figure 16); they are loose and open and a little larger than those of *B. Thunbergii* and *B. vulgaris purpurea*.

The young fruit of *B. Thunbergii* when first formed, is of a pale green colour; that of the purple barberry is of a bright red hue; while the fruit of the hybrids is of a dull reddish shade.

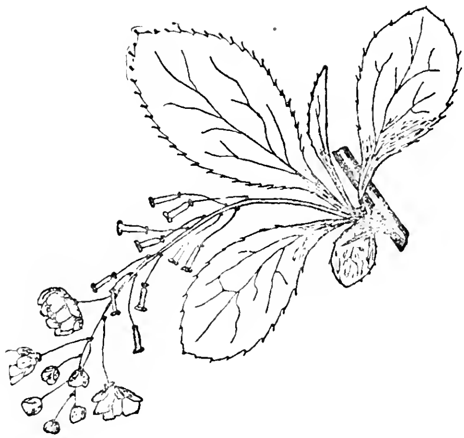


Fig. 15.

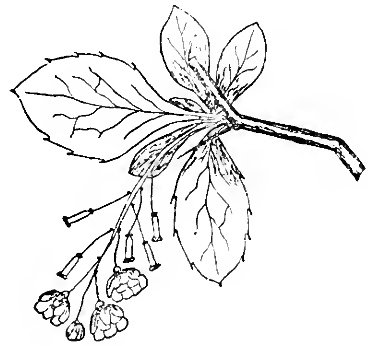


Fig. 16.

From these particulars it will be seen that the hybrid barberries, of which there are four, are intermediate in character between the parents, in leaf, flower and fruit, also in the time of blossoming.

Very efficient help has been rendered me in carrying on this work during the past nine years, by my assistant, Mr. W. T. Macoun; also by Dr. C. E. Saunders, who has done much of the recent work on the fruits, and Dr. A. P. Saunders, who made some of the earlier crosses in wheat and who rendered special assistance in the cross-fertilizing of cereals at the branch experimental farms during the summer of 1892.

TUBERCULOSIS.

It is much to be regretted that further trouble has developed from this disease, more particularly among the cattle at the Central Farm. When Bulletin No. 20 was published, in February, 1894, and the subsequent report issued on the branch farms in the annual report of the experimental farms for that year, giving full particulars of the discovery of tuberculosis and the means applied for its eradication, with the very thorough after precautions taken in disinfecting the premises, it was hoped that immunity from this disease would be had in future. At that time, however, the insidious nature of tubercular disease, the extent to which it prevails and the difficulty of completely eradicating it, were not so fully understood as now, and with the reliability of tuberculine thoroughly established and the process of testing officially recognized, there will probably be no difficulty in future in the way of using the tuberculine test from time to time, and thus preventing any lurking germs of this disease from further spreading in the herd.

After the number of cattle had been reduced at the Central Farm by the slaughter necessary to get rid of this disease in 1893, additional cows were required to carry on some experiments in dairying. These could not be bought at that time subject to the tuberculine test, the use of tuberculine as a test for the disease had been but very recently introduced, and many skilled veterinarians did not believe in its reliability, and it was generally disbelieved in by those engaged in the cattle trade. Negotiations were also then in progress with the British Government looking to the removal of the embargo on Canadian cattle, and it was held to be most unwise, by those interested in the export of cattle, that any further attention should be drawn to this disease, which had in several instances been referred to in the press, either ignorantly or with an object, as pleuro-pneumonia. Under these circumstances, it was decided that any animals required for the use of the farms should be selected with care from healthy herds, and subjected only to the test of physical examination. Thus a number of grade cows were selected in Quebec and Ontario and placed in the barn, every one of which appeared to be perfectly healthy. No pure-bred animals were purchased.

From the experience recently had it is probable that some incipient germs of the disease must have existed in one of the young animals (a Jersey bull), which was tested in 1893 and did not then react, and that these subsequently developed. It also seems clear, from the post mortem examinations, that in the case of two of the grade cows which were purchased in Ontario the disease had developed to that extent to justify the belief that these animals were more or less diseased when they were purchased. It was in all probability from these two sources that the disease spread in the herd, and in confirmation of the correctness of this view it may be said that most of the other animals which reacted when the tuberculine test was used showed the disease but slightly developed, as if the infection had been recent.

While there is no doubt that a diseased animal in the herd is the most common cause of the spread of the disease, there are other possible sources of infection. This is undoubtedly an infectious disease, which can only be produced by the introduction into the system of those minute organisms known as the bacilli of tuberculosis. As this disease is identical with consumption in the human family, and may be communicated from man to animals, as well as from animals to man, it is evident that in a public institution which is visited annually by many thousands of people, this additional source of danger to the cattle is always present.

In September last some purchases were made of pure-bred animals for the improvement of the herds at Nappan and Ottawa. Since animals had been bought and exchanged several times at Nappan since 1893 without submitting them to the tuberculine test, it was decided that this test should be again applied to all the herd there. It was also the intention that similar precautions should be taken at each of the other experimental farms as soon as they could be conveniently arranged for. During a visit made to the Nappan farm by the writer early in October all the animals were tested with tuberculine by Dr. Jakeman, of Halifax, and Dr. F. G. Hall, of Amherst, and no reaction occurred in any case, showing that this herd was free from tuberculosis.

Up to this time there had not been the slightest suspicion that there was anything wrong with the herd in Ottawa. No symptoms had at any time occurred to awaken such suspicion, and the animals appeared to be in excellent health. Before arrangements had been made for the testing of the herd in Ottawa, on the 21st of October the Jersey bull already referred to, which had not fed well for a day or two and was supposed to be suffering from a slight attack of indigestion, died from the effects of an overdose of saltpetre, which, through the misunderstanding of an order, was bought in place of salts. On post mortem examination of this bull one lung was found to be badly affected with tuberculosis. Arrangements were at once made to test the entire herd, and the tests were conducted by Drs. James and Perley, of Ottawa. Particulars of the temperatures observed are given in the appended chart. The normal temperatures were taken 23rd October, the tuberculine was injected that evening and the reactions noted 24th October.

Tuberculine Tests.

Number.	Name of Animal.	Age, Years.	Normal Temperature.				Temperature after injecting Tuberculine.						Extent of Reaction.
			8 a.m.	11 a.m.	1 p.m.	5 p.m.	6 a.m.	9 a.m.	12 p.m.	3 p.m.	6 p.m.	9 p.m	
1	Beauty, grade cow.....	11	101	101·6	101 4	101	101·7	101	101·4	101	100·2	.. .	− ·2
2	Devon Bull (Earl of Salcomb)	5	100·6	100·6	101·4	101	102·1	104·4	106·6	103	102·4	102	+5·2
3	Canadian Bull.........	7	100·8	101·4	101·4	101·6	100·6	100·8	102·4	102·8	102·2	. .	+1·2
4	Ayrshire Bull.........	9	100	101	100·6	101·2	100	101	104	102·3	102	102	+2·8
5	Holstein Bull.........	5	101·6	102	101·4	100·8	101·4	100·7	102	103	103·6	....	+1·6
6	Ayrshire Cow Maggie.	14	101·3	101·4	101	100·2	101	102	106	105·6	106·4	105·2	+5
7	Forest Girl, grade.....	12	101·4	101·2	101·2	101	101	102	100·7	102	100	.....	+ ·8
8	Nancy, grade.........	10	101·4	101·6	101·2	100	102·2	105·6	105·1	104·5	104·5	104·8	+4·6
9	Mayflower, grade......	9	101·2	101·4	101·6	100.2	102·3	105·5	106·3	106·1	105·8	105·2	+4·7
10	Geranium	11	101·2	101·4	101·4	100·1	101·4	103·6	105·4	103·6	102	101	+4
11	Clara.	7	101·4	101·4	102	101·4	102·6	105	107	106	105·6	104·6	+5
12	Gladiolus..............	12	102	102	101·6	101·2	101·4	105·6	106·6	106 3	107	103·3	+5
13	Oriole	3	101·6	101·4	101·4	101·2	101·4	103·6	105·9	105	105·2	104·3	+4·3
14	Spot	3	102	101·4	102·2	100·6	103	105·8	106·2	105·2	103·8	103·6	+4
15	Rosemary.	3	101·4	101·6	102	100·4	106	107·4	106	105·2	104	103·2	+5·4
16	Jewel.	5	101	101·4	102	100·2	103·4	106·6	107·2	104	104·2	101	+5·2
17	Lady Cornelia.........	5	101·4	101·8	102	101·3	103·5	106	106·2	105·2	104	103·7	+4·2
18	Annie Rooney.........	6	101·6	102	102·4	101	101·6	102	104·2	104	104	102·2	+1·8
19	Pauline....	12	101·8	103	103 2	103	102·6	103·2	104·8	104	105	104·6	+1·8
20	Topsy	6	101·2	101·7	101·9	101·2	103·4	107·4	107	106	106	104·6	+5·2
21	Florence......	9	100·2	101·4	101·4	100·6	101·6	101·6	101·8	102·2	100	......	+ ·2
22	Clenna Rex...........	9	100·4	100·4	100·4	100·6	101·7	102	104	103·6	104·8	103·6	+4·2
23	Lily Rex.............	4	102	102	102	101·2	102·7	107	106·6	106·2	103·2	102	+5
24	Nancy Rex...........	3	101 4	101·2	102·8	101	101·6	101	101·6	101·8	101·2	......	−1
25	Louette	7	100·8	101·2	101·4	100·4	103	106·6	106·9	103·2	105·6	106·2	+5·5
26	Therese	9	100·6	100·8	101·8	100·6	101	100	102	102·8	100·2	.... .	+1
27	Verbena..............	9	101·4	100·8	101·4	100·2	101·6	101·4	101·6	101·2	100	....	+ ·2
28	Dolly.................	6	101·2	101	101·4	100·4	101·3	104	103·9	103	100·4	101	+2·5
29	Hazel................	9	100·6	101·4	101·6	100·6	102	102	101·4	101·2	101	.....	+ ·4
30	Linda	10	101·2	101	101·2	100·8	101·4	101·4	101	102	101·2	....	+ ·2
31	Rosella...............	2½	102	101·8	101·8	101·2	105·6	107	107·2	105·6	105	103·9	+5·2
32	Primrose..............	7	101·6	102	102·3	101	102·2	104	106·2	104	103	103	+3·9
33	Madame.	10	101·4	101	101·2	100	102·5	105·6	106·9	104·8	103·8	104·8	+5 5
34	Tulip.................	3	101·6	101·8	102	100·4	102	101·4	102·2	100·6	101·2	......	+ ·2
35	Margaret..............	10	101	101·4	101·6	101·2	101·6	101 5	102	101	101	....	+ ·6
36	Noretti	6	100·4	101·4	101·8	100·6	101·4	101·4	100	101·2	100	....	− ·4
37	Lady Olga............	¾	102	102·2	102	102·2	102	102	102·4	102	102	102	+ ·4
38	Neptune..............	½	102	102·2	101·8	101·8	102·2	100·8	102·6	102	102·2	102	+ ·4
39	Florence......	¾	101 5	101·6	101	101	101·4	100·7	102	101·8	101·4	101	+ ·4
40	Saudie	9	100·6	101 3	101·2	102	151·5	103·2	105·2	105	104·8	103·8	+3·2
41	Julia	5	101	101·2	101·2	100	100	100·6	101·3	102 3	101·4	101·4	+1·1
42	Empress..............	12	103	103	102·4	103	103	102·6	101·3	103	102·2	102·1	=
43	Olive.................	3	102	102·2	101·8	101·1	101·2	101·6	102·6	102·2	102	102	+ ·4
44	Dairy Maid..........	2½	102	101·2	102·2	101·3	100·4	100·5	102·5	102	101·4	101·5	+ ·3
45	Black Beauty.........	2½	101·4	101·1	101	100·8	101·2	101·3	101·4	101·2	101	100·6	=
46	Butterfly	2	101·8	102	102	102·2	100·9	100·6	101·2	102	102	101·8	− ·2
47	Maude................	2	102	102	102	101·2	101·6	101·6	101·8	101·4	101·2	101	− ·2
48	May Belle......	2	101·2	101	102·2	101	100·6	100·7	100·9	101	101	101	− ·3
49	Polly	2	101·4	101·2	101	101·2	101·6	101 8	102·2	102	102·2	102·1	+ ·8
50	Sylvia	2	102	101·6	101·6	101·4	100·6	100·7	102·2	102	101·4	101·1	+ ·2
51	Queenie.	1½	202	101·6	101·6	101·6	103 8	105·6	106·2	105·4	104·9	104	+4·2
52	Clenna May....	1½	101·2	101·8	101	100·6	100·8	100·6	101·6	101	101	100·7	− ·2
53	Lily Belle............	1½	100·2	101	102·2	102	153·2	105·1	106·9	106	104·2	103·2	+4·7
54	Gem	1½	101·4	100·8	100·8	101·2	100·9	101·8	102·1	101·6	101	100·5	+ ·7
55	Myrtle......	2½	101·4	102·8	101·1	101·2	100·2	100·5	101·8	102·4	101	101	+ ·6

As soon as possible after the tests were completed all the animals which were free from disease were removed to another building where no animals had been previously kept.

Of those which had reacted, ten of the milking cows were reserved for experimental tests, and these were forwarded to Montreal for that purpose. They are Nos. 6, 10, 12, 13, 14, 15, 16, 17, 22 and 32. The remainder were killed and post mortem examinations made. Dr. D. McEachran, Chief Veterinary Inspector, of Montreal, was present and superintended this work and was assisted by Drs. James and Perley, of Ottawa.

Physical examinations were made of several of the animals before they were slaughtered, but the results only confirmed the opinion now generally held by the best veterinary authorities that it is practically impossible to detect the presence of this disease by the most careful examination, except in advanced cases and where the more important organs are considerably involved.

No. 2. Devon Bull.—Earl of Salcomb, age 5 years; bred at the Experimental Farm; was tested in 1893 and did not then react. Post mortem—Lungs full of masses of soft tubercle, some cheesy. The liver and mediastinal and bronchial glands all contained tubercle in a soft condition, most of it indicating comparatively recent formation.

No. 3. Canadian Bull.—Quintal, age 7 years. Was tested in 1893, but did not then react. Both lungs somewhat diseased, containing nodules of tuberculous matter. A small quantity of tubercle was found at the apex of one lobe of the liver. Bronchial and mediastinal glands diseased and partly filled with tubercle.

No. 4. Ayrshire Bull.—MacDuff, 9 years. This bull was tested in 1893, but gave no reaction then. In one lung there were several small masses of tubercle in different parts of its substance. Mesenteric glands, liver and peritoneum all slightly affected.

No. 5. Holstein Bull.—Netherland Chief, age 5 years; bred at the Experimental Farm; was tested in 1893, but did not then react. A careful examination of all the organs and glands was made and no evidence of disease discovered. In this instance the reaction after the injection of tuberculine was comparatively slight.

No. 8. Nancy.—Grade cow, age 10 years; bought in 1894. In the lungs there were some small patches of tubercle, the mediastinal glands were considerably diseased and the bronchial glands slightly affected.

No. 9. Mayflower.—Grade cow, age 9 years: bought in 1894. In this animal both the lungs and mediastinal glands were considerably diseased.

No. 11. Clara.—Grade cow, age 7 years; bought in 1895. Lungs grown to the ribs and diseased in spots. Bronchial and mediastinal glands considerably affected with soft tubercle.

No. 18. Annie Rooney.—Grade cow, age 6 years: bred at the Central Experimental Farm; was tested in 1893, but did not then react. One of the mediastinal glands was slightly affected. Diligent search failed to reveal any diseased condition in any of the other glands or organs.

No. 19. Pauline.—Grade cow, age 12 years; bought in 1893. In this cow the spleen was very much enlarged and thickened and the interior was filled with masses of tubercle, and one end of this organ was much decayed, of a dark colour, almost black, and gave a very offensive odour. The left lung was very badly diseased. The bronchial and mesenteric glands were also much affected. The indications in this case were that the disease had existed in the animal for a long time.

No. 20. Topsy.—A grade cow, age 6 years; bred at the Experimental Farm; was tested in 1893, did not then react. In this animal the retropharyngeal, mediastinal and bronchial glands were all slightly affected, but no disease was found in any of the large organs.

No. 23. Lily Rex.—A Jersey cow, age 4 years; bred at the Experimental Farm; was tested when a calf in 1893, but did not then react. Small quantities of tubercle were found in several parts of the lungs. The mediastinal glands were also considerably affected.

No. 25. Louette.—A grade cow, age 7 years; bought in 1893. The mesenteric glands, mediastinal glands and peritoneum were all slightly affected. Disease was also found to a slight extent in the udder.

No. 28. Dolly.—A grade cow, age 6 years; bought in 1893. The liver, mesenteric and mediastinal glands were all slightly tuberculous.

No. 31. Rosella.—A grade heifer, age 2½ years; bred at the Experimental Farm. Anterior lobe of left lung considerably diseased; mediastinal glands also tuberculous.

No. 33. Madame.—A grade cow, age 10 years; bought in 1893. Lungs slightly diseased. Bronchial glands considerably affected; mediastinal glands also slightly tuberculous.

No. 40. Saudie.—A grade cow, age 9 years; bought in 1893. One lobe of the lungs was considerably diseased. Liver also diseased at tip of one lobe. The latter, however, was not clearly tuberculous. The posterior mediastinal glands were much enlarged and badly diseased. This cow had probably been affected for some years.

No. 51. Queenie.—A grade heifer, age 1½ year; bred at the Experimental Farm. The peritoneum was very slightly affected with small pustules, which appeared to be tuberculous. The disease was not clearly demonstrated in this case. All the organs and glands were carefully examined, but no tubercle was detected in any of them.

No. 53. Lily Belle.—A Jersey heifer, age 1½ year; bred at the Experimental Farm. A small mass of tubercle was found in one of the lungs; liver very slightly affected. Small tuberculous patches were found distributed over the peritoneum.

After the animals were all removed the barn was thoroughly disinfected as follows: It was first well swept, scraped and cleaned, when the entire surface, including floors, walls, ceiling, stalls and other woodwork, was carefully sprayed with a solution of corrosive sublimate (mercuric chloride) of the strength of 1 in 640, made by dissolving half an ounce of corrosive sublimate, mixed with an equal weight of muriate of ammonia (ammonium chloride) in 2 gallons (20 pounds) of water. Sulphur was next used—burned in three iron pans placed on the floor in different parts of the building, with the doors and windows all closed, and this fumigation was maintained for about 12 hours. The day following, about 3 p.m., a second fumigation was begun with muriatic acid gas, prepared as follows: Twelve open glazed earthenware dishes were procured, each capable of holding about six pints, which were elevated on ordinary flour barrels equally distributed throughout the building, and all openings carefully closed. In each of these dishes was put 2½ pounds of common salt (sodium chloride) and on this was poured one pint, fluid measure, of strong sulphuric acid. Muriatic acid gas was rapidly disengaged from each generator, and in a short time the fumes were so dense as to saturate the air in the barn with a thick cloud of vapour. Gas was constantly given off all night and every nook and corner penetrated, and exhalations from the vessels had not ceased when the building was opened the following morning.

Subsequently the walls and woodwork were swept, and a second spraying made similar to the first with the corrosive sublimate solution. Then the floors, stalls and passages were all thoroughly soaked with the corrosive sublimate solution by means of mops and afterwards scraped with sharp hoes, so as to remove all coating from the woodwork, then mopped again with the corrosive sublimate solution freely used and subsequently allowed to dry. After this the walls, ceiling and stalls received three coats of lime whitewash, when the cattle which were free from disease were returned to the barn. Twenty-two steers were subsequently bought for feeding experiments. These were isolated until tested with tuberculine, but no reaction took place in any case, showing that they were free from disease. These have since been placed in the barn with the other cattle.

The instructions sent to the branch experimental farms in the west to have the tuberculine test applied to all the animals have since been carried out.

EXPERIMENTAL FARM, BRANDON, MANITOBA.

At this farm the herd consisted of 20 animals, all of which were tested by Dr. Cox, V.S., of Brandon, from 6th to 8th of December, and found free from disease. Twelve steers, which were purchased for experimental feeding tests and kept isolated until the tuberculine could be used, have also been tested and one of these reacted, the highest temperature being two degrees above the highest normal.

This animal was slaughtered and a careful examination made, but no evidence of the disease was found.

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

The herd at this farm consisted of 51 animals, all of which were subjected to the tuberculine test by Inspector Burnett, V.S., of the Mounted Police, early in December, and only two reacted. In one case a Durham cow, Prairie Wildflower, six years old, the highest reaction was $2\frac{2}{5}$ degrees above the highest normal; in the other, a Holstein cow, Abi 2nd of Assa., five years old, the reaction was greater, the temperature reaching $3\frac{2}{5}$ degrees above the highest normal. Both these animals were tested in 1894 and did not then react. On examination after killing the disease was found in the Durham cow in several of the organs, and in the Holstein the lungs were both slightly affected. Evidence of the disease was also said to have been detected in connection with the heart.

EXPERIMENTAL FARM, AGASSIZ, B.C.

At this farm the herd numbered 19 animals. These were all tested with tuberculine by Dr. J. Gibbins, of Vancouver, on December 14 and 15, and no reaction occurred in any case, showing that no tuberculous disease existed there.

EXPERIMENTS IN THE FEEDING OF STEERS, 1896-97.

During the past season three groups of steers, four animals in each group were fed for 16 weeks, with the object of ascertaining how far it is economical for farmers to withhold grain during the first part of the feeding period. All were fed on the same bulky fodder mixture, consisting of 50 lbs. of Indian corn ensilage, 25 pounds of roots, 5 pounds of cut hay and 5 pounds of cut straw. This ration was also used at the outset, for the preparatory feeding from 15th November to 15th December, 1897. No meal was given during this period, and the food consumed was not weighed. Before the feeding tests began the twelve steers were divided into three very even groups.

The meal which was used in these experiments was made of equal parts by weight of pease, barley, oats and bran, and in estimating the cost of the rations, this mixture has been valued at the uniform rate of one cent per pound.

In estimating the cost of the rations the ingredients composing the bulky fodder portion have been valued at the following prices:—Corn ensilage at $2 per ton, roots at $2 per ton, hay at $8 per ton and straw at $4 per ton. The value of these ingredients will vary in different localities, but they have been fixed at about the cost of production at Ottawa and will afford a basis for comparison in all parts of the Dominion.

The feeding period was divided into three portions, one of 8 weeks and two following of 4 weeks each.

To group No. 1 no meal was given for the first eight weeks, 2 pounds of meal were given to each animal per day for the next four weeks, and 6 pounds to each animal per day for the last period of four weeks.

To group No. 2 two pounds of meal were given to each animal per day for the first period of eight weeks, four pounds to each per day for the next four weeks, and six pounds each per day for the last period of four weeks.

To group No. 3 four pounds of meal were given to each steer per day for the first period of eight weeks, and six pounds to each per day for the two remaining periods of four weeks each.

These rations are not as rich in digestible protein (flesh forming material) as are usually recommended in standard rations. They have a wider nutritive ratio that is a larger proportion of digestible carbohydrates (starch, sugar, gum, &c.,) and fat to the protein than the standard rations usually contain. The standard feeding rations for steers vary from 1 of protein to 6 to 8 of carbohydrates and fat whereas the nutritive ratio in the rations used in these experiments were about as follows :—

Group 1.—1st 8 weeks 1·11, next 4 weeks 1·10, last 4 weeks 1·8·5.
Group 2.—1st 8 weeks 1·10, next 4 weeks 1·9·4, last 4 weeks 1·8·5.
Group 3.—1st 8 weeks 1·9·4, remaining 8 weeks 1·8.5.

During the course of these tests the steers had all of the bulky fodder mixture they would eat up clean, they had access to water in a trough in front of their stalls and were supplied also with salt in a small box at the side of the manger.

The steers were weighed when purchased and were weighed again three times on 17th December at the close of the preparatory feeding. The first weights taken and the average of the three last weighings were as follows, the weights being given in the order in which the animals were finally grouped :—

Group 1.	15th Nov.	15th Dec.	Group 2.	15th Nov.	15th Dec.	Group 3.	15th Nov.	15th Dec.
No. 1......	1,050	1,070	No. 5.	1,140	1,150	No. 9......	1,170	1,205
" 2......	1,010	1,020	" 6.......	1,070	1,095	" 10......	1,095	1,115
" 3......	1,085	1,120	" 7.	1,075	1,090	" 11......	Raised at C. E. F.	1,060
" 4.... .	1,130	1,170	" 8.......	1,050	1,075	" 12......	Raised at C. E. F.	1,035
Totals..	. . ....	4,380	....	....	4,410	....	....	4,415

From the figures given it will be seen that the heaviest of the three groups as arranged for the test was only 35 lbs. heavier than the lightest of the groups.

Group No. 1.

Results for the first eight weeks, during which time no meal was given.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 1..	65·55	....	110	1·96	7·87	4 02
No. 2.........	65·55	... .	80	1·43	7·87	5 50
No. 3....................	65·37	....	80	1·43	7·84	5 48
No. 4....................	69·16	....	115	2·05	8·30	4 05
Average..........	66·41	....	96¼	1·72	7·97	

Cost of producing each 100 pounds of increase for the group, $4.64

Results for the next four weeks, during which time each animal received two pounds of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 1	63·75	2	70	2·50	9·65	3 86
No. 2..................	64·92	2	60	2·14	9·79	4 57
No. 3..................	64·92	2	30	1·07	9·79	9 15
No. 4................	68·39	2	35	1·25	10·20	8 16
Average..........	65·49	2	48¾	1·74	9·86	

Cost of producing each 100 pounds of increase for the group, $5.66.

Results for the remaining four weeks, during which time each animal received six pounds of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 1..................	60·68	6	48	1·71	13·28	7 77
No. 2..................	60·68	6	54	1·93	13·28	6 88
No. 3..................	60·68	6	64	2·29	13·28	5 80
No. 4..................	64·57	6	56	2·00	13·74	6 87
Average	61·65	6	55½	1·98	13·39	

Cost of producing each 100 pounds of increase for the group, $6.76.

GROUP No. 2.

Results for the first eight weeks, during which time each animal received two pounds of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 5..................	63·70	2	70	1·25	9·64	7 71
No. 6..................	65·46	2	115	2·05	9·86	4 81
No. 7..................	65·55	2	110	1·96	9·87	5 04
No. 8..................	65·55	2	110	1·96	9·87	5 04
Average..........	65·06	2	101¼	1·80	9·81	

Cost of producing each 100 pounds of increase for the group, $5.42.

Results for the next four weeks, during which time each animal received four pounds of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 5....................	60·79	4	80	2·86	11·29	3 95
No. 6.....	64·79	4	48	1·71	11·77	6 88
No. 7....................	64·79	4	55	1·96	11·77	6 01
No. 8..............	64·79	4	45	1·61	11·77	7 31
Average	63·79	4	57	2·03	11·65	

Cost of producing each 100 pounds of increase for the group, $5.72.

Results for the remaining four weeks, during which time each animal received six pounds of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 5	58·36	6	66	2·36	13·00	5 51
No. 6..........	60·54	6	31	1·11	13·26	11 95
No. 7.................. .	60·29	6	34	1·21	13·23	10 93
No. 8.....	58·86	6	14	·50	13·06	26 12
Average	59·51	6	36¼	1·30	13·14	

Cost of producing each 100 pounds of increase for the group, $10.15.

Group No. 3.

Results for the first eight weeks, during which time each animal received four pounds of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 9	65·61	4	60	1·07	11·87	11 09
No. 10.....	64·52	4	125	2·23	11·74	5 26
No. 11...	64·84	4	115	2·05	11·88	5 79
No. 12.	59·12	4	120	2·14	11·09	5 18
Average...........	63·52	4	105	1·87	11·64	

Cost of producing each 100 pounds of increase for the group, $6.21.

Results for the next four weeks, during which time each animal received six pounds of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 9.	42·96	6	40	1·43	11·15	7 80
No. 10..................	55·82	6	25	·89	12·69	13 13
No. 11.	58·29	6	60	2·14	12·99	6 07
No. 12.	58 29	6	80	2·86	12·99	4 54
Average..	53·84	6	51¼	1·83	12·43	

Cost of producing each 100 pounds of increase for the group, $6.79.

Results for the remaining four weeks, during which time each animal received six pounds of meal per day.

Steer.	Fodder consumed per day.	Meal per day.	Total increase in weight.	Increase in weight per day.	Cost per day.	Cost per 100 lbs. of increase.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.
No. 9	57·46	6	37	1·32	12·90	9 77
No. 10.	54 36	6	56	2·00	12·52	6 26
No. 11......	58·14	6	59	2·11	12·98	6 15
No. 12............	58·14	6	32	1·14	12·98	11 39
Average............	57·02	6	46	1·64	12·84	

Cost of producing each 100 pounds of increase for the group, $7.82.

The results of the foregoing experiments appear to show that it is economical to withhold the feeding of grain, or to feed but little of it, during the first portion of the feeding period. The steers in group No. 1 fed without grain for the first 8 weeks cost on an average 9·80 cents per day for the whole period of 111 days; group No. 2 11·10 cents and group No, 3 12·14 cents per day. This shows an average cost of 1·30 cents per day more for each animal in the second group than for those in the first group, and 2·34 cents per day more for each steer in the third group than for those in the first group. This makes the average cost of feeding each animal in the second group for the 111 days during which these tests were continued $1.44 more than for those in the first group, while the average gain in weight at the close of the experiment was six pounds more per head in the first group than it was in the second. The steers comprising the third group cost on an average $2.60 per animal more than those in the first group, while the advantage in gain was only 1¾ pounds per head.

		Lbs.
Group No. 1—Total gain per steer for full feeding period 16 weeks	....	200½
" No. 2 " " " "	....	194½
" No. 3 " " " "	....	202¼

EXPERIMENTS IN THE FATTENING OF SWINE.

Experiments in the fattening of swine have been continued since 1890, using different rations from year to year with the object of gaining information as to the best methods of producing pork of the best quality and at the lowest cost. In all cases particulars have been given rega ing the different sorts of feed used and the quantities consumed, also the increase in live weight of the animals under experiment.

THE FEEDING OF SWINE WITH SHORTS.

Lot 11.—This pen contained four cross-bred swine, one Yorkshire sire with Berkshire dam, farrowed 7th June, 1896, and three Berkshire sire and Tamworth dam, farrowed 26th May, 1896, and were fed entirely on shorts soaked in cold water for 30 hours, and were given all they would eat up clean. This feeding test was begun on 25th September, 1896, and continued for sixteen weeks, or until 6th January, 1897. The pigs were weighed every two weeks, and the increase in weight and the quantity of food consumed, are given in the accompanying table for each four weeks:—

No. of Swine, Four.	Sept. 23.	Oct. 21.	Nov. 18.	Dec. 16.	Jan.6,1897	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	287	408	500	586	624	....
Increase in weight	....	121	92	86	38	337
Feed consumed, shorts	....	452	413	382	241	1,488
" per lb. of increase	....	3·73	4·48	4·44	6·34	4·41

The average live weight of each pig when this feeding test was begun was 71¾ pounds; average weight of each at the conclusion of the experiment, 156 pounds. Sold 6th January, 1897. Shrinkage in weight—

Live weight, fasted 14 hours........................ 624 lbs.
Dressed weight, 24 hours after killing............. .... 457 "
Percentage of shrinkage from weight after fasting........ 22·27

THE FEEDING OF SWINE WITH GROUND BARLEY.

Lot 12.—This pen contained four cross-bred swine, one Yorkshire sire and Tamworth dam, farrowed 7th June, 1896, and three Berkshire sire and Tamworth dam, farrowed 26th May, 1896. These were fed for the whole period of sixteen weeks entirely on barley ground and soaked for 30 hours in cold water; they were given all they would eat up clean.

No. of Swine, Four.	Sept. 23.	Oct. 21.	Nov. 18.	Dec. 16.	Jan. 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	291	435	546	694	735	....
Increase in weight	....	144	111	148	41	444
Feed consumed, ground barley	....	531	550	552	299	1,932
" per lb. of increase	....	3·68	4·95	3·72	7·29	4·35

The average live weight of each pig when this feeding test was begun was 72¾ lbs.; average weight of each at the conclusion of the experiment, 183¾ lbs.

Sold 6th January, 1897. Shrinkage in weight—

Live weight, fasted 14 hours........................ 735 lbs.
Dressed weight, 24 hours after killing.............. 548 "
Percentage of shrinkage, from weight after fasting...... 25·44 "

THE FEEDING OF SWINE WITH GROUND INDIAN CORN.

Lot 13.—This pen contained four cross-bred swine, one Yorkshire sire and Berkshire dam, farrowed 7th June, 1896, and three Berkshire sire and Tamworth dam, farrowed 26th May, 1896. These were fed for the whole period of sixteen weeks entirely on Indian corn ground and soaked for 30 hours in cold water; they were given all they would eat up clean.

No. of Swine, Four.	Sept. 23.	Oct. 21.	Nov. 18.	Dec. 16.	Jan. 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	296	460	558	665	688	....
Increase in weight	....	164	98	107	23	392
Feed consumed, ground Indian corn	....	585	457	413	178	1,633
do per lb. of increase.	....	3·56	4·66	3·85	7·73	4·16

The average live weight of each pig when this feeding test was begun was 74 pounds; average weight of each at the conclusion of the experiment 172 pounds.

Sold 6th January, 1897. Shrinkage in weight—

Live weight, fasted 14 hours........................ 688 lbs.
Dressed weight, 24 hours after killing.................. 529 "
Percentage of shrinkage from weight after fasting........ 23·11

THE FEEDING OF SWINE ON A MIXTURE OF SHORTS, BARLEY AND INDIAN CORN.

Lot 14.—This pen contained three cross-bred swine, one Yorkshire sire and Berkshire dam, farrowed 7th June, 1896, and two Berkshire sire and Tamworth dam, farrowed 26th May, 1896. These were fed for the whole period of sixteen weeks with a mixture of equal parts by weight of shorts, ground barley and ground Indian corn, soaked in cold water for 30 hours; they were given all they would eat up clean.

No. of Swine, Three.	Sept. 23.	Oct. 21.	Nov. 18.	Dec. 16.	Jan. 6.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight....	228	363	448	557	596	....
Increase in weight	....	135	85	109	39	368
Feed consumed, equal weights of shorts, barley and corn	....	463	420	398	189	1,470
Feed consumed, per lb. of increase.	... .	3 42	4·94	3·65	4·84	3·99

The average live weight of each pig when this feeding test was begun was 76 pounds; average weight of each at the conclusion of the experiment 198½ pounds.

Sold 6th January, 1897. Shrinkage in weight—

Live weight, fasted 14 hours........................ 596 lbs.
Dressed weight, 24 hours after killing.................. 447 "
Percentage of shrinkage, from weight after fasting....... 25·00

THE FEEDING OF SWINE WITH PEASE, BARLEY, OATS AND SHORTS ADDING SIX POUNDS SKIM MILK PER PIG PER DAY.

Lots 15, 16, 17 and 18.—These pens contained twelve cross-bred swine in all, which were fed for twelve weeks on all they would eat up clean of a mixture of equal parts by weight of ground pease, barley, oats and shorts, soaked in cold water for 30 hours with 6 pounds of skim milk per day to each pig. These feeding tests were begun on the 10th March, 1897, and continued for twelve weeks or until 19th May, 1897.

Lot 15.—Consisted of two cross-bred swine Essex sire with Yorkshire dam, farrowed 10th September, 1896.

No. of Swine, Two.	Mar. 10.	April 7.	May 5.	May 19.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	210	255	309	333	....
Increase in weight	....	45	54	24	123
Feed consumed, meal	....	130	154	75	359
" milk	....	336	336	168	840
" per lb. of increase, meal	......	2·88	2·85	3·12	2·91
" " milk	....	7·44	6·22	7	6·82

Lot 16.—Consisted of three cross-bred swine, two Essex sire and Yorkshire dam—farrowed 10th September, 1896, and one Tamworth sire and Berkshire dam, farrowed 10th October, 1896.

No. of Swine, Three.	March 10.	April 7.	May 5.	May 19.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	282	345	418	458	....
Increase in weight	....	63	73	40	176
Feed consumed, meal	....	178	188	103	469
" milk	....	504	504	252	1,260
" per lb. of increase, meal	....	2·82	2·57	2·57	2·66
" " milk	....	8	6·90	6·30	7·15

Lot 17.—Consisted of four cross-bred swine, one Essex sire and Yorkshire dam, farrowed 10th September, 1896, two Tamworth sire and Berkshire dam, farrowed 10th October, 1896, and one pure Berkshire.

No. of Swine, Four.	March 10.	April 7.	May 5.	May 19.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	378	479	585	632	.....
Increase in weight	......	101	106	47	254
Feed consumed, meal	....	221	257	143	621
" milk	....	672	672	336	1,680
" per lb. of increase, meal	......	2·18	2·42	3·04	2·44
" " milk	....	6·65	6·33	7·14	6·21

Lot 18.—Consisted of three cross-bred swine, two Essex sire and Yorkshire dam, farrowed 10th September, 1896, and one Tamworth sire and Berkshire dam, farrowed 10th October, 1896.

No. of Swine, Three.	March 10.	April 7.	May 5.	May 19.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	284	340	424	460	......
Increase in weight	....	56	84	36	176
Feed consumed, meal	....	155	218	105	478
" milk	....	504	504	252	1,260
" per lb. of increase, meal	....	2·76	2·59	2·91	2·71
" milk	....	9	6	7	7·15

The average live weight of each of the pigs in these groups, when these feeding tests were begun, was 96⅙ pounds; average weight of each at the conclusion of the experiment, 157 pounds.

THE FEEDING OF SWINE WITH UNGROUND OATS.

Lot 19.—This pen contained four cross-bred swine—two Berkshire sire and Tamworth dam, farrowed 1st May, 1897; and two Yorkshire sire and Berkshire dam, farrowed 6th May, 1897. These were fed for the whole period of twelve weeks with unground oats, soaked in cold water for 54 hours, all they would eat up clean, with 3 pounds of skim milk per day to each pig. This feeding test was begun on the 1st September, 1897, and continued until the 24th November, 1897.

No. of Swine, Four.	Sept. 1st.	Sept. 29th.	Oct. 27th.	Nov. 24th.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	389	443	546	681	....
Increase in weight	....	54	103	135	292
Feed consumed, oats	....	299	421	510	1,230
" " milk	.. ..	336	336	336	1,008
" " per lb. of increase, oats	....	5·53	4·08	3·77	4·21
" " " " milk	....	6 22	3·26	2·48	3·45

To gain information as to how much of this unground grain passed through the swine undigested, the excrement was carefully collected for one day (24 hours) and washed, when, from about 14 pounds of oats fed, 2 pounds 6 ounces of undigested grain was separated, which when dried weighed 22½ pounds per bushel. When tested as to its germinating power, eleven per cent of this grain sprouted.

The average live weight of each pig, when this feeding test was begun, was 97¼ pounds; average weight of each at the conclusion of the experiment, 170¼ pounds.

Sold 25th November, 1897. Shrinkage in weight:—

	Pounds.
Live weight, fasted 14 hours	659
Dressed weight, 24 hours after killing	492
Percentage of shrinkage from weight after fasting	25·33

THE FEEDING OF SWINE WITH UNGROUND BARLEY.

Lot 20.—This lot consisted of four cross-bred swine—three, Berkshire sire with Tamworth dam, farrowed 1st May, 1897; and one, Yorkshire sire with Berkshire dam, farrowed 6th May, 1897. These were fed for the whole period of twelve weeks with unground barley, soaked in cold water for 54 hours, all they would eat up clean, with 3 pounds of skim milk per day to each pig.

No. of Swine, Four.	Sept. 1st.	Sept. 29th.	Oct. 27th.	Nov. 24th.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	397	477	619	797	....
Increase in weight	....	80	142	178	400
Feed consumed, barley	....	354	511	591	1,456
" " milk	....	336	336	336	1,008
" " per lb. of increase, barley	....	4·42	3·59	3·32	3·64
" " " " milk	....	4·20	2·36	1·88	2·52

To gain information as to the proportion of this unground barley which passed through the swine undigested, the excrement was carefully collected for one day (24 hours) and washed, when, from about 17 pounds of barley consumed, 2 pounds 2 ounces of undigested grain was separated, which when dried weighed 35 pounds per bushel. This was tested as to its germinating power, but not one of the kernels sprouted.

The average live weight of each pig, when this feeding test was begun, was 99¼ pounds; average weight of each at the conclusion of the experiment, 199¼ pounds.

Sold 25th November, 1897. Shrinkage in weight:—

	Pounds.
Live weight, fasted 14 hours	798
Dressed weight, 24 hours after killing	592
Percentage of shrinkage from weight after fasting	25·81

THE FEEDING OF SWINE WITH UNGROUND PEASE.

Lot 21.—This pen contained four cross-bred swine, three Berkshire sire and Tamworth dam, farrowed 1st May, 1897, and one Yorkshire sire and Berkshire dam, farrowed 6th May, 1897. These were fed for the whole period of twelve weeks with unground pease soaked, in cold water for 54 hours, all they would eat up clean, with 3 pounds of skim milk per day to each pig.

No. of Swine, Four.	Sept. 1.	Sept. 27.	Oct. 27.	Nov. 24.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	402	498	660	830	....
Increase in weight	....	96	162	170	428
Feed consumed, pease	....	349	505	572	1,426
" " milk	....	336	336	336	1,008
" " per lb of increase, pease	....	3·63	3·11	3·36	3·33
" " " milk	....	3·50	2·07	1·97	2·35

To gain information as to the proportion of the unground pease which passed through the swine undigested, the excrement was carefully collected for one day (24 hours) and washed, when from about 17 pounds of pease fed, only 2 ounces of undigested grain was separated. This quantity was too small to admit of the weight per bushel being ascertained, and when tested as to germinating power none of these pease sprouted.

The average live weight of each pig when this feeding test was begun was 100½ pounds; average weight of each at the conclusion of the experiment 207½ pounds.

Sold 25th November, 1897. Shrinkage in weight:—

	Pounds.
Live weight, fasted 14 hours	830
Dressed weight 24 hours after killing	626
Percentage of shrinkage from weight after fasting	24·57

THE FEEDING OF SWINE WITH UNGROUND INDIAN CORN.

Lot 22.—This lot consisted of three cross-bred swine, Poland China sire and Yorkshire dam, farrowed 25th June, 1897. These were fed for the whole period of thirteen weeks with unground Indian corn soaked in cold water for 54 hours, all they would eat up clean, with 3 pounds of skim milk per day to each pig. This feeding test was begun on the 29th September, 1897, and continued until the 29th December, 1897.

No. of Swine, Three.	Sept. 29.	Oct. 27.	Nov. 24.	Dec. 22.	Dec. 29.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	216	320	430	537	570	....
Increase in weight	......	104	110	107	33	354
Feed consumed, Indian corn	....	272	319	388	49	1,028
" " milk	....	252	252	252	63	819
" " per lb. of increase, Indian corn	....	2·61	2·90	3·62	1·47	2·90
Feed consumed, per lb. of increase, milk	....	2·42	2·29	2·35	1·90	2·31

To gain information as to the proportion of the unground Indian corn which passed through the swine undigested, the excrement was carefully collected for one day (24 hours) and washed, when, from about 11 pounds of corn consumed, 8 ounces of undigested grain was separated, which when dried weighed 40¼ pounds per bushel and germinated in the proportion of 8 per cent.

The average live weight of each pig when this feeding test was begun was 72 pounds; average weight of each at the conclusion of the experiment 190 pounds.

Sold 31st December, 1897. Shrinkage in weight:—

	Pounds.
Live weight, fasted 14 hours	564
Dressed weight, 24 hours after killing	461
Percentage of shrinkage from weight after fasting	18·26

THE FEEDING OF SWINE WITH MIXED OATS, BARLEY AND PEASE, ALL UNGROUND.

Lot 23. This lot consisted of three cross-bred swine, Poland China sire with Yorkshire dam, farrowed 25th June, 1897. These were fed for the whole period of thirteen weeks on a mixture of equal parts by weight of oats, barley and pease all unground and soaked in cold water for 54 hours. The pigs were given of this mixture all they would eat up clean and each one received in addition 3 pounds of skim milk per day.

Number of Swine, Three.	Sept. 29th.	Oct. 27th.	Nov. 24th.	Dec. 22nd.	Dec. 29th.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	212	302	407	500	527	
Increase in weight	....	90	105	93	27	315
Feed consumed, mixed grain	....	245	314	401	49	1,009
" " milk	....	252	252	252	63	819
" " per lb. of increase, mixed grain	....	2·72	2.99	4·31	1·81	3·20
" " per lb. of increase, milk	....	2·80	2·40	2·70	2·33	2·60

To gain information as to the proportion of the unground mixed grain which passed through the swine undigested, the excrement was carefully collected for one day (24 hours), and washed, when from about 11 pounds of grain consumed 10 ounces of undigested material was separated. Of 100 kernels tested as to germinating power, two of the oats only sprouted.

The average live weight of each pig when this feeding test was begun was $70\frac{2}{3}$ pounds; average weight of each at the conclusion of the experiment, $175\frac{2}{3}$ pounds.

Sold 31st December, 1897. Shrinkage in weight:

	Lbs.
Live weight, fasted 14 hours	521
Dressed weight, 24 hours after killing	412
Percentage of shrinkage from weight after fasting	20·92

VISIT TO THE BRANCH EXPERIMENTAL FARM, NAPPAN, N.S.

A visit was paid to the Experimental Farm at Nappan, N.S., in October. Notwithstanding the unfavourable wet weather in the early part of the season, the crops on this farm turned out well, as will be seen from the particulars given in the report of Mr. Geo. W. Forrest appended. The great advantage resulting from the under-draining of land was very clearly demonstrated this year. A large proportion of the land under cultivation on this farm has been tile-drained, and thus outlets have been provided for the prompt discharge of surplus water, which has permitted early and thorough cultivation and given conditions favourable for the growing crops.

Early in October the superintendent, Mr. Geo. W. Forrest, resigned his position, and Mr. R. Robertson was appointed his successor. During the year some of the less useful animals in the herd of cattle were disposed of for beef, and late in the season a number of choice dairy cows were purchased, including some pure bred Guernseys, and these additions have much improved the character of the herd.

In the horticultural division of the work many new varieties of large fruits have been added to the orchards and the plantations of small fruits have been similarly increased. Many varieties of vegetables have also been tested. The ornamental trees and shrubs and sample hedges have all made fair progress, and the flowers in the beds and borders have given a constant succession of bloom throughout the summer.

VISIT TO THE WESTERN BRANCH FARMS.

At the request of the committee of arrangements for the entertaining of the members of the British Association, I left Toronto on August 24th in charge of a party of these distinguished visitors from Europe and accompanied them to the Pacific coast. We were favoured with fine weather during the whole journey and every facility was afforded the party by the officers of the Canadian Pacific Railway for seeing the more interesting portions of the country by day. In this way an excellent idea was formed regarding the extent and resources of the country and unusual opportunities given for seeing its great natural beauties. The extensive wheat areas between Winnipeg and Regina were all seen by daylight when the harvest was in progress, and opportunity was also afforded for seeing the experimental farms at Brandon and Indian Head and of examining specimens of the more important cereals and other products grown there, also of seeing similar crops at Agassiz and of testing some of the many excellent varieties of fruits produced there. The cities and towns, along the route vied with each other in the hospitalities shown to the members of this distinguished party, and special entertainments were given at Winnipeg, Vancouver and Victoria. The visitors expressed their surprise at the wonderful extent of the country and of its agricultural and mineral resources, and their admiration of the great beauty and diversity of the mountain scenery along the route of travel On the return journey, the usual annual inspection of the Experimental Farms was made.

AGASSIZ, B.C.

Several days were spent here in inquiring into the progress of the work and arranging the details of future experimental operations. The season had been favourable and the crops of grain and roots were good and well above the average. The fruit crops also had given satisfactory returns. Apples and pears were fruiting well, the plum crop also had been an excellent one, and considerable quantities of fruit had been shipped to the mining districts in British Columbia and to the towns and cities in Manitoba and the North-west Territories. An additional area of land has been cleared at the experimental farm during the year and brought under cultivation, the fruit orchards have also been further extended and many new varieties of fruit added. The orchards which were planted at different heights on the bench lands on the mountain side are all making good progress, and some of the young trees were heavily laden with fruit. The plantations of forest and ornamental trees are also doing well, and the flower beds and borders have been brilliant and attractive with bloom throughout the season. Excellent progress has been made in all branches of the work and much evidence was afforded of careful and judicious management.

INDIAN HEAD, N. W. T.

The grain crops at this branch farm were very good the past season and the yield of grain has been considerably above the average over a large part of the Indian Head district. Where the land was summer-fallowed many farmers realized thirty bushels or more per acre of first class wheat. At the price which grain now commands such crops are very encouraging and very profitable to the farmer and should bring about rapid settlement of this fertile portion of the great plains.

In the early part of the season the weather was very dry and the outlook on the experimental farm was unpromising, but timely rains in June produced a luxuriant growth and an abundant harvest of grain. Through lack of rainfall in the autumn the crop of roots was very light.

The beneficial effects of the shelter provided by forest plantations on the Indian Head experimental farm were clearly shown during the past season. Plots of several varieties of grain sown within the influence of shelter compared with plots of the same sorts sown beyond such influence, gave a difference of from 25 to 50 per cent in the yield in favour of the sheltered locations. Further experiments have been carried on with the Awnless Brome Grass, *Bromus inermis*, with very satisfactory results. This grass has now become well known and is much appreciated by the farmers in the territories, who find it to be hardy and reliable, and a most useful grass both for hay and meadow in the North-west country. The farm generally was in excellent order, the buildings and stock were also inspected and found to be in a satisfactory condition.

BRANDON, MANITOBA.

Most of the grain crops on this farm turned out fairly well and some of them were good, but they were not so heavy as those at Indian Head. The Brandon district suffered considerably from drought in the spring and also from the prevalence of unusually severe winds and spring frosts. Oats suffered most and in some instances where the land was exposed a large proportion of the young plants were destroyed. Notwithstanding these drawbacks the crops of grain obtained at the experimental farm were much larger than the average crops of the province and most of the grain was of good quality. The corn crop was lighter than usual owing to very dry weather in the autumn; for this cause also the yield of roots was below the average.

Experiments have been continued with many grasses for hay and pasture but the Awnless Brome grass takes the lead here as at Indian Head as the most successful in its growth and generally useful in its character of all the varieties thus far tested. The forest belts, avenues and hedges have made good growth and the general collection of trees and shrubs in the Arboretum surrounding the house of the Superintendent is increasing in interest every year. Many promising additions have recently been made to this collection. The general condition of all branches of the work in progress here was very satisfactory.

CHANGES IN THE STAFF.

During the year two changes have occurred in the staff. The Superintendent of the branch experimental farm at Nappan, Mr. Geo. W. Forrest, resigned and Mr. R. Robertson was appointed in his place. Mr. John Craig also resigned his position as Horticulturist of the Central Experimental Farm.

CORRESPONDENCE.

The following is a summary of the letters received and sent out at the Central Experimental Farm from November 30, 1896, to November 30, 1897, also of the number of reports, bulletins and circulars sent out by mail during the same period.

	Letters received.	Letters sent.
Director	32,301	19,408
Horticulturist	2,576	2,495
Chemist	1,249	1,410
Entomologist and Botanist	1,920	2,110
Poultry Manager	1,306	1,159
Accountant	1,319	1,539
	40,671	28,121

Circular letters sent, including circulars sent with samples of seed grain	41,857
Number of Reports and Bulletins mailed	256,736

The large increase in the correspondence and in the volume of farm literature distributed during the past year is an index of the increasing interest taken in the work of the experimental farms. The figures given show that the letters received during the year have averaged 130 per day and the number sent out has averaged 90 per day. The total distribution of reports, bulletins and circulars has reached a daily average for the whole year of 953.

ACKNOWLEDGMENTS.

I acknowledge most gratefully my indebtedness to the Director of the Royal Gardens, Kew, England, for another valuable collection of the seeds of trees, shrubs and plants, also a large collection of willows. Many packages of the seeds of rare and interesting species have also been received from the Director of the Arnold Arboretum, Jamaica Plains, Mass. Further contributions have also come from the Royal Botanic Gardens at Sapporo, Japan. A collection of the seeds of hardy perennials has been received from the Missouri Botanic Gardens at St. Louis, Mo., and another very useful collection of similar plants from the Botanic Garden of Smith College, Northampton, Mass. A large and interesting collection of seeds of useful sorts of trees and shrubs from the northern parts of Russia has also been received from Mr. J. Niemetz, Councillor of State, Winnitza, Podolia, Russia. To Prof. John Macoun, Naturalist of the Geological and Natural History Survey, and to Mr. J. M. Macoun, Assistant Naturalist, my hearty thanks are due for seeds of many rare and useful species collected in different parts of the Dominion.

I desire also to acknowledge the continuance of the faithful services rendered by all the officers at the central and branch experimental farms, and for their earnest and diligent co-operation in carrying on the many lines of experimental work which has been planned.

A special acknowledgment is due to those members of the staff who have rendered me efficient aid in carrying on those branches of the work of which I have had personal charge. To the Farm Foreman, Mr. John Fixter, who has carefully managed and watched over the field experiments and taken notes on the crops at different stages in their growth, also to my assistant, Mr. W. T. Macoun, who, in addition to his work as Foreman of Forestry, which is this year reported on separately, has had charge of all the uniform test plots of cereals and potatoes, also of the small plots of new cross-bred and hybrid cereals, and has taken records of the growth and yield of the many varieties under test. From Mr. R. R. Elliott, Herdsman, I have also received much valuable assistance. He has carefully carried out the work planned and taken notes on the results of the experiments conducted in the feeding of cattle and swine. Accurate work has also been performed by Mr. Wm. Ellis in testing the vitality of seeds, the propagation of plants and the taking of the meteorological records. The employees also of the farms in every branch of the work have discharged their several duties faithfully and well.

WM. SAUNDERS,
Director Experimental Farms.

REPORT OF THE HORTICULTURIST.

(JOHN CRAIG.)*

DR. WILLIAM SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I beg to submit a report of some of the work carried on by the Division of Horticulture of the Central Experimental Farm for the year 1897, being the eighth annual report which I have had the honour to prepare.

I have found it impossible to condense into the limited space available, a full account of the work of the year. Some of this has been cumulative in results, the work being carried on for a term of years and culminating this season. This is particularly true of two lines of research, viz., methods of root grafting as affecting the health and vigour of the resulting tree, and the results of experiments with native and American plums. Both topics would require a considerable space to do them justice, besides a generous amount of illustration.

Blossoming Records.—The work of recording the blossoming period of our leading varieties of large and small fruits throughout the Dominion has again occupied my attention, and has been carried on with the kind assistance of interested fruit growers. The names of these recorders appear at page 101, Report 1896. The work of compiling these records and of reducing them to intelligible and useful form is very great, and it has been found impracticable with the assistance at hand to prepare the data in time for this report.

Fruit Crop.—As expected the crop of apples throughout the Dominion this year was small, after the phenomenally large yield of last season. Not only was it small as to quantity, but the quality of the product was much below the average—chargeable chiefly I may say to the laxity of growers in putting into practice those principles of fruit culture now so well understood, viz., the necessity of fertilizing adequately, pruning carefully, and spraying perseveringly.

TEST ORCHARDS AT THE CENTRAL FARM.

Apples.—These are planted out in two separate blocks. No. 1, contains a collection of named American varieties including a number of others of more remote introduction from Europe. This has been commonly designated the "Standard" orchard, including as it does those varieties which on account of general adaptability have become "standards" the country over. In it is contained a block each of Wealthy, Duchess and Tetofsky apple-trees. The first variety has been used as a top-grafting stock since 1891. There are now a large number of varieties among these top-grafts new to Canada and approaching fruiting age. The lines separating "hardy" from "tender" apples are quite closely drawn at Ottawa. Leading varieties of Western Ontario like King, Northern Spy and Greening are entirely unreliable on their own stocks in the Ottawa Valley. Experiments

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* Resigned, November, 1897.

in top-grafting have been planned with a view of ascertaining the effect—if any—of hardy stocks upon doubtfully hardy scions. For this purpose considerable space in the "Standard" orchard has been given to trees of Haas (*Gros pommier*, *Fall Queen*), Gideon, McMahan White, and Hibernal; all vigorous growing trees and promising stocks. These will be ready for top-grafting next spring.

Apple Orchard No. 2, commonly known as the "Russian" orchard has been devoted to the testing of varieties of apples imported directly or indirectly from East Europe—principally Russia and Germany. Frequent references to these apples will be found in my preceding reports. Among them are a number of useful fruits, notably *Pointed Pipka*, *Switzer*, *Romna* and *Winter Arabka*.

Seedling Apple Orchard.—About 50 trees fruited this year. They were all Russian seedlings. The fruits were described and the trees numbered and labelled. None of those fruiting this year appear to be worthy of propagation.

Pear Orchard.—The soil of the pear orchard, a cold light sandy loam, is unsuitable to the growth of this fruit. The trees have been destroyed by blight and winter killing in large numbers each year. Particulars of the varieties on trial including those which have succumbed to blight and winter injury appear at page 136, Rep. 1896. Flemish Beauty is the only American variety that has borne fruit thus far, though the tree is not strictly hardy. Bessemianka, Gakovka, Lemon, Tonkovietka and Sapieganka, Russian pears, are perfectly hardy but blight badly. The fruit also is very poor in quality and exceedingly perishable.

Plum Orchard.—None of the *Prunus domestica* class have been entirely successful upon their own roots or upon the Myrobolan stock. The collection of American seedlings is now very large. It has been found that seedlings of *P. Americana* make the best propagating stocks for the descendants of *P. domestica*, *P. angustifolia* and for the named varieties of *Americana*. Provision has been made in this orchard for extensive top- and stock-grafting experiments. Among the valuable varieties of American plums are: Stoddard, Hawkeye, Yosemite Purple, Cheney and Hunt.

Cherry Orchard.—The serious injury wrought to this orchard two years ago by root killing has been duly noted. It has been observed that those trees propagated in 1891 upon "Bird cherry" stock, *Prunus Pennsylvanica*, have thus far escaped root damage by frost. These trees have been thrifty and healthy and this season bore a small crop of fruit. Bird cherry, sprouts, but not more freely than the Mazzard type. A number of each variety of cherry trees in the orchard have been propagated upon this stock, are in nursery now and will be ready for planting out next fall.

MEETINGS ATTENDED.

I was present by invitation and gave addresses during the year at the following horticultural meetings:—

Nova Scotia.—Colchester County Fruit Growers' Association, Truro, 19th January. Nova Scotia Fruit Growers' Association, Wolfville, 22nd and 23rd January.

Quebec.—Pomological Society, Howick, 27th and 28th January. Pomological Society, Stanstead, 17th and 18th August.

Ontario.—Napanee Horticultural Society, 15th February. Deseronto Horticultural Society, 16th February. Picton Horticultural Society, 17th February. Trenton Horticultural Society, 18th February. Smith's Falls Horticultural Society, 23rd February. Lindsay Horticultural Society, 24th February. Port Hope Horticultural Society, 25th January. Cobourg Horticultural Society, 26th February. Leamington Horticultural Society, 13th April. Olinda Horticultural Society, 12th January. Lincoln and Wentworth Fruit Growers' during August.

I was present by invitation at the meeting of the Vermont State Horticultural Society, Grand Isle, in September; also attended officially the meeting of the American Pomological Society in Columbus, Ohio.

Acknowledgments.—I am again deeply indebted for valuable technical assistance rendered to this Division during the year, to the following eminent scientists:—Mr. J. Dearness, Inspector of Schools, London, Ont.; Dr. W. T. Connell, Pathologist of Queen's University, Kingston, Ont.; Dr. B. D. Halsted, Experiment Station, New Brunswick, N.J.; Prof. B. T. Galloway and Dr. Erwin T. Smith, of Pathological Division, Dept. of Agriculture, Washington, D.C.; Prof. L. R. Jones, Experiment Station, Burlington, Vt.; Prof. A. D. Selby, Experiment Station, Columbus, Ohio.

To the *Fruit Growers of Canada* I wish to tender my warmest thanks for their generous help whenever called upon, and for their kindly appreciation of my efforts put forth in the interests of the fruit industry of this country.

DONATIONS.

I beg gratefully to acknowledge the following donations received during the year:—

Sender.	Donation.
Agricultural College, Guelph, Ont	Plants of new varieties of strawberries.
Bartlett, J., Oshawa, Ont	Vegetable seeds.
Brodie, R., St. Henri, Que	Cherry scions.
Bustin, Wm., Belleisle, N.S	Apple scions.
Closson, Bros., Highland Creek, Ont.	Cuttings of Ruby currant.
Cone, E. W., Wisconsin.	Patrick strawberry plants.
Dempsey, W. H., Trenton, Ont	Scions, apples and pears.
Evans, A. A., Kingsey, Ont	" yellow choke cherry.
Experimental Station, Burlington, Vt	" apple, plants Prunus Besseyii.
" Geneva, N.Y	Hunn, strawberry plants.
Fairfield, F. S., Orono, Ont	Seedling plums; cherry scions.
Fisher, M. J., Maxville, Ont	Scions, apple.
Glass, A., St. Catharines, Ont	Seedling strawberries.
Graham, J. I., Vandeleur, Ont	Scions, apple.
Horton, E. L., Port Steamburg, N.Y	Seed beans.
Harsant, T. A., Glen Orchard, Muskoka	Seedling raspberries.
Iowa Agricultural College, Ames, Ia	Apple, pear and plum trees.
Mugnier, J. B., Albertine, N.B	Scions, apple.
Mowbray, W., Sarnia, Ont	" "
McFarlane, D. H., Pictou, N.S	Scions, plum.
McCallum, Dr., Smith's Falls, Ont	" apple.
Morden, J. A., Hyde Park, Ont	" "
MacKombir, J. T., Grand Isle, Vt	Plants, raspberry, grape cuttings.
Nichols, Rob., Mitchell, Ont	Seedling grapes.
Porter, F. W., Mt. Forest, Ont	Raspberry plants.
Read, M. A., Port Dalhousie, Ont	Hybrid grape and raspberry plants.
Stead, A. H., Tapley's Mills, N.B	Scions, pear.
Stephens, C. L., Orillia, Ont	Seedling, gooseberry.
Stevenson, Wm., Guelph, Ont	Strawberry plants.
Steele, Brigg's Co., Toronto, Ont.	" "
Sewell, W. W., Carthage, Ind	" "
Trotter, R., Owen Sound, Ont	Scions, Baker prune.
Waters, J. M., Fernhill, Ont	Raspberry plants.
Yeisley, Chas., Lisbon, Ia	Scions of apples.

I have the honour to be, sir,
Your obedient servant,

JOHN CRAIG,
Horticulturist.

December 2, 1897.

SMALL FRUITS.

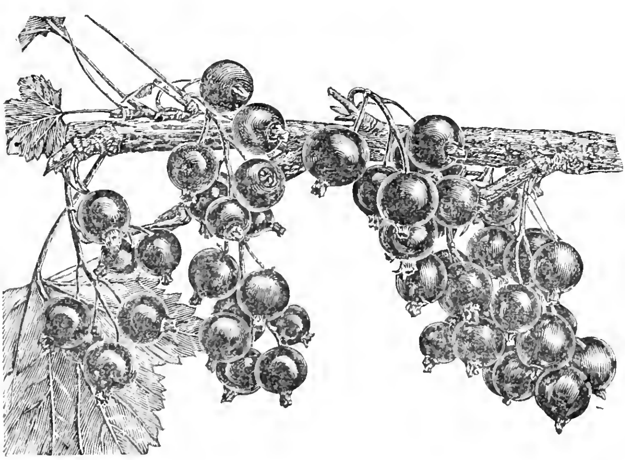
SEEDLING BLACK CURRANTS.

The following seedling black currants have been under my observation during the past seven years. They have been propagated in a small way, and have been tried in different situations on the Central Farm. They have also been sent to the branch farms and to some of the leading Canadian small fruit growers.

After these trials I feel justified in expressing the opinion that they are worthy of introduction. They, with 15 others, were selected in 1893, after four years' fruitage, out of more than 100 seedlings which had been under test at the Central Farm since 1887. Since that time they have maintained their individual points of excellence, and each one described is, I believe, superior to any other named commercial variety of the same season. They were originated as follows:—

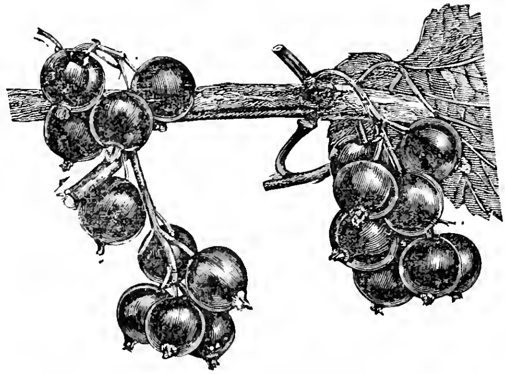
About the year 1879 a considerable number of seedling black currants were grown in London, Ont., by Dr. Wm. Saunders, the present Director of the Experimental Farms, from extra large selected berries of the Black Naples. One of these seedlings produced very large fruit of good quality, and the bush was productive. In 1884 several hundred seedlings were raised from large berries of this seedling, then known as Saunders' Seedling, but subsequently lost. When Dr. Saunders removed to Ottawa in 1887 to organize the system of experimental farms in Canada he brought with him from his experimental gardens in London about 150 of the most promising of these seedlings. By discarding from year to year all those of less promise they have been gradually reduced to the number stated.

DESCRIPTION OF VARIETIES.



BEAUTY.—Half natural size.

Beauty.—Plant, a strong uniform grower; berries, above medium; skin, thin, free from astringency; quality, good; bunches, large; berries refuse to separate easily from the pedicel. In gathering, it is best to pull the entire bunch, rather than attempt to pick the berries individually in the ordinary way. Field Note.—Ripe, July 13, 1896. Still holding to the bush, August 10, 1896. This year it ripened July 18, and was picked August 3.



STANDARD.—Half natural size.

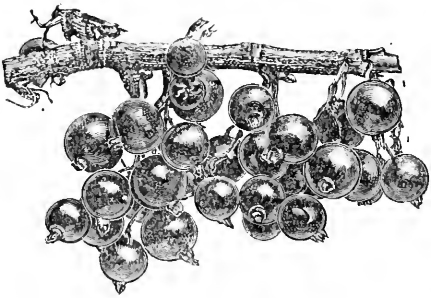
Standard.—Bush, low spreading, fairly vigorous; bunch, medium size; berries, medium to large, round; skin, thin; flavour, pleasant, brisk acid. Ripe, July 3, 1896; July 10, 1897. Very productive.

SUCCESS.—Half natural size.

Success.—Bush, a medium grower; cluster, large; berry, medium to large; skin, firm but thin; quality, best; season, the earliest in the collection. This, with its productiveness, are its strong points. This variety was distributed in a limited way, through the Fruit Growers' Association of Ontario, three years ago. Many favourable reports have been received concerning its behaviour under varying conditions.

The four varieties following have not, one year with another, proved equal to the three above, but are all superior to *Lee's Prolific* and *Black Naples* in regard to size, quality and productiveness.

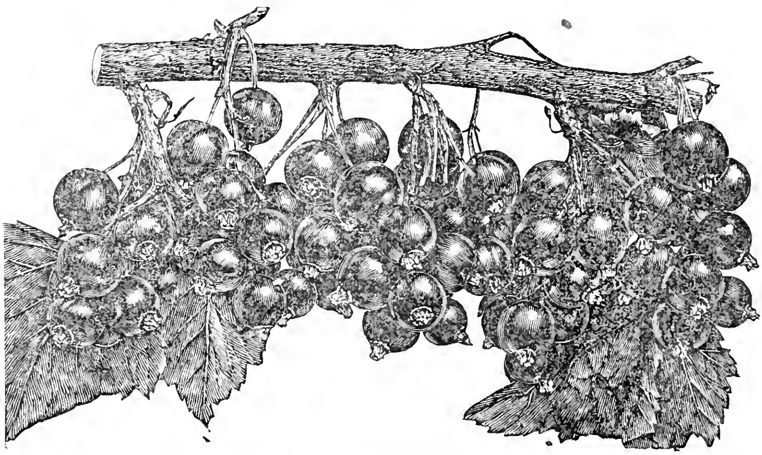
LEE'S PROLIFIC.—Half natural size.



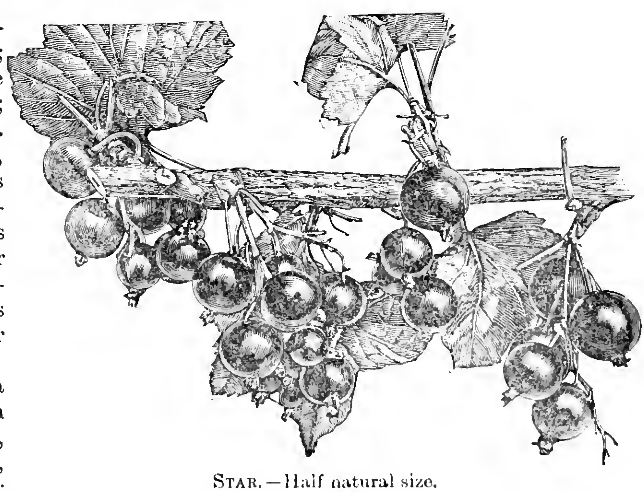
Black Naples.—Half natural size.

Monarch.—Plant strong, vigorous ; bunch, long, usually well filled ; berries, medium size, ripen evenly in bunch ; skin, thin ; quality, good. Ripens among those of early mid-season. Very productive.

Climax.—Plant strong, vigorous. (No. 3 in row not true.) Bunch, large ; berries, glossy ; skin, thin, brisk subacid ; quality, good. This is one of the latest, ripening with, or a little before Beauty. In productiveness it is one of the best.



Climax.—Half natural size.



Star.—Half natural size.

Star.—Plant, moderately vigorous, flat-topped ; bunch, large ; berry, of the largest size, round, glossy ; skin, rather thick ; flavour, a pleasant subacid ; quality, best. The weak points of this variety are its time of ripening — mid-season — and its manner of ripening—rather uneven. It is not more uneven, however, than Lee's Prolific, and is much larger and finer in quality.

Winona.—Plant, a strong grower, upright in habit ; bunch, above medium, long, well filled ; berry large, round, clings well to pedicel ; skin, thin, non-astringent ; one of the most prolific, ripening with or a few days after the earliest. This variety is of the type of Monarch, but usually a few days earlier.

THE GOOSEBERRY PLANTATION.

The present collection of gooseberries was set out in the spring of 1893. It is composed of 10 American and 107 English varieties, beside a few of their hybrids. The soil is light sandy loam underlaid by limestone ledge and shale. Before setting the plants a portion of the area received a light surface dressing of blue clay. The ground was well manured before planting. The American varieties and hybrids were propagated by layers at the Central Farm. The English varieties were imported as two-year old plants. They were set in rows 4 x 6 feet apart. Cultivation was thorough. The plantation was mulched with barn-yard litter in the autumn of each year. No special winter protection was given. Two years ago the ground was heavily mulched with barn-yard manure; since then cultivation has been suspended, such weeds as appeared being pulled by hand. The English varieties have not been successful. A few have done fairly well and bear paying crops, but much the larger percentage have proved melancholy failures. This failure should, I believe, be largely credited to the character of the soil. In this locality and throughout the Ottawa valley gooseberries are not successful on the lighter sandy soils, but do well on the heavier soils. A clay loam is desirable—one that is rich, friable but not loose, and one naturally moist is preferable. A protected situation is also necessary—where the snow lodges early in the autumn and remains late in the spring. Unless the fruit grower of Eastern Ontario or the province of Quebec has such a situation and is also prepared to spend some time in spraying the plants to prevent mildew, I would not advise him to plant English gooseberries as a money making venture. He had better stick to the hardier American kinds, such as Pearl, Downing and Houghton. With the conditions as described above and within easy reach of a market, I believe this fruit may be grown profitably in many portions of Canada. There is now a market for considerable quantities of *ripe* gooseberries where formerly the gooseberry was not recognized as a dessert fruit in any uncooked condition.

It may be said that the indifferent success of the trials at the Central Farm gives but scant grounds upon which to base recommendations for their cultivation. I am speaking now, however, more on the strength of observations made elsewhere than upon our experience at Ottawa. The following table contains a list of the varieties on trial with notes regarding their health and hardiness. "Slight" means a very small amount of frost injury to the tips. "Little" describes a killing back of three or four inches. "Considerable" where killed back to two-year old wood. "Severe" shows that some plants have been destroyed by winter killing. "Health" refers to their relative immunity from mildew.

GOOSEBERRIES.

Variety.	Winter Injury.	Health 1 to 10 max.	Fruit.
Alcock's King	Slight	8	White ?
Aston Red.	"	9	Red.
Amber	Considerable	6	Yellow.
Admiration	"	5	Red.
Alma	Severe	7	
Antagonist	Slight	5	White.
Am. Seedling (Am.)	Hardy	10	Green.
Archville	Slight	7	"
Beauty	Considerable	8	Red.
British Crown	"	7	
Briton	"	7	Yellow.
Broom	Slight	9	"
Bank of England	Severe	4	?
Bright Venus	Considerable	8	?
Bumper	Slight	4	?
Crown Bob	"	8	Red.
Clayton	Badly	6	"
Champion Red	....	....	"
Conquering Hero.	Little	8	"

GOOSEBERRIES—*Concluded.*

Variety.	Winter Injury.	Health 1 to 10 max.	Fruit.
Champagne	Considerable	6	White.
Columbus	Slight	8	"
Catharina			Yellow.
Compton's Bird Lime	Considerable	5	Green.
Companion	"	5	Red.
Ironmonger	Little	7	"
Imperial Red	Severe	6	"
Industry	Little	7	"
Keen Seedling	"	6	"
Keepsake	Considerable	7	Green.
King of Trumps	Slight	8	Red.
London	Little	9	"
Lord Derby	Severe	7	Green.
Lancashire Lad	"	6	Red.
Lancashire Gunner	"	7	?
Lomax Victory	"	5	?
Lily of Valley	Considerable	5	White.
Leader	"	6	Yellow.
Leveller	Little	7	"
Lady Houghton	Considerable	5	Green.
Lady Leicester	Little	6	"
Lancer	Considerable	7	White.
Napoleon le Grand	Severe	6	Red.
Marigold	Considerable	6	Yellow.
Mountain of Snow	Slight	8	White.
Moses	"	7	Red.
Mountain Seedling (Am.)	Hardy	9	"
Ottawa (hybrid)	"	9	Green.
Prince Regent	Severe	6	Red.
Peru	Slight	8	White.
Shiner	Severe	4	Green.
Souter Johnny	Considerable	3	?
Snowball	Little	6	White.
Snowdrift	Severe	7	"
Snowdrop	Slight	8	Red.
Smith's Imp. (Am.)	Hardy	10	Green.
Trumpeter	Little	7	Yellow.
Tally-ho	Severe	7	"
Transparent	"	6	"
Whinham's Industry	Considerable	6	Red.
Walnut	Little	6	White.
White Eagle	Severe	7	"
White Crystal (Am.)	Little	9	"
Whitesmith	Considerable	7	"
Wandering Girl	Slight	8	"
Yellow Sulphur	"	8	Yellow.

VARIETIES RECOMMENDED.

Red Jacket.—American but of English parentage; originated at London, Ont., by Dr. Wm. Saunders; received from George S. Josselyn, Fredonia, N.Y.; plant, fairly mildew free; berry, reddish-green, sometimes brightly tinged with red; size, $1\frac{1}{8}$ x $\frac{7}{8}$ inches; smooth, roundish oval; fair quality; ripe, Aug. 5, 1897.

King of Trumps.—English; from Wm. Fell & Son, Hexham, Eng.; mildews considerably, but is a vigorous grower; berry light red, spined; size $1\frac{3}{8}$ x 1 inch; slightly pyriform, sometimes oblique; firm, meaty, not high flavoured. This variety quite closely resembles Aston Red.

London.—English; from Wm. Fell & Son; plant a strong grower; berry, dark red; pyriform; $1\frac{1}{4}$ x $\frac{3}{4}$ inch; flavour, sweet, pleasant; skin, thin; free from mildew.

Speedwell.—English; from Wm. Fell & Sons; a fair grower; berries pale red, sparsely spined, oval or pyriform; ripe Aug. 1; quality rather poor, productive.

Riccardo.—From same source as last named variety; a strong healthy grower; berries $1\frac{1}{2}$ x $1\frac{1}{8}$ inches; tinged with red; roundish oval or slightly pyriform; mildly subacid; ripe last week of July.

Among other better known varieties may be mentioned Crown Bob and Lancashire Lad. The two varieties of English gooseberries best known and most widely cultivated are Whitesmith and Industry.

Of American varieties Downing or Pearl undoubtedly stand at the head of the list. White Crystal has been very productive, but drops badly and is of poor quality.

LARGE FRUITS.

THINNING PEACHES AND PLUMS.

The importance of thinning peaches and plums during seasons of heavy yields is fully demonstrated by the results of the following experiment carefully carried out and clearly described by Mr. Martin Burrell, St. Catharines, Ont. The crop of peaches throughout the peach belt of southern Ontario last season was very large and the size of the average sample of fruit very small. No doubt the extremely hot weather of early summer was largely responsible for the small size of the fruit; again the usual period of high temperature characterizing the Crawford season had the effect of forcing the whole crop on the market very hurriedly. Prices went down to zero and poor fruit was an absolute drug. For a few days only the best grades brought in remunerative returns. Had the fruit been of good size it would have paid growers and buyers to have stored it a few days pending the clearing of the markets—as it was, a large proportion of the early Crawfords were sacrificed. The experiments conducted by Mr. Burrell for this division are therefore timely, and it is hoped that fruit growers will bear in mind the necessity of carrying out practices of this kind in these days of close competition.

With regard to thinning plums, though the results are not so marked as in the case of the peaches on account of the variety selected, there is no doubt that thinning Lombards is an absolute necessity, taking one year with another. If allowed to bear at will the tree overbears, the fruit soon becomes small and poorly coloured and will hardly pay the cost of picking, transportation and selling. The trees, too, break down and become debilitated. It is expensive work, but it will pay. The fruit should be thinned early in the season. Hand labour seems to be the only practicable method at present.

NOTES BY MR. BURRELL.

The thinning experiment on peaches were conducted on six-year old trees of the Hyne's Surprise variety, an almost free stone, white fleshed peach ripening between the season of the Early Rivers and the Yellow St. John. (10th to 25th Aug.) Three trees of each variety were selected as nearly alike as possible. The first was thinned on 22nd June, the second ten days later and the third left as a "check" tree. The thinning process was performed on the first tree when the peaches were quite small, between one-half and two-thirds of an inch from apex to base. On the second tree the peaches were from an inch to an inch and a quarter long. The fruit was picked as it ripened, three or four pickings for each tree. In the results appended "firsts" were 7 inches or more in circumference, and "thirds" were too small to be marketable.

PEACHES.

Tree.	Thinned.	No. Off.	Quarts.	Time.	Amount of Fruits in Lbs. and Number.				
					Firsts.	Seconds.	Thirds.	Total.	
				hrs.	Lbs.	Lbs.	Lbs.	No.	Lbs.
No. 1..	June 22..	1,500	11	1¼	107	75½	2	1,290	184½
No. 2..	July 2..	800	16	1	85½	73	....	1,115	158½
No. 3..	Check....	....	....	....	20	93½	21	1,419	134½

With reference to the above figures it should be explained that the peaches under 'firsts' went about 6 to the lb.; the 'seconds' of trees No. 1 and No. 2 went about 8 to the lb., but in the case of No. 3 the sample was much smaller, going about 10 to the lb., and the 'thirds' about 15 to the lb.

At first sight it appears as if No. 1 tree ripened a great number of peaches considering the large number (1,500) that were taken off, but a considerable proportion of this 1,500 would not have 'set' and would shortly have dropped anyway. It must also be pointed that about 25 per cent more rot obtained on the 'check' tree, and had these extra rotten been counted, the total number on the 'check' tree would have been much heavier. It will be seen that on the thinned trees the gain, in size, was immense, and this is where the great commercial advantage lies. Had the trees been of a later variety with a longer season of ripening, the difference would probably have been still greater. In thinning, an endeavour was made to leave the peaches about two inches apart. I am convinced, however, that a much larger number could profitably have been taken off. The cost of thinning out trees of this size would amount to only from ten to twelve cents a tree. In conclusion, it may be urged from the above experiment, that, when a big crop of fruit is set, thinning peaches is a highly remunerative process for the following reasons :—

1. It increases the weight of yield.
2. It largely increases the size of the fruit.
3. It reduces the number of matured seeds, thereby considerably lessening the drain on the vitality of the tree.
4. It renders the crop less liable to 'rot.'

Some of the best Michigan and Georgia peach growers thin to six inches apart.

PLUMS.

Tree.	Thinned.	No. Off.	Quarts.	Time.	Lbs. of Fruit.	No. of Plums.	Size, No. to Lb.	No. of other Plums.
				Hrs.				
No. 1....	June 21..	3,000	7	1½	164	4,852	29½	645
No. 2....	July 3..	1,800	9	1½	145	4,900	34	114
No. 3.. .	Check....	....	....	....	*170	6,650	39	1,011

* 12 lbs. of this 170 consisted of inferior and unmarketable fruit.

In the thinning experiment conducted on plums three trees of "Moore's Arctic" were taken; an early variety of small to medium size. The crop was far too heavy even on the thinned trees. This fact and the dry weather during the growing season partially accounts for the small size of the plums. Although the results with plums were not so marked as in the case of peaches, the evidence points the same moral. In both cases it will be observed that the early thinning bore the most profitable results, and it will manifestly pay to commence all work of this kind immediately after the fruit sets."

THINNING at C. E. F.

Variety.	When Thinned.	Number of Thinned Specimens in ½ bushel.	Weight, of ½ bushel Thinned.	Number Specimens in ½ bushel not Thinned.	Weight of ½ bushel not Thinned.
			Lbs. Oz.		Lbs. Oz.
APPLES—					
Krimskoe....................	June 17....	109	22·	126	22· 8
Duchess...........................	" 17....	96	19·	123	18· 4
PLUMS—					
R. B. W. Seedling, No. 3...........	" 17 ...	560	19·	640	18· 4

The above small experiment points the same moral and emphasizes the result obtained by Mr. Burrell.

APPLE STORING EXPERIMENTS.

Quite an extended series of trials were made last winter with a view of securing information regarding methods of storing apples in winter. Some of the points involved were (1) wrapped *versus* unwrapped fruit; (2) cellar *versus* ground floor storage; (3) close, *versus* ventilated packages. The experiments began in the autumn, were carried through the winter, the final examination being made July 29, 1897. Twenty-four varieties of apples were included in the trials. The results given below are averages:—

1. Wrapped *versus* unwrapped apples.

	Per cent. Sound.	Comparative weight. Scale of 100.
Wrapped and stored in cellar.................	42·	37
" store-room......................	36·	33
Unwrapped in cellar......................	32·8	29
" store-room............	33·	23

Specimens wrapped in paper kept best, there were fewer rotten apples, and they lost least by evaporation. The ground floor store-room did not preserve them as well as the cellar.

CLOSE *versus* VENTILATED PACKAGES.

This was tested by packing equal quantities of six varieties of apples in boxes of the same make with, and without ventilation. Half of the cases were placed in the cellar the other half in the upper store-room.

Results.

Package.	Stored.	Per cent of fruit sound.
Not ventilated.	Cellar.	42
do	Store-room.	64·6
Ventilated.	Cellar.	49
do	Store-room,	45·8

The tight package preserved the fruit best in store-room, but not in cellar; per contra the ventilated did better in cellar than in storeroom.

GOOD KEEPERS.

1st. Class. *To April or later.*

Walbridge.	Lawver.	Scott's Winter.
Salome.	Sharp's Russet.	Ben Davis.
Rawles Janet.	Hartshorn	Thompson's 35.
Nodhead.	Swayzie Pomme Grise.	

2nd. Class. *To March.*

Watterson No. 3.	Golden Stone.
Ontario.	Pewaukee.
Flushing Spitzenberg.	Plumb's Cider.

3rd Class. *To February.*

Princess Louise.	Wealthy.	Haas.
McMahon.	Gideon.	Orange Winter.
Longfield.	Fameuse.	McIntosh.

ADDITIONAL NOTES ON COVER CROPS.

This subject was discussed somewhat exhaustively in the report for 1896. Several points of interest have presented themselves since that.

CLOVERS INJURED BY WINTER OF 1896–97.

The destruction of the clover crop by the severe weather of January, 1896, (without snow) was general throughout the Ottawa valley. *Mammoth Red* and *Common Red* were completely killed out in the Farm orchards. *Alfalfa (lucerne)* fared a little better, a small percentage of the plants showing vitality in the spring of 1897. It was noted that whenever the plots of Mammoth Red and Alfalfa over-lapped in the orchard that both varieties came through the winter better than when growing separately. Acting upon this hint, plots containing equal quantities of Alfalfa and Mammoth Red were sown last autumm. 6 pounds of each clover were used per acre and sown August 1st. The seed germinated uniformly and the plants made a strong growth which continued till the arrival of frosty nights. At this time the average height of the Alfalfa was 16 inches, and the Mammoth Red 10 inches. The one formed an appropriate complement to the other—the spreading stools of the Mammoth Red covering the ground with a thick mat beneath the more slender and taller growing Alfalfa.

Sowing the Seed.—It is wise for orchard cover purposes to use not less than 25 pounds of seed per acre.

The soil should be in an excellent condition as regards tilth—entirely free of weeds and lumps or clods of earth. The best time to sow the seed at Ottawa is between July 25 and August 5. At this time purslane or "pursley" *(Portulaca oleracea)* is the most troublesome orchard weed. If it has obtained a foothold, the best thing to do is to turn it under with a gang plough. Surface cultivation will not exterminate it but merely check its growth, and that only during dry weather. The clover seed may be sown satisfactorily with a hand broadcasting seeder. If the soil is in a proper condition—that is, has been thoroughly harrowed—all that is necessary afterwards is to roll it. This should be done immediately the seed is sown as it germinates so quickly, under favourable conditions, that a late rolling often does more harm than good by crushing the tender sprouts.

Part of the farm orchard was not seeded down this year until August 10. This was too late to hope for the best results. The open autumn, however, gave unusual opportunities for late growth and a fair cover was secured though not equal to other parts sown 10 days earlier.

FURTHER EXPERIMENTS IN THE PRESERVATION OF GRAPE JUICE.

The experiments in connection with the preservation of grape juice detailed in the Report for 1896 (page 166–8) were continued with other antiseptics and by different processes again this season.

The juice of five varieties of grapes was used, viz., Clinton, Black Elvira, Bacchus, Brant and Concord.

Amount of juice from 100 pounds of grapes of each variety :—

	Gals.	Qts.
Clinton, 100 pounds	8	0
Black Elvira, 100 pounds	8	2
Bacchus, 100 "	7	1
Brant, 100 "	7	0
Concord, 100 "	7	0

Series I.

Heated to 160° for 10 minutes. Bottled December, 1896.

Variety.	Quantity.	How Treated.	Condition, November, 1897.
Clinton	1 pint	Sugar, 2 oz	Slight boiled flavour; fresh, palatable.
Bacchus	1 "	" 2 oz	Fresh, palatable.
Brant	1 "	" 2 oz	Slightly soured.
Concord	1 "	" 2 oz	Fresh, but juice lacks briskness.
Black Elvira	1 "	" 2 oz	Palatable, good.

Series II.

Heated to 150° for 10 minutes. Bottled December, 1896.

Variety.	Quantity.	How Treated.	Condition, November 1, 1897.
Clinton	1 pint	Sugar, 2 oz.; salicylic acid, ·175 grms	Fresh, palatable; good flavour and condition.
Bacchus	1 "	Sugar, 2 oz., sal. acid ·175 grms	Milder than last, pleasant.
Brant	1 "	Sugar, 2oz., salicylic acid, ·175 grms	Juice light red in colour, pleasant flavour.
Concord	1 "	Sugar, 2 oz., sal. acid, ·175 grms	Muddy, flavour fair; no fermentation.
Black Elvira	1 "	Sugar, 2oz., salicylic acid ·175 grms	Mouldy, not in good condition.

Series III.

Bottled cold, December, 1896.

Variety.	Quantity.	How Treated.	Condition, November, 1897.
Clinton	1 pint	Formalin, 4·8 c. c., 1%; sugar, 2 oz.	Unfermented, flavour unpleasantly pungent.
Clinton (A).	1 "	Formalin, 2·4 c. c., ½%; sugar, 2 oz	Unfermented, very dark, flavour disagreeable.
Bacchus	1 "	Formalin, 4·8 c. c., 1%; sugar, 2 oz.	Same disagreeable astringent after-taste.
Bacchus (A).	1 "	Sugar, 2 oz.; formalin, ½%	Unpalatable.
Brant	1 "	Formalin, 1%; sugar, 2oz.	Fermentation had not taken place in any case, but each sample was characterized by an unpleasant pungent burning after-taste, undoubtedly caused by the formalin.
Brant (A)...	1 "	Formalin, ½%; sugar, 2 oz.	
Concord	1 "	Formalin, 1%; sugar, 2 oz.	
Concord (A).	1 "	Formalin, ½%; sugar, 2 oz.	
Black Elvira	1 "	Formalin, 1%; sugar, 2 oz.	
B. Elvira (A)	1 "	Formalin, ½%; sugar, 2 oz.	

Series IV.

Heated 10 minutes at 130° on two consecutive days. Bottled December, 1896.

Variety.	Quantity.	How Treated.	Condition November, 1897.
Clinton	1 pint	Sugar, 2 oz............	Fermented.
Bacchus	1 "	" 2 oz.............	"
Brant ...	1 "	" 2 oz.............	"
Concord	1 "	" 2 oz.............	"
Black Elvira	1 "	" 2 oz.............	"

Series V.

Heated 10 minutes at 160°. Bottled December, 1896.

Variety.	Quantity.	How Treated.	Condition, November, 1897.
Clinton	1 pint	Without sugar..........	Fresh, unfermented; rather acrid.
Bacchus	1 "	"	" brisk, pleasant acid, good.
Brant	1 "	"	" " palatable.
Concord	1 "	"	Rather insipid, unfermented.
Black Elvira	1 "	"	Fresh, acid slightly astringent.

Series VI.

Not heated. Bottled December, 1896.

Variety.	Quantity.	How Treated.	Condition, November, 1897.
Black Elvira	1 pint	Formalin, ½%; sugar, 2 oz.	Unfermented, unpleasant flavour.
" (A)	1 "	" ½%..........	Slightly fermented.
Clinton	1 "	" ½%; sugar, 2 oz.	Fairly good, unfermented.
Clinton (A).	1 "	" ½%.....	Disagreeable, flavour pronounced.
Bacchus	1 "	" ½%; sugar, 2 oz.	Unfermented, but unpleasant.

Series VII.

Heated 10 minutes at 170°. Bottled December, 1897.

Variety.	Quantity.	How Treated.	Condition, November, 1897.
Clinton	1 pint	Sugar, 4 oz	Sweet, pleasant, palatable, unfermented.
Black Elvira	1 "	" 4 oz	Astringent, unfermented.

DEDUCTIONS.

1. Formalin while a proved ferment arrester imparts such a disagreeable flavour to the juice that it cannot be used, at least as strong as in the proportion of ¼ per cent.

2. Sugar added to the juice with formalin masked the flavour of the latter somewhat, but did not obliterate it entirely.

3. Salicylic acid, ·175 grammes with 2 ounces sugar to each pint produced the most palatable beverage.

4. Samples were successfully preserved when heated for 10 minutes at 160°, with sugar at the rate of 2 ounces to each pint of juice. Duplicate samples without sugar were also successfully preserved but were not generally as palatable as the former.

5. 160° Fahr. seems to be the lowest safe temperature that may be used in the preservation of grape juice. The juice may be held at this temperature for 15 or 20 minutes without imparting to it any unpleasant boiled flavour.

SPRAYING.

The apple orchards on the Central Farm were sprayed four times with Bordeaux mixture and Paris green. As a result of this work it was difficult at harvesting time to find an imperfect specimen of fruit. Even such varieties as McIntosh Red and Lawver were almost entirely free from "apple spot." The formula used was that recommended by this division for the past four years, viz.: 4 pounds each of copper sulphate and lime to each barrel of water. Paris green was always added at the rate of 4 ounces to each barrel of the mixture. This did not entirely prevent injury from codling moth, but undoubtedly lessened the loss from this source very materially. In addition to this standard fungicide, Lysol—a substance mentioned in last year's report—and formalin, a new antiseptic, were tried with the following results.

Lysol.—Reference was made to this substance in the annual reports of 1895–96. It was strongly recommended as an insecticide and fungicide by some German horticulturists. The results secured here do not corroborate these reports, and no good reason can be shown why it should be recommended as a fungicide, though it is but fair to add that last year's work warranted a claim being made for its usefulness as an insecticide. The experiments of this season did not show that it promised qualities superior or equal to the present standard insecticides.

1. Four ounces to 5 gallons water, equal to ½ per cent solution on Duchess apple trees. Three applications did not give marked results. Foliage and fruit were normal and healthy. The crop of apples on these trees was too small to allow of reliable comparison being made.

2. Eight ounces to five gallons of water equal to 1 per cent solution; foliage healthy; fruit somewhat gnarled. The gnarly appearance was noticed soon after the first application.

3. Twelve ounces to five gallons equal to $1\frac{1}{2}$ per cent solution. Foliage continued healthy throughout the season. The fruit on one tree was fairly sound and clean, on the other it was badly deformed and rusty. This seemed justly attributable to the Lysol. Further additional reference to this substance will be found in connection with the peach spraying experiments.

Formalin.—This antiseptic and preservative was tested as a fungicide on Duchess apple trees in the following strengths:—

4. One ounce to five gallons of water. Foliage was not affected injuriously; fruit clean. Aphides present on foliage were not killed.

5. Two ounces to five gallons. This had no perceptible injurious or beneficial effect upon foliage or fruit. Aphides did not seem to be disturbed.

9. Four ounces to five gallons.; no injury to foliage. Three pecks of apples picked, only four specimens wormy. Check trees were wormy to the extent of 8 to 10 per cent only. This would seem to indicate that formalin possessed some deterrent influence against codling month.

BORDEAUX MIXTURE WITH PARIS GREEN *VS.* PARIS GREEN IN WATER.

This question is often asked: Is Paris green as efficacious against codling moth when used with Bordeaux mixture as when it is applied by itself? Careful experiments carried on in 1895 and 1896 answered the question in the affirmative. The experience of this season corroborates that of former years. Paris green was used in both cases at the rate of one pound to 160 gallons of fluid. Three applications were made. When applied in water alone considerable injury resulted to the foliage of the Tetofsky apple trees under experiment. No injury was noted in the case of other trees treated three times with Bordeaux mixture and Paris green. As to effects on codling moth larvæ a Transcendant crab tree sprayed with Bordeaux mixture and Paris green yielded five bushels of fruit. Of these, nine specimens only were wormy; one Hyslop treated as above, yielding three and one-quarter bushels, gave thirty-six wormy specimens.

PARIS GREEN AND WATER.

One Jumbo crab tree yielding one and one-quarter bushel gave five wormy specimens.

One Orion crab tree yielding one bushel gave fourteen wormy specimens.

It will be noted that the proportion of wormy apples is small in both cases and does not point to important practical differences. It is my opinion that it would not pay a fruit grower to incur the expense involved in making a separate application of Paris green in view of the very doubtful benefit derived.

BORDEAUX MIXTURE—SIX POUNDS OF COPPER SULPHATE *VS.* FOUR POUNDS.

Some horticulturists advise the use of six pounds of copper sulphate with four pounds of lime to each barrel of water in making Bordeaux mixture. This formula has in one or two instances given better results when used against potato rot, than formula 4:4. In combating diseases of fruit trees its advantages have never been apparent to me. If four applications are made, many varieties of apples will be more or less russetted by the 6:4 formula (See Rep., 1896, p. 174), and during seasons of heavy precipitation the foliage may suffer injury.

A careful comparison was made this year of the two formulas when applied to heavily laden crab trees. With the 4 : 4 formula the foliage and fruit were healthy and clean throughout the season. No injury to the leaves was observed, while with the 6 : 4 formula all the fruit was distinctly russetted and the foliage slightly scorched. In the case of a Quaker Beauty Crab part of the fruit was rendered unsalable. The number of wormy specimens in both series was about the same.

ARSENATE OF LEAD.

The experiments with this insecticide commenced in 1895, continued in 1896, were again carried on this year. The results would seem to indicate that it is an effective remedy against codling moth. The insecticide was made by dissolving one-half of an ounce of arsenate of soda in one quart of water, three-quarters of an ounce of acetate of lead in an equal quantity, then pouring the two together and diluting with water, to five gallons. This mixture sprayed three times on two trees of Orange crabs yielding five bushels, gave an average of five wormy specimens in each bushel.

ARSENATE OF LEAD WITH BORDEAUX MIXTURE.

The above formula was used in connection with Bordeaux mixture, 4 : 4 formula replacing Paris green. One tree each of Jumbo and Ball's Winter crab apples were selected. Three applications were made. The result was disastrous to both foliage and fruit. The former was badly scorched, while the latter was rendered entirely unfit for market on account of the skin bearing deep patches of russet besides numerous blotches and cracks. The number of wormy specimens averaged four to each bushel of fruit. Check trees standing alongside were healthy and normal, so that there seems no reason to doubt that the corrosive and injurious action was due to some unfavourable combination of the insecticide with the fungicide. In former experiments this injurious effect was not noted.

TABLE showing per cent of Sound and Wormy Fruit obtained by the different mixtures.

Mixture.	Handpicked.		Windfalls.		Handpicked and Windfalls.
	Per cent Sound.	Per cent Wormy.	Per cent Sound.	Per cent Wormy.	Per cent Wormy.
1 Lysol ½ per cent sol	97·2	2·8	92·2	7·8	10·6
2 Lysol 1 per cent sol	92·7	7·3	80·	20	27·3
3 Lysol 1-1½ per cent sol	96·3	3·6	93·9	6·1	9·7
4 Formalin ⅛ per cent sol	100.	....	94·1	5·9	5 9
5 Formalin ¼ per cent sol	98·9	1·1	85·	15·	16·1
6 Formalin ½ per cent sol	96·9	3·1	95·3	4·7	7·8
7 Bordeaux 4 : 4 Paris green	99·2	·8	98·9	1·1	1·9
8 Paris green	100·	....	99·5	·5	·5
9 Bordeaux 6 : 4 Paris green	99·7	·3	99·2	·8	1·1
10 Paris green	98·8	1·2	99 6	·4	1·6
11 Arsenate of Lead	99 3	·7	98·8	1·2	1·9
12 Bordeaux mixture, arsenate of lead	100·	....	99·	1·	1·
13 Checks	92·	8·	89·	11·	19·

SPRAYING EXPERIMENTS AT ST. CATHARINES.

(Superintended by Martin Burrell, Esq.)

Object of the experiment :—To prevent peach leaf curl, rot of the fruit of peach and plum, and orange rust of the quince.

Lysol of three strengths was used : (1) ½ per cent (2) 1 per cent, and (3) 1½ per cent. (4) Copper sulphate, 2 lbs. to 25 galls. of water for first application followed by Bordeaux mixture. (5) Bordeaux mixture, 3 : 3, 40 gallons. The first application was made on Apr. 17, when the peach buds were beginning to swell. The 2nd on May 22, 3rd on May 26 (repeated on account of rain), 5th on June 12, 6th on July 10.

RESULTS.

Lysol on peach trees. (1) ½ per cent. Effect on foliage: Twig blight (Monilia) was not arrested; leaf curl was abundant. Effect on fruit: No perceptible benefit. (2) 1 per cent; foliage, considerably "curled" and blighted. Fruit, an average amount of rot. (3) 1½ per cent; foliage, less affected by curl than No. 1 and 2. Twig blight in evidence. Fruit fairly sound. (4) Copper sulphate and Bordeaux mixture. The trees in this row developed yellows and were destroyed before harvesting time. (5) Bordeaux mixture 3 : 3 lbs., 40 galls., and Paris green, 3 oz. Foliage, five trees out of the six in this row were practically free of curl leaf. Twig blight caused by Monilia appeared here and there, no injury to the foliage was noted as an effect of the spray. Fruit almost free from rot. (6) Bordeaux mixture, 4 lbs. copper sulphate. 8 lbs. lime, 4 oz. Paris green. Four applications beginning May 22. This formula was compared with No. 5. At the time of the first application "curl leaf" had already developed and was not obviously checked by the spray. (7) Check row: badly affected by curl leaf; considerable blight.

Lysol was also used on *plum* trees, but without any apparent benefit. 1½ per cent; solution injured the leaves slightly. On *quinces* it did not prevent the development of orange rust. Having tried this substance for three years with unsatisfactory results, there does not seem to be any good reason for retaining it longer among the list of insecticides and fungicides used as sprays.

Mr. Burrell makes the following observations:—

"In regard to the experimental work of spraying peach and plum trees to prevent curl leaf and rot, although you have the details, I might say that the season throughout was unfavourable for the successful application of the mixtures, frequent showers and rapid changes of temperature creating unusual and somewhat difficult conditions. Unfortunately, too, the disease of "yellows" appeared on several of the trees in one of the treated rows; these trees were of course promptly cut out and burned. While the spraying was not so effective as might have been desired against the peach curl and monilia, some good was accomplished; the fruit on the trees sprayed with the Bordeaux mixture being from 15 to 25 per cent freer from rot than on the unsprayed trees. The Lysol was not noticeably effective either as an insecticide or as a fungicide. The 1½ per cent solution (6 oz. to 10 galls.) was slightly injurious to the foliage. At this strength some of the smaller green aphides were killed, but the half grown and mature lice were unhurt.

"The applications to the quince trees for the prevention of orange rust were not productive of any very marked results, as very little orange rust appeared this year on any quince trees.

"I may say, however, in gathering the quinces I observed that the foliage of the two rows sprayed (4 times) with Bordeaux mixture was much more glossy and healthy than that on the rest of the trees, and that the quinces were uniformly good. The row sprayed with 'lysol' was much the same as the two unsprayed rows, and in each case the foliage was less healthy than on the rows treated with Bordeaux mixture, and some slight indications of rust were noticed."

DEDUCTIONS.

Lysol.—Gave no marked results either as a fungicide or insecticide.

Bordeaux mixture 3 : 3 gave the best results in preventing peach curl, fruit rot and twig blight. This standard remedy seems most effective and is therefore recommended. Care should be exercised in preparing the mixture in order that injury to peach and plum foliage may not result. It is wise to use *fresh lime* only, and expedient to employ the ferrocyanide of potassium test before applying Bordeaux mixture to peach trees.

TREATMENT OF APHIDES IN THE ORCHARD.

It is not often that orchard trees under good cultivation suffer from the attacks of aphides. The summer of 1897 was marked by the most serious visitation of this little insect that I have known. Plum trees were severely attacked throughout Ontario and Quebec. Cherry trees in some instances lost their foliage in midsummer, while in bad cases the growth of vigorous apple trees was completely arrested in midseason. The attack began in spring with the unfolding leaf buds and was continued with more or less vigour till the leaves fell. Two weeks of fiercely hot weather in July and again towards the end of August retarded the increase somewhat, but the check was only temporary. Nursery stock and young orchard trees suffered most. The Farm orchards were sprayed four times to prevent injury from this little pest. Among remedies the following were tried:—

KEROSENE EMULSION (Riley-Hubbard formula).

Rolfe apple tree.—Applied June 15. Examined June 16. A few (about 10 per cent) of aphis killed. Sprayed again June 17. Examined June 19. About 20 per cent of aphis killed. Leaves of tree quite rusty; considerably injured by spray.

Rubicon apple tree.—Sprayed June 28. Examined June 29. Not more than 10 per cent killed; foliage slightly spotted. Sprayed again July 3. Examined the following day. About 50 per cent of aphis killed; foliage considerably injured.

Borsdorf apple tree.—Sprayed June 28. Examined June 29. About 80 per cent of aphis killed. Foliage badly injured. Sprayed again July 3. Examined July 5. Aphis nearly all dead, but foliage badly injured.

In every case where kerosene emulsion was used two or more times, the foliage was considerably injured although every care was exercised in preparing and applying the emulsion. For this reason other insecticides were tried.

TOBACCO WATER.

Made by soaking 8 lbs. of home grown tobacco leaf and stems in a barrel of water for 48 hours with 2 lbs. of soft soap added, applied to *Scotts Winter*. Three applications completely cleared the tree.

Rolfe apple tree.—Treated June 25. Examined June 26. About 50 per cent of aphis killed. Sprayed again June 26. Examined June 28. No living insects visible.

Fanny apple tree.—Treated on June 24, and again on the 26th. Examined June 28. A few colonies were found upon twigs that were not thoroughly sprayed.

Ordinary tobacco waste did not give satisfactory results. Three sprayings of tobacco water made from this material only killed about 50 per cent of the insects upon a Rubicon apple tree. The efficacy of this brand was increased by soaking the stems in hot water. One application destroyed about 95 per cent.

A tree of the *Peter apple*, sprayed once with tobacco decoction prepared as just described, was cleared of aphis on July 14, by one application.

TOBACCO WATER AND LEMON OIL.

One half pint of lemon oil was added to five gallons of water. This was applied to a badly infested *Scotts Winter* apple tree. A single application completely ridded the trees of aphis. The foliage and young wood were somewhat discoloured, but did not appear to be injured.

QUASSIA CHIPS AND WHALE OIL SOAP.

To prepare:—Quassia chips, 4 lbs., boiled ½ an hour in 4 gals. water. Whale oil soap, 2 lbs., stirred in. Diluted to 1 barrel or 45 gals. water.

Ruby Gem apple.—Sprayed on July 14. Examined July 16. About 90 per cent of aphis dead.

Glowing Coal apple.—Sprayed July 14. Insects all dead where leaves were not tightly curled. Other trees treated at the same time showed about the same results. Very much depended upon the thoroughness of the application. This held good all the way through.

SUMMARY.

1. For ease of preparation, cheapness, and efficacy against aphides tobacco water with soft soap or whale oil soap is recommended for general orchard use.
2. Tobacco water and lemon oil gave the most decisively satisfactory results. The lemon oil more than doubles the cost of the preparation which, without it, is less than one half cent per gallon.
3. Quassia chips and whale oil soap make an insecticide rather more expensive than the last and nearly as effective.
4. In spraying to destroy aphides the greatest possible care ought to be exercised in order that the liquid should reach every part of the lower leaf surface.
5. Two or three applications at intervals of a few days should be made in order to destroy the colonies escaping the first spray.

FUNGOUS DISEASES.

The year was marked by the vigour and activity of many of the fungous diseases parasitic on cultivated plants.

Apple spot (*Fusicladium dendriticum*, Fckl.) was phenomenally virulent upon the foliage of apple trees. This may be accounted for by the favourable climatic conditions for its growth, prevailing during the latter part of June and the greater portion of July. It is a regrettable fact that many growers omitted spraying their orchards this year on account of the small crop of fruit. This is bad policy and will not pay in the long run. Many orchards were partially and some completely defoliated in midsummer. So severe was the attack that growers in certain sections thought a new kind of blight had struck their orchards. It was, however, only an old enemy in new guise. Even orchards sprayed most carefully were not exempt by any means, but they were vastly superior in vigour of foliage to those not sprayed. Several cases of plum spot (*Cladosporium carpophilum* v. Thümen) affecting *apricots* were noted. In one instance the fruit was entirely destroyed. *Native plums* where not sprayed were again severely attacked. Owing to this cause not more than one-quarter of a crop was harvested in the Ottawa valley where this type of plum is largely grown. The native plum crop on the Central Farm was fair as to quantity and good as to quality. The trees were sprayed three times with Bordeaux mixture.

The season was also marked by a severe outbreak of the disease which so frequently injures Flemish Beauty pears, variously known as "pear cracking," "pear leaf blight," &c. (*Entomosporium maculatum*). *Numerous samples were received from widely separated sections showing the disease to be very general in its attack. Its presence in the orchard may be noted in early summer by the appearance of small black spots upon the leaves and smoky patches dotting the skin of the fruit. The leaf spots increase in size; the leaves turn yellow and fall in late summer; meantime the fruit spots have grown in size; invading the skin and assuming a horny external covering, they eventually check the growth of the pear causing uneven development, resulting in the growth of cracks in the skin and a general aborted and gnarled appearance.

Treatment.—Bordeaux mixture is invaluable in preventing the development of this disease. It is of little use if not applied as soon as the buds begin to swell. Four ap-

* It is probable that two or three distinct diseases are confused with the last named enemy. A bulletin upon this subject has recently been issued by the Cornell Experiment Station.

plications are necessary. It does not seem possible of late years to obtain a good sample of Flemish Beauty pears except with careful spraying.

Peach mildew appeared in a few orchards. This disease is superficial in habit of growth, causing grayish patches upon the fruit and covering the under side of the leaves and the bark of the young shoots with a powdery gray coating. It is often brought in from the south with young peach trees. If such trees develop the disease during the first season in orchard they should be discarded. Close pruning would undoubtedly check the growth of the disease, but it is unwise to begin orcharding with unhealthy trees. I have had no experience in spraying to prevent mildew, but see no good reason why standard fungicides should not be effective.

Shot hole fungus (Septoria pruni).—This parasite should rank among the first-class pests of the season. Many letters like the following were received. "Dear Sir:—What is the matter with the inclosed plum leaves? They are from Lombard's. The trees were planted five years ago, are in good sandy ground and have been well cultivated." Henry Shaw, Waterville, N.S. "Shot hole fungus" is readily recognized in its later stages by the small, neatly cut, circular perforations surrounded by a purplish ring which so plentifully mark affected leaves. It is a serious enemy to plum culture. Whenever a plum tree is enfeebled by uncongenial soil, the attacks of borers, or the effects of climate, shot hole fungus is nearly certain to appear. In cases of severe attack the tree loses its foliage prematurely. This prevents the fruit from ripening, the proper development of leaf and fruit buds, bringing about generally disastrous results.

Remedial.—If the trees are sprayed to prevent plum rot (*Monilia fructigena*), Septoria will also be largely prevented. The trouble is, that growers do not think it necessary to spray young trees not in bearing. Healthy foliage is essential to the proper storing of the leaf and fruit buds, and unless this is secured by spraying assisted by good cultivation, success will not be attained.

Grape mildew (*Peronospora*) was not so injurious as might have been expected on account of the character of the season, and yielded in the Farm vineyard to the persistent application of Bordeaux mixture.

GOOSEBERRY MILDEW.

This has been the chief difficulty met with at the Central Farm in the cultivation of the English gooseberry. The plantation is situated on light sandy loam. Although carefully sprayed each season there has always been present a certain amount of mildew. This combined with frost injury has rendered most of them unproductive. For further particulars (as to susceptibility of varieties) see notes on Gooseberries.

An experiment in shading the plants from the sun's rays by growing a hill of corn on the south, east and west sides was tried. The seed of a medium growing variety of corn was planted on the sides indicated, about two feet from the gooseberry plant.

Three plants each of the following varieties of gooseberries were shaded, viz., Snowball, Lady Leicester, Marigold, Conquering Hero, Fillbasket and Riccardo. (Notes taken Sept. 30.)

Results.

Scale 1 : 10. Healthy, 10. Badly diseased, 1.

Date, 1897.		Shaded.		Not shaded.	
Aug. 16	Snowball	8	plants growing	6	not growing.
do	Lady Leicester	7	do	7	growing.
do	Marigold	7	fair condition	5	very sickly.
do	Conquering Hero	5	poor condition	6	fair condition.
do	Fillbasket	9	good condition	7	fair condition.
do	Riccardo	10	healthy	9	good condition.

With one exception the plants protected by the growth of corn were healthier than plants of the same variety not so protected. These results should only be regarded as indicative and not conclusive. The experiment should be repeated on a larger scale another year on the same plantation. With regard to fungicides. Bordeaux mixture was applied in the forepart of the season—later when this began to stain the fruit, a weak solution (1 pound to 160 gallons) of copper sulphate was applied. This proved fairly effective. Weekly applications were necessary, however, in order to hold the disease in check. It seemed quite as effective as ammoniacal copper carbonate, is much easier prepared and exceedingly cheap. It is best to have a concentrated solution on hand which may be diluted as needed.

FUNGUS (*Heterosporium gracile*, Sacc.)

Many species of Iris in the perennial border were severely attacked by the above named fungous disease. It is first noticed by the presence of circular yellow spots upon the foliage. These spots increase in size and number; the leaves wither and the flower stalks fail to develop, or wither in the act of flowering. At this stage, if the plant is pulled up the bulb will in most cases be found to be affected with a soft rot resembling very much the crown rot which so frequently destroys celery in winter. This disease develops and spreads rapidly in cool moist weather, such as characterized the month of July. It usually appears in the first half of June, its later development depending upon temperature and moisture. The German Iris section appears to be more susceptible to the disease than other types. This parasite is a serious drawback to the cultivation of the Iris.

Treatment.—Bordeaux mixture was used with apparently good effect, although no exact comparisons were made. When plants are badly diseased it is wise to dig them up and burn them. In the case of a badly infested bed it is advisable to remove the healthy plants to new ground and use the old ground for some other class of plants.

A DRY ROT OF APPLES.

A preliminary note regarding the appearance of this fungus was made in last year's Report (see page 171). The disease again appeared this year, being present upon St. Lawrence as early as Aug. 25. No other additions to the list of affected varieties given last year were noted. Dr. W. T. Connell has been engaged in studying the parasite during the past year, but is not yet ready to report the results of his investigations which he hopes to complete to his own satisfaction this autumn. The fungus found in greatest abundance in the affected areas is one closely resembling *Penicillium glaucum.*

A PEACH DISEASE.

During the past three years I have received from time to time, chiefly through the kind offices of Mr. Milton G. Bruner, Olinda, Ont., specimen peach twigs very much resembling in general characteristics those affected with peach rosette. On July 20, 1897, Mr. Bruner forwarded a number of samples, writing as follows:—"I send you by this mail samples of peach twigs affected by a disease resembling the descriptions I have read of rosette. The specimens are from two different orchards. One of them from Mr. Conover's, near Leamington. This orchard is well cared for and is one of the handsomest in that vicinity. It shows that he has spared no pains in looking after it. The foliage of most of the trees looks healthy and unaffected; trees are making a vigorous growth; yet it is polluted with this rosette-like disease. Peach growers are becoming alarmed, as whereever it has made its appearance it has spread steadily and quite rapidly. It affects orchards at Leamington, as well as Olinda, and seems to have taken a strong hold at both places."

The external characteristics of the disease, are (1) abnormally thickened annual shoots; (2) a marked conduplication of buds; (3) tufted, broom-like growths involving a single twig or branch or sometimes the entire top of a tree; (4) the colour of the foliage a somewhat lighter green than normal; (5) leaves much narrowed and contorted. Upon examining the orchards in question, I found that often a single tufted branch would be noticed upon a tree; again, half of the top would be involved and on other occasions the entire tree would bear the peculiar tufted broom-like growths. The twigs were always abnormally thickened by the shortening of the internodes and the close packing together of the buds. Affected trees are not known to recover; growth is greatly retarded and such trees are usually barren. As the disease Peach rosette (whose life history, like the yellow's, has never been worked out) is peculiar to the south and unknown here, specimen twigs taken from these trees were submitted to Dr. Edwin F. Smith, Assistant Pathologist U. S. Dept. of Agriculture, Washington, D.C. Dr. Smith writes under date of July 8, that "the tufted shoots somewhat resemble rosette, but I do not like to pronounce it such. If it is a genuine rosette, the limbs bearing such growths will die this fall, or be dead next spring." In answer to further letters on the subject he writes on August 8, that "the samples sent are not affected with rosette." This is satisfactory as far as the disease known by that name is concerned, but the form so much resembling it at Olinda and Leamington appears to be as much to be dreaded. Not only do trees attacked, not recover, but a single specimen appears to act as a centre from which the malady spreads slowly throughout the orchard.

Remedial.—While true rosette has not been found in the northern peach-growing states it is to be hoped that we have not already a form equally injurious. In view of this possibility, peach growers should not hesitate to remove promptly trees that show symptoms of the presence of this obscure enemy. I am pleased to state that through the intelligent and energetic efforts of Mr. Bruner (fruit tree inspector) fruit growers in the neighbourhood of Olinda are amply warned regarding the gravity of the case and the necessity of instituting radical preventive measures. I regard this enemy as one of the most serious affecting the peach interests of the western peninsula of Ontario, and fruit growers are urged to apply the most heroic treatment possible when these rosette-like growths make their appearance. The mere removal of the affected branch is not sufficient; the tree must come out root and branch.

A SERIOUS GRAPE TROUBLE.

For a number of years—six or seven or more—grape growers between Hamilton and Niagara Falls have noticed here and there in their vineyards unthrifty and sickly looking vines. In some instances the trouble would be confined to a few vines occupying a small area. Again it would be more or less scattered throughout the vineyard. It was brought to my notice in the summer of 1896, by a letter, accompanied with grape foliage, forwarded by Mr. W. M. Hendershott, St. David's, Ont. Early in June of the same year, Mr. L. Woolverton, of Grimsby, forwarded a vine similarly affected, and on 26th June wrote as follows :—

GRIMSBY, 16th June, 1896.

DEAR MR. CRAIG,—I received your letter regarding the affected grape vine, and since that time have been examining the vine more particularly, root, branches and leaves, but have not yet been able to discover any cause for the peculiar disease. To-day Mr. L. Hagar called me in to see his vineyard, and I found that it was sadly affected with the same trouble. He has a large vineyard, and in it there appear to be at least two or three hundred vines that are dying, because of the disease. It appears to be spreading. Last year it began with a few vines of Moore's Early, which were destroyed by it, and this year it has extended as I have stated above. Evidently it is a very serious trouble, and requires immediate attention, or the whole vineyard will be destroyed. Strange to say, it is mostly the Concord which is affected with him, a variety which is seldom infested by Phylloxera. I have dug up a whole vine in Mr. Hagar's vineyard, and forwarded it to you by mail, so that you may have it carefully examined. Please do this and send me your reply as early as possible, in order that we may know what treatment to give our vines.

I am, sir,

Yours very truly,

L. WOOLVERTON.

APPEARANCE OF AFFECTED VINES.

Leaves.—The older leaves normal as to size, but lighter in colour than normal; leaves towards the ends of the canes only partially developed thin, yellow to light, yellow in colour.

Canes.—Short jointed; tendrils often abortive. The trouble manifests its presence by the appearance of yellow coloured areas upon the leaves; these extend until the entire leaf is involved. Growth is checked and becomes sluggish as the leaves turn yellow. When the vine is seriously affected, the older leaves drop off, the younger ones turn deep yellow, remain only partially developed. This with the short-jointed character of the wood renders such vines easily recognizable in the vineyard.

Roots.—The root system of affected vines is very imperfect. As the trouble progresses, the laterals lose vitality, decay and fall away, so that a badly affected vine has only the larger system of roots. The lower rootlets appear to die first, and vines were examined which had completely lost the roots originally thrown out from the base of the cutting. The vines most affected in Mr. Hagar's vineyard were those situated on the lower levels and were chiefly confined to Concord's and Moore's Early. This vineyard, in common with many others in that vicinity, is situated near the base of the ridge which bounds the peach belt along the shore of Lake Ontario

Mr. Hagar has lost over one hundred vines of Moore's Early and Concords from this cause Mr. Hendershott's vineyard at St. David's is similarly situated, and is flanked by the limestone ridge. As in the case of Mr. Hagar the vines on the lower portions are usually effected more than those on the higher levels. Roger's varieties, Moore's Early, and Concord suffer most, while Niagara seems to be fairly exempt. The malady makes its appearance soon after growth begins and reaches its height about the end of June or middle of July. In cases of mild attack it may disappear to a large extent as the season advances, notably more pronouncedly during dry seasons than in wet ones—though this may not be considered an invariable rule. Vines lightly affected frequently recover sufficiently to perfect their fruit. Those badly attacked lose their fruit after the leaves. Moore's Early succumbs more readily than other varieties and dwindles down to unhealthly sprouting crowns in two or three years.

Microscopic Examination.—Parts of the affected plants were submitted to Mr. J. Dearness, London, Ont., who kindly reports as follows under date of 6th July:—

"The cause of this disease of the grape is obscure to me. In petioles of discoloured leaves and peduncles of the fruit bunches, I find abundance of minute oval to round spore-like bodies requiring a high magnification to define, but no mycelium or other vegetable phase of an ordinary fungus. These may be bacterial, possibly produced in the disorganized tissue without being the cause of it. The small branches of the root have a diseased appearance, but although I have teased a number of scrapings, shreds and sections of these under the microscope, I fail to find fungus or eggs, sloughs, etc., of aphides or Phylloxera. The roots from the thickness of a pencil upwards seem all right. May there be some injurious cause affecting spongioles and absorption areas of the root tips? So far as I can form an opinion it inclines to locating the disease in the green tissues of the plant. In section after section through the petioles the cambium is destroyed, medullary rays more or less collapsed, in fact nothing left retaining form but cortex bundles and pith."

Specimens were also submitted to the chief of the Division of Vegetable Pathology, Washington, D.C., but nothing definite was learned regarding the cause. Mr. Galloway writes that "the specimens show no fungus attacks, such injuries might result from the plants being in dry soil or wet soil. Grapes affected with a root rot due to a fungus sometimes behave in the manner described by you."

Remedial Experiments.—Presuming that the trouble might be due to unfavourable soil conditions producing imperfect nutrition, some fertilizer experiments were planned and commenced last spring at St. David's and at Grimsby.

The following diagram shows the plan of the experiment, arranged at both places. The fertilizers used were kindly furnished free of cost by the German Kali Works of New York at the instance of Mr. B. VonHerff, to whom I am indebted for valued suggestions in this connection.

I visited both vineyards three times during the summer, noting carefully the health and conditions of the vines in each plot. Nothing definite was ascertained—the work will in all probability need to be continued for a number of years before safe conclusions may be formed.

The plot experiments aim to determine whether the presence or absence of lime plays any important part in producing the characteristic unhealthy condition of the vines. If carried out thoroughly a large amount of additional information will undoubtedly be gained incidentally. The question of where, when and how to use commercial fertilizers is one of great importance to the fruit growers of the Niagara district. It is believed that these experiments inaugurate a line of work that will prove of great value to those who follow up-to-date practices in feeding their vineyards.

The series of plots on the right duplicate those on the left, but in each case 100 pounds of lime has been given in addition.

FERTILIZER EXPERIMENTS, GRAPES, APRIL, 1897.

(W. M. Hendershott, St. David's, Ont.)

27 Vines in each Plot. Plots 30 x 90 feet.

N.

W. — E.

1	30 lbs. Acid Phosphate. 6 " Muriate of Potash.	Ditto. 100 lbs. Lime.	1*a*
2	6 lbs. Muriate of Potash. 10 " Nitrate of Soda.	Ditto. 100 lbs. Lime.	2*a*
3	No Fertilizer.	100 lbs. Lime.	3*a*
4	30 lbs. Acid Phosphate. 10 " Nitrate of Soda.	Ditto. 100 lbs. Lime.	4*a*
5	30 lbs. Acid Phosphate. 10 " Nitrate of Soda. 6 " Muriate of Potash.	Ditto. 100 lbs. Lime.	5*a*
6	30 lbs. Acid Phosphate. 10 " Nitrate of Soda. 12 " Muriate of Potash.	Ditto. 100 lbs. Lime.	6*a*
7	30 lbs. Acid Phosphate. 10 " Nitrate of Soda. 12 " Sulphate of Potash.	Ditto. 100 lbs. Lime.	7*a*
8	No Fertilizer.	100 lbs. Lime.	8*a*

S.

POTATO SCAB.

A large amount of experimental work has been devoted by station workers to the potato disease known as "scab." To Prof. Bolley, of North Dakota Experimental Station, is due the credit of discovering the nature of the malady, and a remedy—corrosive sublimate—which has proved eminently successful in fighting the disease. The dangerously poisonous character of the remedial agent gives it a decidedly undesirable feature. In searching for a germicide less harmful to the person handling it, Prof. Arthur, of the Indiana Experiment Station, reported last winter, through the columns of the agricultural press, and later by special bulletin, that formalin (formic aldehyde), a lately introduced and harmless antiseptic substance, had given him better results in combating potato scab than had corrosive sublimate.

While potato scab is not in potato culture in Eastern Canada a disease of the first importance, yet a considerable percentage of the potato crop is rendered unsaleable by this disease each year. Some experiments were therefore planned and carried out, having for their object the determination of the comparative value of various substances in preventing this disease. Two varieties of potatoes—Clark's No. 1 and Northern Spy—were selected for the trial. The potatoes were washed and found to be an average sample, with a fair proportion of scabby specimens. Each variety was divided into 18 lots of 5 pounds each, care being taken to make the samples as even as possible as to quality. Each sample was soaked for two hours in one of the germicidal solutions. In the case of sample H the potatoes, when cut, were rolled in the *flowers of sulphur*. They were all planted, May 21, on a clean piece of unmanured, sandy loam. They were given good cultivation and sprayed to prevent injury from potato bugs. Each lot occupied 50 feet in the row. The crop was harvested on September 29, the rotten potatoes being separated from the sound and weighed. In order to get an estimate of the percentage of scabby potatoes, an average peck of the produce of each sample planted was selected and the number of diseased specimens counted out. Full particulars are given in the subjoined tabular statement.

EXPERIMENTS TO PREVENT POTATO SCAB.

Potatoes planted 21st May; Harvested 29th September; 5 pounds of seed used in each case. Each row 50 feet long.

—	Weight of Sound Potatoes.		Weight of Rotten Potatoes.		Number of Scabby Potatoes in a Peck.	Number of Clean Potatoes in a Peck.
	Lbs.	Oz.	Lbs.	Oz.		
A { Clark's No. 1	69	..	3	8	3	85
A { Northern Spy	51	..	..	..	2	42
B { Clark's No. 1	60	..	3	8	17	75
B { Northern Spy	59	8	..	..	4	33
Check—						
Clark's No. 1	62	..	4	..	20	70
Northern Spy	66	..	..	..	......	48
C { Clark's No. 1	70	8	3	8	7	72
C { Northern Spy	71	..	..	..	3	49
D { Clark's No. 1	45	..	3	..	12	94
D { Northern Spy	66	8	..	..	1	42
Check—						
Clark's No. 1	50	..	8	..	43	33
Northern Spy	69	8	1	..	..	35

EXPERIMENTS TO PREVENT POTATO SCAB—*Concluded.*

—	Weight of Sound Potatoes. Lbs.	Oz.	Weight of Rotten Potatoes. Lbs.	Oz.	Number of Scabby Potatoes in a Peck.	Number of Clean Potatoes in a Peck.
E { Clark's No. 1	62	8	4	8	6	73
E { Northern Spy	51	8	..	..	5	67
G { Clark's No. 1	55	8	4	8	28	77
G { Northern Spy	50	..	..	8	7	66
Check— Clark's No. 1	59	8	4	8	40	63
Check— Northern Spy	65	..	..	8	....	41
H { Clark's No. 1	52	8	2	8	15	97
H { Northern Spy	47	8	..	..	2	66
F { Clark's No. 1	36	8	1	8	23	98
F { Northern Spy	52	..	..	..	....	82
M { Clark's No. 1	28	..	5	..	....	90
M { Northern Spy	38	8	..	..	....	88
Duplicate— L { Northern Spy	16	8	..	..	....	157
Duplicate— L { " planted 23rd June, 1897	19	..	..	..	....	140
I { Clark's No. 1	57	..	6	8	16	60
I { Northern Spy	48	8	..	..	7	62
J { Clark's No. 1	52	8	3	8	38	47
J { Northern Spy	60	..	..	..	14	56
Check— Clark's No. 1	43	8	4	8	74	3
Check— Northern Spy	47	8	..	..	17	53
K { Clark's No. 1	64	8	4	..	25	64
K { Northern Spy	73	..	..	..	7	67
L { Clark's No. 1	4	..	1	..	....	53
L { Northern Spy	22	..	..	..	....	85
Check— Clark's No. 1	50	8	5	8	33	54
Check— Northern Spy	64	..	..	..	6	70
Duplicate— M { Northern Spy	24	8	..	..	3	111
Duplicate— M { " planted 23rd June, 1897	29	8	..	..	....	99

GERMICIDES.

A Corrosive sublimate, ½ ounce to 4 gallons of water.
B Kainite 8 ounces " "
C Nitrate of soda 4 " " "
D " " 2 " " "
E Potassium sulphide 1 " " "
F " " 2 " " "
G Nitrate of soda 1⅓ " " "
H Flowers of sulphur (seed rolled).
I Formalin, 2 ounces to 4 gallons of water.
J " 1 " " "
K " ½ " " "
L Lysol, 3 per cent solution.
M " 1½ " "

DEDUCTIONS.

It will be seen that the variety Northern Spy was affected to a very small extent by either rot or scab, so that the weight of evidence is given by Clark's No. 1. It will here be noted that over 90 per cent of the yield of the check (untreated) plots of this variety were affected by scab.

In this experiment, as in that reported later in connection with treating bean seed, Lysol gave the most decisively satisfactory results. Corrosive sublimate ranks next, with a very small percentage of affected tubers. Formalin gave very unsatisfactory results as compared to lysol and corrosive sublimate. I cannot account for this variance with the results secured by Professor Arthur. It will be noted that there were duplicate plots of the lysol treated seed, and that the results are harmonious throughout. Nitrate of soda and kainit both gave better results than formalin.

ROSES INJURED BY ABUNDANT GROWTH OF MUCOR.

Rather an unusual occurrence is described in the following letter, which accompanied a package of rose foliage arriving on 3rd May last:—

"MONTREAL, May 3, 1897.

"DEAR SIR,—The inclosed leaves you will find are covered with black dots. Whether it is a fungus or scale insect I should like to know. The leaves are from rose bushes forced under glass in the usual way with florists in this country. The roses are in good condition as to health and vigour, and the fungus, or whatever it is, has appeared only within the last two weeks. About two weeks ago we mulched the rose beds with fresh cow manure obtained from a neighbouring farm. I think it is from this source it came, as it is only since then that it has appeared, and now the whole house is covered with it, even the glass and woodwork. Other plants in the same house are covered with it also. If you can inform me of any means whereby I can cure it and get the house cleaned, I will feel much obliged to you.

"Yours sincerely,

"GEORGE KERR,

"*Gardener to C. Campbell.*"

I took occasion to visit the houses in question, and found the condition of the plants substantially as described by Mr. Kerr. The fresh cow manure laid over the bushes to the depth of three to four inches had furnished the right conditions for the rapid growth of *mucor*, a low form of saprophytic fungus. The small black spherical bodies, like little pellets, covering the rose leaves, mostly on the under sides, were the sporangia of the organism. These had been adjuncted with such force as to carry them a distance of four and a half feet from the breeding beds and lodge them on leaves, glass, woodwork or whatever they might strike. The propelling power seemed remarkable. This organism, while not parasitic in character, rendered the flowers and plants unsaleable and caused considerable loss. The fermentive action was promptly arrested by covering the beds with a light coating of air slaked lime—land plaster would probably serve equally well. Under ordinary circumstances the sporangia will begin to be ejected about ten days after the application of the manure to the beds.

CELERY LEAF SPOT *(Cercospora apii)*.

The prevalence of celery leaf spot or rust as it is called by gardeners was the source of much loss this year to the truck growers in the vicinity of large cities,

"OUTREMONT, August 3.

"DEAR SIR,—Inclosed please find a few celery leaves that I picked from my celery patch. They become rusted and fall off, which prevents, to a large extent, the head from forming. Kindly inform me the cause, and give a remedy to prevent it, as it is a great loss to me. The soil is a light loam with very little sand and underlaid with gravel. This is the second year that celery has been grown on the same ground. An early reply will greatly oblige.

"Very respecfully,

"MAURICE RODLEY."

This disease caused considerable damage to the trial plots of celery grown on gravelly soil on the Experimental Farm and fertilized with spent hot-bed manure. Where this manure was not used the disease was much less injurious. It was kept in check with fair success by using Bordeaux mixture. When the plants are badly attacked all affected leaves should be removed by hand before applying the fungicide. The old trench system with its coating of barn-yard manure on bottom is to be discouraged.

A FUNGOUS PARASITE OF SAN JOSE SCALE.

Prof. Rolfs, Botanist to the Florida Experiment Station, reported last summer the discovery of a fungous parasite (*Sphærophila coccophila*) attacking a native scale (*Aspidiotus obscurus*) of Florida. He was also successful in transplanting the parasite to colonies of San José scale (*A. perniciosus*) Coms., in neighbouring orchards where it flourished even to the extinction of its pernicious host. This was a most important discovery, notices of the work of Prof. Rolfs appeared contemporaneously with the discovery of the San José scale in some of the orchards of southern Ontario. I immediately secured, through the kindness of Prof. Rolfs, a quantity of parasitized scales in the hope of establishing this friend of the fruit grower in infested Canadian orchards. Cultures of the fungus were made by Dr. W. T. Connell of Queen's University, Kingston. These were taken to St. Catharines, Ontario and applied to several trees of Abundance plum, badly infested by San José scale. One treated tree was inclosed in a covering, or tent of cheese cloth and examined from time to time. At the close of the season, the presence of the parasite could not be detected by the aid of a hand lense upon the treated trees under cover or unprotected and a laboratory examination made by Dr. Connell later in the season failed to discover any trace of growth or development of the fungus. . It is possible that had the climatic conditions been different the trial might have been successful. As regards moisture the conditions were favourable, but the temperature was rather below the normal for a few days succeeding the application of the cultures. I believe, however, the trial on the whole was a fair one, and failing to succeed, this parasite cannot be looked upon as a practical preventive of San José scale in the climate of southern Ontario.

The following letters from Dr. Connell show the good work done by him in this connection.

"KINGSTON, 6th August.

"DEAR SIR,—I inoculated the plum wood affected with the San José scale, with the scale fungus *Sphærophila coccophila* on Friday last, 30th July. I have examined it from time to time since, and find that the fungus is growing well, invading the bark, and in many cases attacks and grows into the bodies of the scale insect themselves. Whether it grows into the insect during life, I cannot yet say, but it appears highly probable that such is the case.

"My method of inoculation was to brush over portions of the wood (bark) a watery dilution of the fungus grown on bread. I find that when wood is kept dry, that growth is very slight ; while when more moist, growth occurs freely in bark.

"Yours very truly,

"W. T. CONNELL.

"KINGSTON, 23rd August.

"DEAR SIR,—I have carefully examined the specimens of plum wood sent by you a few days since. I have not been able to detect any of the scale fungus (*Sphærophila coccophila*) upon the wood.

"With regard to the plum wood, inoculated by myself the early part of this month, with the Fungus, I (as I reported) obtained a good growth. The Fungus simply penetrates the surface layers and remains quite superficial. It has attacked most of the insects, but occasionally one is noted not attacked. Growth ceases when the wood is dried.

"Yours very truly,

"W. T. CONNELL."

BEAN ANTHRACNOSE.

(*Colletotrichium Lindemuthianum*, Sacc.)

This serious disease affecting bush beans was treated of in the annual report for 1892, and again in 1894. It was again very prevalent the past season. In previous reports soaking the seed in copper sulphate 1 oz. to 2 gals. of water, and spraying the plants subsequently with Bordeaux mixture was recommended. In the following table the results obtained from soaking the seed of Early Mohawk in various substances—most of them germicidal in character—are submitted. It will be seen that Lysol in the proportion of 1½ pound to 100 pounds of water gave exceedingly satisfactory results; four per cent only, of the pods being spotted when this substance was used. Formalin was also exceedingly satisfactory, standing second in order of efficacy. There is little to choose between the three solutions of this substance used. Potassium sulphide, a well-known germicide, stands third in order of efficacy. Nitrate of soda, corrosive sublimate and kainit follow in the order named. The two latter do not show marked germicidal qualities. If further trials with this substance should corroborate these results, Lysol should then supersede copper sulphate as a preventive of bean anthracnose, as the results obtained here are much more satisfactory than those obtained in the former experiments with copper sulphate.

VEGETABLES.

SOAKING SEED IN VARIOUS SUBSTANCES TO PREVENT BEAN ANTHRACNOSE.

Seed sown May 22. 2 oz. seed to 20 feet of row.

Variety.	Seed soaked 2 hours. — Substances used.	Weight of 500 Pods.		Number Pods Spotted in 500.	Number Pods Clean in 500.	Weight of Beans when Thrashed out.		Percentage of Pods Diseased.
		Lbs.	Oz.			Lbs.	Oz.	
Mohawk....	Corrosive sublimate: ½ oz. to 4 galls......	9	0	82	418	5	9	19
"	Kainit: ½ lb. to 4 galls. water...	10	0	134	366	5	6	36
" ..	Nitrate of soda: 1 oz. to 1 gall. water	8	0	68	432	5	2	15
"	Nitrate of soda: 1 oz. to 2 galls. water....	10	0	71	429	4	10	16
"	Potassium sulphide: ½ oz. to 2 galls. water	10	0	41	459	5	2	9
"	Nitrate of soda: 1 oz. to 3 galls. water......	9	0	58	442	4	12	13
"	Formalin: 1 oz. to 2 galls. water	8	0	46	454	4	3	10
"	" ¾ " ..	10	0	38	462	4	12	8
"	" ½ " ..	11	0	40	460	5	8	9
"	Lysol: 3 per cent solution......	Failed	to	germinate.				
"	" 1½ " ...	9	0	20	480	4	14	4
" ...	*Check untreated..........	....		....	....	....		57

* From Report of 1892.

BEANS—VARIETY TESTS.

The varietal test of bush beans detailed in the accompanying table includes 48 kinds. Thirty feet of row of each variety was sown either on May 17 or May 18. Very few varieties were exempt from anthracnose.

EARLY VARIETIES.	LATE VARIETIES.	MEDIUM EARLY.
Challenge Wax.	Boston Favourite.	Detroit Wax.
Black-eyed Wax.	Emperor William.	Early Refugee.
White Advancer.	White Marrow.	Golden Refugee.
Wardwell's Dwarf Kidney.	Refugee or 1,000 to 1.	Ne Plus Ultra.

EXPERIMENTS WITH BEANS ALL SOWN 17TH AND 18TH MAY—TABLE I.

Bush Beans.	Ready for Table.	Total Weight of Green Pods.		Length of Row.	Remarks.
Variety.		Lbs.	Oz.	Feet.	
Algerian Black Wax	July 16..	17	0	30	Foliage and pods slightly rusted; pods round yellow; a fair to good grower.
Black Eyed Wax.................	" 10..	16	0	26	Foliage and pods slightly rusted; a dwarf grower.
Best of all Bush.................	" 26..	18	12	30	Foliage slightly rusted; pods clean; long green; slightly flattened; good.
Boston Favourite Large Goddard.	" 23..	23	5	30	Foliage and pods slightly rusted; robust grower; inclined to run; pods green; smooth.
Bismarck Black Wax............	" 16..	10	13	30	Foliage and pods considerably rusted; pods yellow; nearly round; of fair length.
Burpee's New Stringless Green Pod	" 14..	5	13	10	Foliage slightly rusted; pods slightly rusted; pods green; nearly round.
Challenge Wax..................	" 9..	18	8	30	Foliage considerably rusted; pods slightly; pods yellow; nearly round.
Canadian Wonder, French... ...	Aug. 6..	17	6	25	Foliage and pods considerably rusted; pods long; green.
Detroit Wax	July 14..	19	8	30	Foliage slightly rusted; pods flat; yellow; a fairly good bean.
Date Wax.......................	" 16..	13	2	30	Foliage considerably rusted; pods slightly; dwarf grower.
Dwarf Lyonnaise....	Aug. 6..	17	9	26	Foliage and pods slightly rusted; pods long; green; inclined to curl.
Dwarf White Wax................	July 18..	13	7	26	Foliage very slightly rusted; pod yellow; flat; medium size.
Dwarf Mexican Tree.............	Aug. 24..	18	8	30	Healthy; pods short green.
Dwarf Blue Podded Butter........	July 16..	8	6	15	Foliage slightly rusted; a long, blue flat pod.
Early China......................	" 14..	15	9	30	Foliage considerably rusted; pods slightly; pods green.
Emperor William........... ...	" 17..	19	4	30	Foliage badly rusted, pods slightly; foliage rough; pods rough and unshapely.
Early Mohawk..................	" 14..	18	4	30	Foliage slightly rusted; pods clean.
Extra Early Maine Bush.........	" 16..	24	5	30	Foliage very slightly rusted; pods clean, long and smooth; a good grower; an excellent bean.
Extra Early Refugee............	" 16..	19	4	30	Foliage and pods very slightly rusted; pods green; nearly round.
Early Long Yellow Six Weeks....	" 16..	12	7	30	Foliage considerably rusted; pods slightly; pods green, long and flat.
Extra Early Valentine...........	" 16..	21	1	30	Foliage very slightly rusted; pods healthy; green; of good size.
Emperor William................	" 23..	13	2	25	Foliage considerably rusted; pods slightly; pods green; flat.
Extra Early Refugee........... .	" 16..	27	6	30	Healthy; free grower; yellow pod; roundish.

EXPERIMENTS WITH BEANS, &c.—TABLE I.—*Concluded.*

Bush Beans.	Ready for Table.	Total Weight of Green Pods.		Length of Row.	Remarks.
		Lbs.	Oz.	Feet.	
Extra Early Market	Aug. 6	6	2	10	Foliage and pods very slightly rusted; pods long; green; nearly round.
Golden Eyed Wax	July 16	23	14	30	Healthy; good grower; clean foliage; pods yellow; smooth; long; flat.
Golden Refugee	Aug. 8	27	14	30	Healthy; pods yellow; medium size; nearly round.
Improved Prolific Black Wax	July 16	15	7	30	Foliage very slightly rusted; pods yellow; slightly rusted.
Improved Golden Wax Bush	" 14	23	3	30	Foliage and pods slightly rusted; pod yellow; flat.
Longsword, French	" 12	23	8	30	Foliage slightly rusted; pods green and smooth, 5 to 7 inches long.
Large White Kidney or Royal Dwarf	" 31	21	5	30	Foliage and pods very slightly rusted; pods medium length; flat; green.
Low's Companion	" 25	21	13	30	Foliage slightly rusted; pods long; green; flat.
Marvele of Paris	" 16	29	11	30	Healthy; pods green; long; smooth; a good variety.
Marblehead Dwarf Horticultural (Lima)	" 10	12	4	30	Foliage and pods considerably rusted; a poor variety here.
Nettle Leaved Bagnolet	" 12	15	7	30	Foliage badly rusted, pods slightly; pods green; flat.
Ne Plus Ultra	" 16	18	2	30	Foliage and pods slightly rusted; pods long; green; flat.
Pride of Newtown	" 14	23	1	30	Foliage and pods slightly rusted; pod green; long; flat; a good variety.
Round Yellow Six Weeks	" 16	11	1	30	Foliage slightly rusted; dwarf grower; fair length of pod.
Refugee or 1,000 to 1	Aug. 6	33	8	30	Foliage healthy; pods slightly rusted; robust grower, with whitish pods; a good late variety.
Refugee Wax	July 14	20	6	30	Foliage and pods slightly rusted; yellow round pod; a fair variety.
Red Flageolet Wax	" 16	12	1	25	Foliage slightly rusted; pods yellow; flat; smooth and good.
Rust Proof Golden Wax	" 14	15	5	30	Foliage and pods considerably rusted; pods long; yellow; flat.
Triumph of the Frames	" 14	8	1	22	Foliage slightly rusted; pods clean at first; rusted late in the season; dwarf grower; a fair bean.
The Black Shah	Aug. 6	12	5	15	Foliage and pods slightly rusted; pods long, green, flat and narrow.
White Advancer, French	July 12	16	13	30	Foliage slightly rusted; pods clean; later:—Foliage considerably rusted; pods slight; pod green; 4 to 6 inches long.
White Marrow	" 20	26	5	30	Foliage and pods slightly rusted; a strong grower; inclined to run; pod; flat; green.
White Valentine	" 16	26	4	30	Foliage very slightly rusted; pods green; a strong grower.
Wardwell's Dwarf Kidney Wax	" 12	19	4	28	Foliage and pods very slightly rusted; pods yellow, long, flat and smooth; a good bean.
Yosemite Mammoth Wax	" 16	17	3	28	Pods badly rusted late in season; pods yellow; large; near round; has a tendency to curl.

POLE BEANS.

The following 19 varieties were sown at the same time as the bush beans. The season proved too short to allow of the maturation of the latest kinds. Leaving out the scarlet runner type, the yields do not approximate with those secured from the "bush" section :—

BEST VARIETIES.

Early Varieties.	Late Varieties.
Southern Crease.	Black Algerian Wax.
Holborn Masterpiece.	Dutch Case Knife.
Golden Champion.	Speckled Cranberry.
Flageolet Wax.	Speckled or Cut Short.

Experiments with Beans all sown 18th May.—Table II.—Pole Beans.

Pole Beans.	Ready for Table.		Total Weight of Green Pods.		Length of Row.	Remarks.
Variety.			Lbs.	Oz.	Feet.	
Black Algerian Wax...	Aug.	16	15	12	30	Foliage very slightly rusted; pods medium size yellow, flat.
Dutch Case Knife.....	"	18	21	0	30	Foliage and pods slightly rusted; pods very long, flat and green.
French Asparagus.....	"	30	1	12	30	Foliage and pods slightly rusted; pod green, round, from 6 to 8 inches long.
Flageolet Wax.........	"	6	9	14	30	Foliage and pods considerably rusted; pods yellow, long, narrow and flat.
French Yard Long....	....		....		25	Late; no pods when frost came, Sept. 26.
Golden Andalusia.....	Aug.	16	17	7	30	Foliage and pods slightly rusted: pod yellow of medium size, flat.
German Wax..........	"	16	16	12	15	Foliage and pods very slightly rusted; pods yellow, from 4 to 6 inches long, flat.
Golden Champion.. ...	July	31	8	4	15	Foliage and pods slightly rusted; a yellow round pod.
Holborn Masterpeice...	"	31	11	11	30	Foliage badly rusted, pods clean: pods slightly rusted, from 6 to 10 inches long, green.
Horticultural Speckled Cranberry	Aug.	18	34	6	30	Healthy; pods about 4 inches long, green, flat.
Jubilee Runner........	....		....		30	Foliage slightly rusted; only 4 pods on row at date of first frost; pod green, 8 to 10 inches long.
Kentucky Wonder.....	Aug.	6	15	5	30	Foliage and pods considerably rusted; pods green, narrow to round, medium length; a poor variety.
Mont d'Or.............	July	25	17	0	30	Foliage slightly and pods badly rusted; pods long, yellow and flat.
Southern Prolific... ...	Aug.	14	50	12	30	Healthy; pods green, long, flat and narrow.
Scarlet Runner.......	"	14	49	1	30	Healthy; large flat green pod.
Speckled, or Cut Short.	"	18	23	14	30	Healthy; pods green about 3 inches long, flat.
Southern Crease, black.	July	21	8	3	30	Foliage and pods badly rusted; a short green pod.
White Algerian Wax..	Aug.	8	17	10	30	Foliage and pods slightly rusted; a yellow medium size pod.
White Dutch Running.	"	14	39	1	30	Healthy; pods about 8 inches long, green and flat.

LIMA AND BROAD WINDSOR BEANS.

Of the 11 varieties of Limas tested only one of them produced a paying crop. This failure was principally due to their lateness. There seemed to be insufficient summer heat to bring them to maturity. A notable exception is that of Thorburn's *Horticultural Lima.* The same variety from other seedsmen did not do as well. The yield of this variety approximated the best of the "pole" or "bush" varieties.

Of the Broad Windsor type the best podding variety was *Leviathan.*

EXPERIMENTS with LIMA BEANS all sown 17th and 18th May—TABLE III.

Beans Lima.	Ready for Table.	Total Weight of Green Pods.		Length of Row.	Remarks.
Variety.		Lbs.	Oz.	Feet.	
Burpee's Bush Lima				26	Foliage slightly rusted, late.
do				30	Healthy.
Challenger Lima	Aug. 28	8	4	18	Foliage and pods slightly rusted.
Dreer Lima					Healthy; only 4 plants germinated.
Dreer Bush Lima					Healthy; too late.
Dwarf Lima, Kumerle Strain	Aug. 24	6	6	26	Healthy; pods green, short and flat.
King of the Garden Lima	Sept. 15	0	2	10	Healthy; too late.
Henderson's Bush Lima or Dwarf Sieva	Aug. 21	2	8	30	Foliage slightly rusted, pods short, green and flat.
Horticultural Lima	July 20	35	1	30	Healthy; strong grower, with a large, broad, green pod.
do	" 25	10	6	15	Foliage very slightly rusted, pods flat, of medium size.
Large White Lima	Aug. 28	1	5	17	Healthy; late.
New Dwarf Lima, Jackson's Wonder	" 21	5	14	15	Healthy; pods green, flat.
Broad Windsor	" 6	7	8	30	Slightly rusted.
Early Mazagan	" 28	4	0	30	Foliage and pods slightly rusted.
Green Nonpareil	" 24	3	3	30	Foliage and pods considerably rusted.
Harlington Green Windsor	" 6	3	10	30	Healthy.
Leviathan	" 18	15	12	30	Healthy.
Sword Long-pod	" 6	4	14	30	Foliage slightly rusted, August 22, 1894. Foliage and pods considerably rusted.
Small Horse Bean	" 20	0	6	30	Slightly rusted, a tall grower, pods small.

SOAKING SEED PEASE AND BEANS IN DISSOLVED CHEMICAL FERTILIZERS.

Some experiments were tried last year in soaking the seed of pease and beans in nitrate of soda in solution with the object of ascertaining the effect upon germination and yield.

Nitrate of soda was used in three strengths—one, two and three ounces to the gallon of water. The seed was soaked for one hour then planted, one hundred seeds occupying a space of thirty feet in the row.

RESULTS.

Pease.—The percentage of germination did not vary to a marked extent, but there was a regular increase of yield of each variety with the strength of the fertilizer used :—Heroine excepted, the yield of this remained practically the same in each case.

Beans.—The results here were so variable as to preclude safe generalization.

CELERY.

A VARIETAL TEST.

The following table gives particulars of information gained in growing thirty varieties of celery including five of celeriac. It was arranged that 24 plants should compose the number of each variety tested. In a few instances owing to bad seed or accident it was impossible to obtain the requisite number. The plants were grown under the trench system in single rows. Rust and spot caused serious damage in early summer (see note on leaf spot). This attack I attributed largely to the effect of spent hot-bed manure used in the bottom of the trenches. Market gardeners do not now follow the trenching system, but plant on the level and hill up. The plants should be "handled" twice before the final earthing up takes place. This means that the leaves should be drawn together by hand and sufficient soil packed about the base of the plants as will hold them compactly in an upright position. When the plants are "hilled" or "earthed" care should be taken to prevent the soil from sifting in between the leaves. If this occurs, it destroys the quality of the "heart" and causes rusting.

Among the best early varieties are the following :—*Golden Self Blanching, Paris Golden Yellow and Golden Dwarf.*

Medium Early :—*Improved White Plume, White Walnut, Pascal, Boston Market.*
Late :—*London Red, Covent Garden, Golden Heart, Schumacker, Fin de siecle.*

Celery I.

These were all sown on 9th April, transplanted on 19th May and planted out 26th June.

Celery grown in Trenches.	Seedsman.	Number Planted.	Weight when Lifted.		Condition when Taken up 30th October.
Variety.			Lbs.	Oz.	
Giant Pascal	Thorburn	24	30	0	Green ; solid ; slight amount of rot ; slightly rusted.
Covent Garden Rose	"	24	33	8	Solid ; not blanched ; slightly rusted.
Large Ribbed Kalamazoo	"	24	29	0	Small heads ; firm ; not well blanched.
Large Red Self Blanching	"	24	30	12	Dwarf ; thick ; solid ; clean ; not well blanched
Pink Plume	"	24	44	12	Solid ; clean heads ; not well blanched ; tall.
Schumacker	"	24	51	12	Short and stout ; quite green ; clear of rust.
Cooper's Half Dwarf	"	24	44	4	Green ; medium height ; slightly rusted.
Giant White	Henderson	24	53	0	Tall ; green ; slightly blanched ; suckers freely.
Cooper's Improved Cutting	Thorburn	24	70	4	Suckers freely ; green and slightly rusted.
Golden Rose	Henderson	24	37	0	Thick ; dwarf ; solid ; not well blanched.
Rose Ribbed Paris	Breck	24	31	12	Same as the last.
Improved White Plume	Thorburn	21	30	12	Not well blanched ; slightly rusted.
London Red	Henderson	21	34	12	Small ; not blanched ; late.
Dwarf White	"	23	29	8	Dwarf ; not well blanched.
Triumph	Ewing	23	38	0	Short ; solid ; not well blanched.
Fin De Siecle	Thorburn	24	44	12	Very green ; none fit for table.
Paris Golden Yellow	Ewing	24	32	12	Short ; not well blanched ; slightly rusted.
Sandringham Dwarf White	Thorburn	24	47	9	Medium ; dwarf ; very green ; solid heads.
Carter's Dwarf Crimson	Farquhar	24	32	2	Dwarf ; not well blanched ; slightly rusted.
Golden Self Blanching	Thorburn	24	51	8	Fairly blanched ; solid ; very good.
" (No Manure.)	"	24	24	0	Stout ; green ; slightly rusted ; not fit for table.
White Walnut	"	24	48	3	Medium size ; green ; slightly rusted.
Perfection Heartwell	"	24	28	3	Medium size ; slender ; fairly solid ; green ; slightly rusted.
Boston Market	"	11	19	11	Very stout ; solid ; not all blanched ; tendency to sucker.
Half Dwarf	Henderson	3	10	0	Short ; thick ; green ; solid ; slightly rusted.
Golden Dwarf	"	2	4	9	Medium height ; blanched ; clean ; solid ; good for market.
Parson's Russian Princess	Simmers	24	26	9	Uniform, but not well blanched ; slightly rusted.
Golden Heart	Ewing	18	60	12	Medium height ; very green ; clean ; suckers freely.
Celeriac, Thorb. Giant	Thorburn	22	30	0	Large roots ; clear of rust.
Celeriac New Apple	"	23	22	0	Good size ; not quite so large as the last.
Celeriac Turnip-Rooted	"	24	31	12	Fair size ; roots and foliage clean.

The following varieties were tested in 1896. They are chiefly from English and French seedsmen:—

Carter's Solid Ivory.—Short and stocky; considerably rusted; well blanched; rather bitter; flavour not as good as Standard Bearer.

Carter's Incomparable Crimson.—Tall; late; red; free from rust; blanches moderately well; crisp and of good quality.

De Candolle.—White; medium grower, but late; fairly solid; very nutty and good flavour.

Evan's New Triumph.—Dwarf variety; free from rust; stalks stout; lacks crispness and flavour.

New Perle Le Grand.—Tall; strong; white: rather coarse; watery; somewhat lacking in flavour.

Perle Le Grand.—About the same as New Perle Le Grand, but rather smaller stalks; quality, medium to poor.

Rennie's Giant White.—Medium grower; rather uneven; fair sized stalks; quality fair, solid, but not high flavoured.

Standard Bearer.—Red, large, coarse stalks; fairly well blanched; brittle, very tender; good quality; late.

Vaughan's Giant Golden Dwarf.—Large; not self-blanching; fair size, but of poor quality.

White Triumph.—Medium grower; fair sized stalks; some rust; firm, brittle, good quality, nutty.

Growing Celery in "Spent" Hot-beds *vs.* Cold Frames.

After growing the annual supply of cabbage, cauliflowers and tomato plants, the farmer's hot-bed usually stands idle till the next season comes round. It is true that its phases of usefulness during this period are not numerous but there is at least one purpose which it will serve with great satisfaction to the housewife, viz.: the growing of a supply of celery for winter use. This may be done without removing the manure, by adding an inch or two of soil to the surface—setting the plants 7 x 7 inches apart and watering frequently during the fore part of the season. Of course the bed of manure beneath the covering of soil facilitates drainage so much that the plants require close watching at first in order to prevent injury from drying out. If the manure is thoroughly soaked before the plants are set less difficulty will be experienced. I have found that cold frames give better results in growing celery on the bed plan than do hot-beds.

The following table gives the results of tests of growing celery in cold frame and in hot-bed, both beds being sub-irrigated. The beds were 6 feet wide and 24 feet long. Two lines of three-inch tile were laid three feet apart the full length of the bed and 9 inches below the surface. An upturned tile at each end gave opportunity for introducing water which was done once and sometimes twice each week. In growing celery after this intensive method the labour of cultivating and earthing is largely obviated; but it must be remembered that the drain upon the moisture and fertility of the soil is very great and must be adequately met if healthy and vigorous plants are to be secured.

It will be seen by the yields set forth in the subjoined table that the gross weight of 16 plants grown in the "cold frame"—that is a frame in which no manure had been used to give bottom heat—was greater in almost every instance than 18 plants of the same variety grown in the hot-bed. With regard to quality there was little to choose. This result is probably due to the fact that the conditions of moisture in the cold frame were more uniform throughout the season than those obtaining in the hot-bed. The results are very marked, the average weight per stalk of the "hot-bed" grown plants being 11 ounces each, while that of "cold frame" plants was over a pound each.

CELERY II.

SUB-IRRIGATION EXPERIMENTS.

Seed sown, April 9 ; pricked out, May 19; planted, June 30; distance apart, 7 x 7 inches; sub-irrigated as needed.

Variety.	Sub-Irrigated in Hot-bed. Number of Plants.	Weight when taken up. Lbs.	Oz.	Remarks.	Sub-Irrigated in Cold Frame. Number of Plants.	Weight when taken up. Lbs.	Oz.	Remarks.
Crawford's Half Dwarf..	18	16	14	Unblanched; fair sized heads; slightly rusted....	16	17	13	Unblanched; slightly rusted
Cooper's Imp. Cutting...	18	10	11	Unblanched; slightly rusted	16	16	13	" pithy "
Turnip-rooted Celeriac...	18	16	9	Roots medium size firm.....	16	12	12	Good size; tall; rusted.
Covent Garden Rose	18	14	14	Unblanched; large; rusted.	16	16	12	" " "
Giant Celeriac (Thorb.)..	18	8	12	Med. height; roots small...	16	13	4	Med. size; " healthy.
New Apple Celeriac.....	18	5	4	Heads small; rusted.......	16	8	12	Small; pithy; rusted.
Dwarf Crimson (Carter).	18	14	14	Unblanched; solid; slightly rusted..................	16	18	12	Unblanched "
" White..........	18	9	12	Unblanched; solid; slightly rusted..................	16	13	12	Med. sized; blanched; rusted
Fin de Siecle........ ...	18	14	12	Fairly blanched; healthy..	16	21	8	Well blanched; healthy.
Giant Pascal	18	15	12	" " " ...	16	23	12	Unblanched; crisp; rusted.
Golden Rose...........	18	6	4	Small; rusted.............	16	8	4	Small; farly blanched "
Giant White...........	18	17	12	Unblanched rusted				
Triumph	18	12	4	" "	16	16	12	Dwarf; late; crisp; slightly rusted.
Rose Ribbed Self Blanching..................	18	8	12	Med. size; blanched; rusted	16	10	12	Small; blanched; slightly rusted.
London Red....	18	14	12	Unblanched; rusted......	16	15	4	Unblanched; spindling; rusted.
Paris Golden Yellow....	18	8	10	Small heads; blanched.....	16	12	12	Small; blanched; slightly rusted.
Imp. White Plume......	18	11	4	Slender stalks; rusted......	16	19	0	Fair sized heads; blanched; slightly rusted.
Golden Self Blanching...	18	10	0	Small " blanched...	16	16	12	Blanched; solid; slightly rusted.
Sandringham..........	....	....		....	16	25	0	Unblanched; crisp; firm; slightly rusted.
Total weights.....	324	217	12	Av'ge weight of stalks, 11 oz.	288	298	6	Av'ge weight of stalks, 16½ oz.

CUCUMBERS.

The number of varieties of this vegetable now offered to the public by seedsmen, is much greater than is generally supposed. In the accompanying table the behaviour of 24 kinds, including pickling sorts, all grown under the same circumstances, is described. Important points in connection with the cultivation of the cucumber are health of vine, earliness, desirable form and productiveness. By comparing the number of fruits produced, with the yield in pounds, an idea of the individual size of the cucumber (fruit) may be obtained, e.g., Cool and Crisp produced 204 fruits weighing 229½ pounds; in other words the average weight of each cucumber would be something over a pound, while Extra Early Seedling produced 79 fruits weighing only 35 pounds, giving less than half a pound to each cucumber. It should be stated that the seed was sown in pots in a hot-bed and the plants turned out of these when removed to the field.

VARIETIES RECOMMENDED.

EARLY.—Extra Early Seedling, Evergreen, Early Russian, Nichol's Medium Green.

MEDIUM EARLY.—Giant Pera, Peerless, White Spine, Long Green.

LATE.—Jap. Climbing, Cool and Crisp.

PICKLING.—Commercial, Boston.

CUCUMBERS—Test of Varieties.

These were all sown on 21st April and planted out 11th June, three hills being planted of each variety.

Name of Variety.	Seedsman.	Ready for use.	Number of Fruits Produced.	Yield in lbs.	Remarks.
Cool and Crisp..... ...	Simmers..	July 20	204	229·8	Medium grower; fruit medium size; green; few spines; prolific; late.
Evergreen..............	Thorburn.	" 10	125	103·4	Vine fairly healthy; fruit large, green, moderately smooth.
Extra Early Seedling....	" ..	" 4	79	34·13	Very much like Nichol's Medium Green.
Early Short Green.......	" ..	" 14	41	28·6	Practically the same as Early Russian, with fewer spines.
Early Russian	" ..	" 12	76	28·12	Very weak grower; cucumbers small, oval or oblong.
Early White Spine	" ..	" 18	75	65·12	Same as Peerless.
Extra Long White Spine	" ..	" 18	77	82·2	Later and larger than the type.
Giant Pera (New).......	Steele....	" 16	29	34·7	Weak grower; troubled with mildew.
"	Thorburn.	" 16	48	66·0	More prolific than last; larger.
Improved White Spine..	" ..	" 16	86	59·11	Medium grower; fair size.
Japanese Climbing......	Dreer....	" 21	69	65·0	Fair grower; medium size; bronzy-green colour; spineless.
Long Green Turkey.....	Thorburn.	" 17	61	68·12	Fair grower; large; oval; orange; smooth.
Long Green............	" ..	" 18	136	110·12	More productive than White Spine; larger and longer.
Nichol's Medium Green..	" ..	" 12	113	84·12	Moderate grower; fairly early; medium size; smooth; oblong.
Peerless................	" ..	" 18	69	64·12	Fair grower; very prolific; medium to large; green, spined.
Tilby's Hybrid	" ..	" 16	51	60·9	Good grower; an early variety.
White Pearl............	" ..	" 18	62	46·11	Fair grower; white; medium size; oval or oblong; spines very small.
Boston Pickling	" ..	" 4	....	34·2	A standard variety.
Commercial Pickling....	" ..	" 6	....	67·13	Strong grower; fair bearer; late.
Everbearing	" ..	" 8	....	7·2	Very weak growth; unproductive.
Green Prolific Pickling.	" ..	" 8	....	18·4	Vine weak, subject to mildew.
Milwaukee Pickling	Currie...	" 4	....	20·14	Fair grower; small size.
Siberian	Simmers..	" 4	....	20·4	Weak grower; no fruit.
Golden	....	....	....	....	Small; uniform in size; rather a poor bearer.

EXPERIMENTS WITH ONIONS.

In growing onions this season, the percentage of "thick necks" was remarkably large. This characterized the crop from transplanted as well as untransplanted plots. The soil was well drained, sandy loam, top-dressed in the spring with rotted barn-yard manure. The following table gives the yield of 23 varieties. The yields of good onions are phenomenally small, and that of "thick necks" astonishingly heavy. This term "thick necks" is a market gardeners' name applied to onions that form an unmerchantable product with thick fleshy necks and small bulbs. I know of no satisfactory explanation of this peculiarity of the onion to revert to original types, unless it be faulty seed selection. Strasburg (yellow) was one of the best. Paris Silver Skin, Large Portugal, and Early Red Globe were a few of those most satisfactory.

ONIONS.—Test of Varieties.—All sown in rows 20 feet long.

Varieties.	Seedsman.	Date of Sowing Seed.	Yield of Good Onions.		Yield of Thicknecks.		Remarks.
			Lbs.	Oz.	Lbs.	Oz.	
White.							
Early Barletta	Thorburn.	May 13	2	8	1	8	Rough and very poor.
Paris Silver Skin	"	" 13	7	8	6	8	Large, flat, coarse.
Victoria, Italian	"	" 13	..	..	34	..	All thicknecks.
Large Portugal	"	" 13	10	..	10	..	Large, flat, solid.
" Globe	"	" 13	6	8	16	..	Large, smooth.
Bermuda	"	" 13	1	8	1	8	Flat, medium to small, rough; germinated poorly.
The Queen	Ewing	" 13	1	8	13	8	Flat, rough; not a good onion in the row.
Oxonian Prize	"	" 13	..	..	17	..	All thicknecks.
English Pickling	Thorburn.	" 15	6	..	14	8	Grew too large for pickling.
Excelsior "	"	" 15	2	8	13	..	" "
Welsh	"	" 15	..	..	18	8	Of the leek type.
Red.							
Creole	"	" 13	2	8	1	8	Bad seed.
Early Globe	"	" 13	7	8	14	8	A standard.
Globe Maderia	"	" 13	3	8	28	8	
Giant Rocca red	"	" 13	..	..	20	8	Resembled leeks.
Flat Maderia	"	" 13	4	..	18	..	Rough, pink and white, poor.
Large Globe	"	" 13	1	8	10	8	Large round dark red, uniform in size, quite solid.
Yellow.							
Globe Danvers	"	" 15	3	8	9	8	Very small, round, rather irregular.
Globe	"	" 15	..	..	18	..	
Danvers	"	" 15	6	..	11	..	
Strasburg	"	" 15	12	8	7	8	Smooth, globe shaped, good.
Globe Spanish	"	" 15	..	..	20	8	Very large but all neck.
Giant Rocca yellow	"	" 15	..	..	14	8	

TRANSPLANTING ONIONS.

Some interesting data appears in the following tables upon this subject. It may be seen (1) that three sowings were made in the hotbed at intervals of 12 days apart; (2) the plants were all set in the field on the same day; (3) that the total yield of merchantable onions is much greater for the *third sowing* than either of the other two—in fact more than the product of the two combined; (4) the yield of good and bad onions is larger for the third sowing than either of the other two series; (5) the first sowing gave the most regular returns for each variety, White Victoria being the only one which failed to produce any merchantable bulbs—this result was the same throughout.

ONIONS—TABLE II.

SEED SOWN IN HOT-BED. TRANSPLANTED TO THE FIELD 9TH JUNE.

Varieties.	Seedsman.	1st Sowing, 8th April.		2nd Sowing, 20th April.		3rd Sowing, 30th April.		Length of Rows.
		Weight of Good Onions.	Weight of Thick-necks.	Weight of Good Onions.	Weight of Thick-necks.	Weight of Good Onions.	Weight of Thick-necks.	
		Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	Lbs. Oz	Lbs. Oz.	Feet,
Large Red Wethersfield....	Thorburn.	19 8	3 0	9 8	13 8	32 0	0 0	20
Red Victoria..............	" ..	4 0	55 0	0 0	26 0	0 0	45 8	20
White Large Tripoli.......	" ..	4 0	4 0	7 0	14 8	12 0	5 8	20
Red Ætna.	" ..	16 0	8 0	0 0	20 8	8 8	12 8	20
White Victoria	" ..	0 0	34 0	0 0	34 0	0 0	35 0	20
Red Mammoth Garganus...	" ..	6 8	28 0	5 0	13 8	13 8	21 8	20
White " ..	" ..	7 8	15 0	8 8	8 8	15 8	11 0	20
Prizetaker.................	Hend.....	5 0	19 0	0 0	13 0	18 8	10 0	20
Total weight	....	62 8	116 8	30 0	143 8	100 0	141 0	

ONION SEED SOWN IN THE OPEN EARLY AND LATE.

The following table gives yields for the same varieties of onions grown by sowing the seed in the field on 13th May, 25th May and 4th June. When the plants reached the proper size they were thinned the usual distances according to size, viz., 2 to 4 inches.

Results:—It will be seen (1) that the total yields of the same varieties, are much smaller than where they have been transplanted, (2) that the yield from the first sowing of seed is larger than either of the others, (3) that there is a much larger proportion of "thick necks" to the total product of merchantable onions in all the sowings here than there is when the same varieties were transplanted. Transplanting them increases the total yield and decreases the quantity of "thick necks" or unmerchantable onions.

ONIONS—TABLE III.

SEED SOWN IN FIELD.

Varieties.	Seedsman.	1st Sowing, 13th May.		2nd Sowing, 25th May.		3rd Sowing, 4th June.		Length of Rows.
		Weight of Good Onions.	Weight of Thick-necks.	Weight of Good Onions.	Weight of Thick-necks.	Weight of Good Onions.	Weight of Thick-necks.	
		Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	Lbs. Oz.	Feet.
Large Red Wethersfield....	Thorburn.	8 8	14 0	5 8	13 8	2 8	20 8	20
White Giant Tripoli.. .	" ..	3 8	9 8	5 8	9 8	0 0	15 8	20
Red Ætna................	" ..	1 8	15 8	4 0	18 0	0 0	14 0	20
White Victoria	" ..	0 0	13 0	0 0	22 0	0 0	14 8	20
Red "	" ..	1 0	21 8	0 0	27 8	0 8	20 0	20
Red Mammoth Garganus...	" ..	0 0	15 0	3 0	14 8	0 0	11 0	20
White " ..	" ..	8 0	15 0	4 0	16 8	0 0	9 0	20
Prizetaker...........	Hend.....	4 0	30 0	0 0	28 0	0 0	15 0	20
Total Weight.......	....	26 8	133 8	22 0	149 8	3 0	119 8	

TOBACCO.

The experiments of the year with this crop covered the following features (1) cultural tests; (2) trials of fertilizers; (3) "topping," the best time to do it; (4) the proper number of leaves to allow each plant.

(1.) CULTURAL—TRANSPLANTING EXPERIMENTS.

Three years ago strikingly beneficial results in growing tobacco plants were obtained by transplanting from the hot-bed to a cold frame before setting them in the field. The object of the following experiments was mainly to determine the relative advantages of cold frame and hot-beds in receiving the small plants at the first pricking out. The spring season was very unfavourable for either hot-bed or cold frame grown plants. At the time of setting out in the field, the hot-bed grown plants were stronger and larger than those from the cold frame. Both sets of plants, however, did well in the field, and at harvesting time, as shown by the yields of green leaf, the differences were not sufficiently constant to allow of reliable conclusions being drawn. It is a safe practice, however, in Eastern Ontario and the province of Quebec to prick the young plants into a second hot-bed before setting them in the field. This gives them stockiness and vigour at transplanting time. The number of plants lost in setting them in the field is much less if they have been treated in this way.

TOBACCO—TABLE I.

EXPERIMENTS IN GROWING THE PLANTS.

Variety.	Date of Sowing.	Plants—How Treated.	Planted in Field.	Number of Plants.	Date of Harvesting.	Weight of 1st Grade. Green.	Weight of 2nd Grade. Green.
						Lbs.	Lbs.
Yellow Pryor........	April 9	Not transplanted....	June 7	113	Sept. 18	271	29
"	" 9	Transplanted to cold frame.	" 7	111	" 18	319	25
"	" 9	" hot-bed....	" 7	113	" 16	234	38
Connecticut Seed Leaf.	" 9	Not transplanted..	" 7	113	" 8	540	22
" " ..	" 9	Transplanted to cold frame.	" 7	113	" 8	465	32
" " ..	" 9	" hot bed....	" 7	112	" 8	494	27
Pennsylvania " ..	" 9	Not transplanted..........	" 7	113	" 18	481	31
" " .	" 9	Transplanted to hot bed....	" 7	113	" 18	425	30
Persian Rose.........	" 6	Not transplanted.	" 7	112	" 13	243	41
"	" 9	Transplanted to hot bed....	" 7	113	" 13	223	64
White Burley........	" 9	Not transplanted..........	" 7	91	Aug. 31	404	69
"	" 9	Transplanted to cold frame.	" 7	331	" 31	1,565	191

FERTILIZERS.

The results of the fertilizer trials set forth in table II. Each plot contained 24 plants made up of an equal number of 6 varieties. The plants were set out on 8th June, and the fertilizers applied a few days afterwards, the results are not striking. The largest yield of green leaf was obtained from superphosphate, wood ashes and nitrate of soda (No. 4). The former two with sulphate of ammonia, also gave the second heaviest yield. Barn-yard manure applied in excessively heavy dressings gave the third largest yield. Muriate of potash, wood ashes and nitrate of soda did not give satisfactory returns as compared with the others when applied separately.

TOBACCO—TABLE II.

EXPERIMENTS WITH FERTILIZERS.

All these varieties were sown on the 9th of April, were planted out on 8th of June, and were gathered on 14th September, twenty-four plants were used of each sort.

Fertilizer.	Yellow Pryor. Weight.		Yellow Oronoka. Weight.		Penn. Seed Leaf. Weight.		White Burley. Weight.		Conn. Seed Leaf. Weight.		Persian Rose. Weight.		Total weight, 24 plants. Green.		Fertilizers used.
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	
No. I.....	11	0	15	0	22	8	21	0	13	8	12	8	94	8	Superphosphate, 10 lbs..... Muriate of potash " ..... Sulphate of ammonia, 10 lbs. } 10 lbs. to 24 plants.
" II....	15	8	13	8	17	0	20	0	15	0	13	8	104	8	Superphosphate, 15 lbs...... Wood ashes, 10 lbs.......... Sulphate of ammonia, 10 lbs.. } "
" III ...	14	8	15	0	22	0	20	8	17	8	16	8	106	8	Superphosphate, 15 lbs..... Wood ashes, 15 lbs.......... Nitrate of soda 5 lbs......... } "
" IV....	17	0	15	8	18	8	19	8	19	0	12	0	100	8	Superphosphate 15 lbs ..... Muriate of potash, 10 lbs..... Nitrate of soda, 5 lbs .... } "
" V	14	8	14	8	26	8	19	8	17	8	9	0	101	8	Barn yard manure (green) 200 lbs. to 24 plants.
" VI....	15	0	13	0	26	0	19	8	16	0	11	0	95	0	Wood ashes, 24 lbs. to 24 plants.
" VII...	13	0	15	0	20	0	19	8	17	8	11	0	95	0	Nitrate of soda, 6 lbs. to 24 plants.
" VIII..	12	8	13	0	13	8	19	8	17	0	10	0	85	0	Muriate of potash, 6 lbs. to 24 plants.
" IX....	15	8	12	0	16	0	21	0	13	0	8	8	96	0	Check plot ; no fertilizer.

TOPPING AND PRIMING.

"Topping" is the operation of removing the flower stalk, with one or more of the upper and smaller leaves. The energies of the plant are thus diverted from the natural channel—the production of seed—to the artificial—the more perfect development of its leafy tissue. After the first topping, numerous suckers usually appear in the axils of the leaves; these should be promptly removed. "Priming" is the term used to designate the removal of one or two of the lower or primary leaves, which are usually inferior in size and quality, frequently becoming torn and injured by the cultivator. I have noted the fact in past years that early "topping" usually meant an abundant and persistent growth of suckers. To test this, a block containing 108 plants including 7 varieties was taken and divided into 6 equal portions. Series I contained two plots. Plants in plot 1 were cut back to 9 leaves on July 20, those in plot 2 were cut back to 11 leaves on the same date.

The number of plants in series II and III were divided and cut back respectively on July 26th and August 2nd.

RESULTS.

Field notes show that it was necessary to "sucker" plants in series I twice after topping them. This work of removing the suckers is laborious and rather expensive.

Plants in series II were "suckered" twice after "tipping" but the amount of work was much less than that required in series I.

Plants in series III were "suckered" once. This with the removal of occasional sprouts kept them in order.

Yields.—(1.) Larger yields were obtained from the later "topping" than the earlier. (2). The greater number of leaves gave uniformly the heaviest yields.

TOBACCO—TABLE III.

EXPERIMENTS IN TOPPING.

Seed sown 9th April, planted out 7th June; 18 plants were used in each case.

Variety.	Cut back to 9 Leaves.	Weight of Green Leaf.	Cut back to 11 Leaves.	Weight of Green Leaf.	Date of Gathering
	1897.	Lbs.	1897.	Lbs.	1897.
Series I.—					
White Burley	July 20	62	July 20	102	Sept. 3
Yellow Oronoko	" 20	41	" 20	53	" 15
" Pryor	" 20	47	" 20	53	" 15
Cannelle	" 20	15	" 20	17	" 15
Connecticut Seed Leaf	" 20	61	" 20	78	" 15
Persian Rose	" 20	32	" 20	33	" 15
Pennsylvania Seed Leaf	" 20	42	" 20	53	" 15
Total weight		300		389	
Series II.—					
White Burley	July 26	78	July 26	71	Sept. 3
Yellow Oronoko	" 26	43	" 26	53	" 15
" Pryor	" 26	46	" 26	52	" 15
Cannelle		14	" 26	14	" 15
Connecticut Seed Leaf		66	" 26	69	" 15
Persian Rose		32	" 26	30	" 15
Pennsylvania Seed Leaf		70	" 26	74	" 15
Total weight		349		363	
Series III.—					
White Burley	Aug. 2	71	Aug. 2	104	Sept. 3
Yellow Oronoko	" 2	53	" 2	55	" 15
" Pryor	" 2	50	" 2	53	" 15
Cannelle	" 2	16	" 2	20	" 15
Connecticut Seed Leaf	" 2	69	" 2	72	" 15
Persian Rose	" 2	25	" 2	27	" 15
Pennsylvania Seed Leaf	" 2	63	" 2	80	" 15
Total weight		347		411	

REPORT OF THE CHEMIST.

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

OTTAWA, 30th November, 1897.

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

SIR,—I have the honour to submit herewith the eleventh annual report of the Chemical Division of the Dominion Experimental Farms.

Though much of the scientific work commenced during the past year is not yet completed—notably, the investigations in the matter of the preservation of barn-yard manure, and in the feeding value of certain grasses—we are able to present for the information of our readers in the present report some new and important results bearing directly upon the practice of Canadian agriculture. As in the past, it has been our endeavour to make the Chemical Division one of practical value to the farmer, dairyman and fruit grower, and it is believed that the experiments undertaken and now reported upon are such as to commend themselves as important to those who are following agriculture in one or other of its branches. While every investigation has been undertaken from this point of view, scientific accuracy and thoroughness have not been sacrificed, believing that all true progress and material development can only come from work marked by these qualities.

The work of the Chemical Division in all its branches continues to increase. As the objects of the Experimental Farm system and the value of chemical science as applied to agriculture become better known, the requests for analyses and for information, naturally, become more and more numerous. This fact, though exceedingly encouraging as pointing to an increasing appreciation on the part of our farmers, makes it highly desirable, and indeed necessary, to add to the chemical staff and enlarge our facilities, if we are to keep pace with these demands, more especially when we remember that original investigation should have the first call on our time.

A brief résumé of the more important subjects treated of in the present report may be given as follows :—

Clovers and green manures.—This investigation, begun in 1895, to ascertain the amounts of fertilizing materials that under different conditions could be supplied to the soil by various clovers, has been during the past season further pursued. We are able to place before our readers in the present report some very interesting and important data regarding the value of soil enrichment by growing clover with the cereal crop.

Soil inoculation for the legumes with nitragin.—Our results in this new department of agricultural research will be found of special interest. They indicate the possibility of economically treating land with germ cultures to stimulate the growth of clover and assist in assimilation of free (atmospheric) nitrogen. An illustration, taken from a photograph of the pots under experiment is given. The luxuriance of the foliage in the inoculated soils, in comparison with that in the untreated pots, is apparent. The chemical data, showing the amounts of nitrogen, organic matter, and ash in the (*a*) roots, and (*b*) stems and leaves of the clovers and horse beans experimented with, are presented in tabular form.

Forage plants and fodder.—These include Awnless Brome grass, of which analyses have been made of the hay grown at the Experimental Farm, Indian Head, N.W.T., and cut at different stages of growth ; Alfilaria or Cranebill, a forage lant found in British Columbia ; and a number of milling products, *e.g.*, buckwheat bran and provender.

Soils.—For lack of the necessary time, we have been obliged to postpone our investigation upon the virgin soils of the Dominion. We have, however, continued, as far as opportunity permitted, to examine samples sent in by farmers. Such work usually consisted in a determination of the humus, nitrogen and lime and the relative proportions of clay and sand. These data do not allow us to state the amounts of available plant food present, but they have enabled us to arrive at the general character of the soils and to indicate methods for their economical improvement.

A certain number of reports upon such samples are here inserted, in order to show the practical character of the information thus afforded farmers, and also in the hope that the deductions and advice thus given will be of value to our agricultural readers.

The results of analyses of virgin soils, obtained in our laboratories during the past nine years have been collated and made strictly comparable. They were presented in the form of a paper to the Chemical Section of the British Association at their convention in Toronto in August last. Since the information this paper contains will be found useful for reference by those interested in Canadian soils, it is herewith appended.

Naturally-occurring fertilizers.—Mucks, muds and marls. We have found it quite impossible to analyse all the samples of these materials sent in during the past year. Those samples, however, as far as time allowed, have been examined which, being from new localities, &c., appeared to merit special attention. The composition of these is here given, together with deductions as to their use and fertilizing value.

Miscellaneous fertilizing materials.—In this chapter we report upon the amount of plant food, as found by analysis, in various bye-products and weeds, *e.g.*, lobster refuse from the canning factories ; ashes from lime kilns, and that difficult-to-eradicate weed, purslane or pusley.

Moss litter. The examination of two samples of moss litter from Nova Scotia has been made. The results are confirmatory of those published in the report of this Division for 1895, obtained from moss collected in New Brunswick. Both samples were of excellent quality and specially adapted for bedding purposes, possessing high absorptive capacity. A new use for this material has been found. It is said to be most satisfactory as a packing material for fruit, fish and other perishable substances. Its elasticity makes it desirable for such purposes from a mechanical standpoint, and its power to absorb moisture and noxious gases renders it valuable as a preservative.

Well waters from farm homesteads.—We append in tabular form the data obtained from the examination of 63 samples, together with a brief report as to their quality.

It should be distinctly understood that the samples from *farm homesteads only* can be examined. The printed instructions issued by the Farm should be obtained before sending a water for analysis, since the probability is that otherwise a mistake will be made respecting the quantity required or in the matter of collection and shipment.

Tuberculin.—During the twelve months ending November 30, 1897, 214,018 minims of diluted tuberculin, a quantity sufficient to test 3,567 adult cattle, have been prepared and forwarded. The greater part of this has been sent out within the past three months, interest in the question of tuberculosis in cattle, more especially in those furnishing milk for town supply, having of late been very keen. This tuberculin is furnished to veterinarians by order of the Department of Agriculture. The labour involved in this work has been very considerable and necessarily has encroached largely on the time of this Division. We have in consequence not been able to accomplish as much purely chemical work as otherwise it would have been possible to overtake.

Samples received for Analysis.—The following table gives the details of the samples received from farmers during the past year.

Samples received from Farmers for Examination and Report, November 30, 1896, to November 30, 1897.

—	British Columbia.	North-west Territories.	Manitoba.	Ontario.	Quebec.	New Brunswick.	Nova Scotia.	Prince Edward Island.	Total.
Soils	7	.....	.....	12	23	5	...	.....	47
Naturally-occurring fertilizers (mucks, mud, and marls)	2	.....	1	5	4	3	8	20	43
Manures and fertilizers	4	.....	.....	5	2	1	4	5	21
Forage plants and fodders	1	8	....	5	.....	2	1	.....	17
Well waters	4	7	.....	33	15	7	...	19	85
Miscellaneous, including dairy products	3	4	.....	31	19	4	9	6	76
	21	19	1	91	63	22	22	50	289

It has been quite impossible with the present staff to submit all these to analysis, but as far as time allowed such as were deemed most important have been reported upon, as follows: Soils, 28; naturally-occurring fertilizers, 29; manures, 5; forage plants and fodders, 13; well waters, 68; miscellaneous, including dairy products, 41. The rest await an opportunity for examination. This branch of our work is evidently one that is much appreciated by farmers, and further expert assistance in the laboratory will be necessary if the privileges in this direction are to be extended in the future.

Mineral Specimens.—A very large number of mineral specimens have been received for identification and assay during the past year. The chemical work of the farms is necessarily restricted to matters relating to agriculture and we would, therefore, advise our readers that we cannot undertake to report on such samples.

Correspondence.—For the twelve months past the letters received by this Division number 1,248; those sent out, 1,402. The correspondence is principally from farmers, dairymen and fruit growers, and relates to soils, fodders, fertilizers and other matters of agricultural importance. As it becomes more widely known that questions may be sent, this branch of our work naturally increases.

Meetings attended.—Since November 30, 1896, the more important conventions attended and meetings addressed, include the following:—

The Association of Official Agricultural Chemists, at Washington, D.C.

The Farmers' and Dairymen's Association of New Brunswick, at Fredericton, N.B.

Farmers' Institute Meetings at Jeffries and Penobsquis, N.B.

The British Association for the Advancement of Science, at Toronto.

The Central Canada Agricultural Association, at Montreal.

The Fruit Growers' Association of Quebec, at Howick, Que.

Farmers' Institute Meetings at Summerside, Charlottetown, Georgetown and Alberton, P.E.I.

Two lectures, entitled "The principles of Plant feeding" and "The principles of Animal feeding," were delivered before the students of the Normal School, Ottawa.

Mr. Henry S. Marsh, Associate of the Institute of Chemistry, has continued to efficiently discharge the duties of Assistant Chemist, and to him my thanks are due for much careful work and many of the analytical data contained in this report.

I have the honour to be, sir,

Your obedient servant,

FRANK T. SHUTT,

Chemist, Dominion Experimental Farms.

CLOVERS AS GREEN MANURES.

THE FACTORS OF SOIL FERTILITY.

A high degree of soil fertility or crop-producing power is one of the fundamental factors in profitable farming. It, therefore, becomes of the greatest, indeed of paramount, importance to understand the nature of what constitutes fertility in a soil.

First, the soil must contain at least certain minimum amounts of mineral matter, such as potash, phosphoric acid and lime, and these constituents, or rather a certain percentage of them, must be in a more or less readily assimilable condition; for in this connection it is well to point out that by far the larger proportion of the fertilizing elements present in a soil is in locked-up or insoluble combinations. Plant food from the soil is absorbed and appropriated by crops in the form of a solution, and consequently such compounds as are insoluble, or are not capable of solution by the soil water or the exudations of plant rootlets, are valueless from an agricultural standpoint.

Secondly, a soil to be fertile must be possessed of nitrogen and humus. The latter term is applied to semi-decomposed organic matter, arising from the partial decay of roots and vegetable tissues generally. The nitrogen is in combination with this organic matter and is converted into forms useful to plants (nitrates) by a process known as nitrification. This conversion is the work of certain microbes, or microscopic plants which live on humus. Their development is in a large measure regulated by the amount of humus present, the degree of soil moisture, the soil's temperature, and the percentage of salifiable bases, such as lime and potash, present to combine with the nitric acid as formed. Permeability of the soil to air is also necessary.

Thirdly, fertility depends upon a right mechanical condition of the soil. This is sometimes known as tilth. It should be such that air may readily permeate and rain easily penetrate the soil. Roots and rootlets should be able to find an easy passage in foraging for food. Drainage and good cultural methods are essential in bringing about good tilth.

Fourth, certain conditions of climate are necessary for the best results. Warmth, sunshine and rainfall are all potent influences on crop production.

GREEN MANURING FOR INCREASING SOIL FERTILITY.

The system of green manuring, as practised by turning under a green crop of clover, increases fertility in a greater or less degree by the means named in the first three counts. While it does not add to the total amount of mineral plant food in the soil, the growth of the clover converts a large portion of such into compounds which, upon decay or rotting of the crop, are more readily assimilable for future use. This is certainly of no small value.

The feature of special importance, however, is that the decay of the clover enriches the soil in nitrogen and organic matter—a distinct gain, since all the elements of the latter, and the greater portion of the former, have been appropriated by the clover plant from the atmosphere. This organic nitrogen, as it may be termed, is readily transformed, in the presence of lime or potash and under favourable conditions of climate, into nitrates, the compounds which ordinary farm crops draw upon for their supply of nitrogen. As much nitrogen can be furnished per acre by ploughing down a crop of clover as would be furnished by an application of 10 to 15 tons of barn-yard manure. Again, the addition of the large amount of humus by a crop of clover vastly improves the texture of the soil, opening up and making warmer a clay loam and rendering a sandy soil more absorptive.

There are other benefits accruing from this system of manuring, but, in addition to those just discussed, attention need now only be directed to the following:—During the hot months of summer the process of nitrification goes on rapidly. The nitrates so formed are extremely soluble and consequently may in a large measure be lost by the leaching of autumn rains, when the crop grown has matured and been harvested early. The cereals are comparatively short-lived crops, and, therefore, the value of sowing clover with them and thus having the ground covered, after the former have been cut, with vegetation that can utilize these nitrates is apparent. The late summer and autumn rains then assist in the storing up of these valuable nitrogenous compounds rather than in their dissipation.

A further advantage in sowing the clover with the cereals is in keeping down weeds after the grain is harvested.

SOWING CLOVER WITH BARLEY.

It will be remembered that in the report for 1896 we recorded the results of an experiment carried on with various clovers as "cover" crops for orchards, stating their relative merits for this purpose and giving their analyses in detail. The figures showed that large quantities of fertilizing materials and humus can be furnished the soil by ploughing under the crop in the autumn.

In the present report we give the results of a further investigation, the clovers having been sown at various rates per acre with barley, and the roots and dead stems and leaves of the clovers being collected for analysis in the following spring. The barley employed was that known as Odessa, which was sown on all the plots under experiment at the uniform rate of 1¾ bushel per acre. The barley and clover were sown together on all the plots on 5th, May 1896, and the barley cut on 27th July. The clover residues (that is, the roots, dead stems and leaves) were collected on May 1st, 1897.

The results, therefore, indicate the amounts of organic and mineral matter and certain fertilizing constituents contained in the roots to a depth of 9 inches, and in the dead or dried stems and leaves, immediately before spring ploughing.

The data are presented in tabular form, as follows :—

ANALYSES of clover residues (roots, dead stems and leaves), 1897.

All the clovers were sown, at the respective rates mentioned below, on 5th May, 1896, with Odessa barley at the rate of 1¾ bushel per acre. The barley on all the plots was cut 27th July, 1896. The clover residues (roots, dead stems and leaves), were collected 1st May, 1897.	Composition.				Weight of Clover residue, per acre.		Amount of certain constituents, per Acre.		
	Water.	Organic Matter.	Ash.	Nitrogen.			Organic Matter.	Ash.	Nitrogen.
				p. c.	Tons.	Lbs.	Lbs.	Lbs.	Lbs.
Mammoth red clover, sown 14 lbs. per acre.	71·51	24·45	4·04	·903	3	636	1,622	268	59
" " " 12 "	69·73	25·28	4·99	1·109	3	976	1,762	349	77
" " " 10 "	59·43	33·19	7 38	1·417	2	1,955	1,978	439	81
" " " 8 "	70·00	26·18	3·82	1·123	3	976	1,783	258	76
" " " 6 "	72·00	24·00	4·00	1·041	3	806	1,634	272	70
" " " 4 "	63·34	31·74	4·92	1·260	2	594	1,458	226	58
Common red clover " 10 "	72·50	23·61	3·89	1·016	3	125	1,446	238	62
Alsike clover " 6 "	71·58	22·63	5·79	1·020	1	1,233	732	187	33
Alfalfa " 14 "	61·54	34·79	3·67	1·075	1	212	772	79	26
Crimson clover " 24 "	62 82	33·01	4·17	·827		1,322	478	60	12

Field notes regarding the growth and appearance of the clovers at certain stages of growth, are to be found on pages 37 and 38 of the Annual Report of the Farms for 1896.

MAMMOTH RED CLOVER.

Considering briefly the data of the foregoing table, we notice first that as regards nitrogen, the greatest amount was found in the residue of the Mammoth Red clover, sown at the rate of 10 pounds per acre. Above and below this rate of seeding, the quantity of nitrogen decreased. Allowing for the unavoidable errors of experiment, the trials with clover sown at the rate of 12, 8 and 6 pounds, respectively, per acre, gave approximately the same amount of this element, averaging from 5 to 10 pounds less than in the residue from 10 pounds of clover seed per acre. That sown very thickly, 14 pounds, and that very thinly, 4 pounds, are seen to contain, practically, the same amounts.

The greatest weights of organic matter and ash constituents were also contained in the residue from 10 pounds of seed per acre. The reason that it appeared to yield a smaller total weight than that of the others of this series (save that sown at 4 pounds per acre) was that on analysis, it was found to contain from 10 to 13 per cent less water than they.

On all three counts, therefore, we may conclude that the maximum benefit as a green manure was obtained by seeding this clover at the rate of 10 pounds per acre.

The fertilizing value of the residues from 14 pounds and 4 pounds are, somewhat strangely, almost identical.

Of the other clovers experimented with, the Common Red clover makes the best showing, and the Crimson clover the poorest, with Alsike and Alfalfa intermediate in the order named.

If we leave out of consideration all the advantages accruing from this system of manuring, save the accumulation of nitrogen, and suppose that Mammoth Red clover sown at the rate of 8 to 10 pounds per acre can appropriate from the atmosphere, say 50 pounds of this element (the rest being obtained from the soil), the economy and profit of this method of supplying nitrogen by sowing clover with a grain crop for increasing the fertility of soils become apparent. In this connection it may be well to remark that the growth of the clover did not, on any of the plots, diminish the yield of grain.

The question arises as to whether the clover crop, when grown solely for the purposes of enriching the soil, should be ploughed under in the autumn or the spring. Comparing the results given in last year's report with those now recorded, the conclusion must be drawn that greater benefit is derived by ploughing under in the autumn. The investigations were not on parallel lines, so that a close comparison cannot be made, but nevertheless there is such a large difference between the weights of essential constituents in the crop in the autumn and the spring—the difference being in favour of the former—that little room is left for doubt on this point. Moreover, the crop in the autumn is green and succulent, and we have, therefore, every reason to suppose that its decomposition and the subsequent setting free of its elements of plant food would proceed more rapidly than the decay of the organic matter in the dead and dried residue which is to be found the following spring.

The work so far, then, makes evident the advantage of growing a nitrogen-collector (one of the legumes) with the grain crop. The results of the past season show that the greatest benefit was obtained from sowing 8 to 10 pounds of Mammoth Red clover per acre, and favour the ploughing under of the crop at the close of the growing season —in most localities about the middle of October.

SOIL INOCULATION FOR THE GROWTH OF THE LEGUMES.

THE USE OF NITRAGIN IN AGRICULTURE.

Though not generally practised as a means of soil enrichment, it has been known for many centuries that the growth of clovers and other members of the Pulse family, now commonly termed legumes, increased rather than diminished the fertility of the soil, so that the yield of grain after a crop of clover was greater than it would have been without a previous seeding of clover. The theory generally accepted was that the clover being a deep rooted plant brought up from the sub-soil mineral matter that was out of the reach of other farm crops. This, however, appears to be but one of the causes —and that a minor one—for the fact above mentioned. The chief reason, as revealed by a recent scientific discovery, lies in the fact that the legumes can appropriate the free nitrogen of the atmosphere, assimilating and building it up into their tissues. This nitrogen, by the decay of the roots (and foliage, if the crop is ploughed under) may be utilized, after the process of nitrification, by subsequent crops. As far as we are at present aware the legumes only have this power, hence they are known as nitrogen-collectors in contradistinction to all other crops, which are known as nitrogen-consumers. The demonstration that the free, that is uncombined, nitrogen of the atmosphere can be so utilized by the legumes is due to Hellriegel, a celebrated German scientist. He, with his equally renowned colleague Wilfarth, made this announcement to the world in 1886, at the same time giving overwhelming proof of the correctness of the assertion and explaining the way in which this appropriation and assimilation takes place. The discovery was not only a brilliant scientific achievement, but one of the greatest importance to the agricultural world.

In explaining the fact of this discovery and the application to practical agriculture, it may first be pointed out that the legumes have not in themselves the power of free nitrogen assimilation; in this respect all plants are alike. They can, however, utilize atmospheric nitrogen through the agency of certain micro-organisms present in the soil. These micro-organisms, microbes or bacteria attach themselves to the roots of the legumes upon which nodules or tubercles then form. These contain the microbes. In some way, at present not well understood, the latter can absorb the nitrogen of the air occupying the instertices between the soil particles, converting it into certain nitrogenous compounds that enter the sap circulation of the host plant and finally are stored up in the tissues. When the nodules and their inhabitants are not present in the soil, clover, pease and all other legumes must, like the rest of vegetation, obtain all their nitrogen from the supply in the soil existing there as nitrates.

Now, it is to be noted that these micro-organisms, though very widely distributed, are not found in all soils. The question, therefore, of the possibility of introducing them where absent, or present only in small numbers, becomes one of agricultural importance. Further, if soil inoculation (as such a process may be well called) is possible, can it be made an economical method for enriching the soil with nitrogen? These are questions that come well within the scope of scientific agriculture to investigate, questions well worthy of careful research, for the answers must be of the greatest importance to farmers.

It might, at the outset, be supposed that the soil of a field growing a luxuriant crop of clover, the roots of which possess nodules, would in all probability contain large numbers of these organisms. Naturally, therefore, we find the first experiments consisted in taking soil from a field upon which a legume possessing an abundance of nodules had been grown and scattering it on the field to be impregnated. This was practically soil inoculation, and though the plan in many instances proved eminently satisfactory, the carrying out of it was frequently costly and cumbersome. Dr. Nobbe, of Tharand, Saxony, was the one who first made this practical application of Hellriegal's discovery.

The next step, also taken by Dr. Nobbe, was in the isolation of the nitrogen-converting microbes from such soil and the preparation, by certain well known bacteriological methods of "pure cultures." These cultures consist of colonies of the organisms and the preparation has been named *Nitragin.*

It would appear that the members of the leguminosæ have each their own peculiar bacterium or micro-organism, for it seems that those influencing the assimilation of nitrogen in the clover plant are of no value for the pea crop, and *vice versa.* Hence, the necessity for the preparation of clover "nitragin," pea "nitragin," &c. These cultures or bacterial preparations, to the number of 17, are now manufactured on a commercial scale in Germany, and a quantity of each said to be sufficient to inoculate an acre can be procured for about $1.25.

The practical application of *Nitragin* has been made in two ways; first, by diluting the preparation with sufficient water and sprinkling the seed with the fluid, and, secondly, by treating a quantity of soil with a dilute solution of the preparation, allowing the soil to dry, and then spreading it evenly over the field to be inoculated, which is then deeply harrowed.

Following these methods, experiments have been made in Germany, England and on this continent. The results so far obtained, as gathered from the reports of these investigations, scarcely admit of any more emphatic statement than that the indications are that on soils that have not previously grown legumes, or for other reasons do not contain the nitrogen-assimilating bacteria, the practice of inoculation will be attended with profit. Some soils contain such an abundance of these microbes that a further supply is unnecessary. European field experiments seem to show that even when the growth of the foliage is not increased by *Nitragin* there is frequently a greater root development and a larger number of nodules. No great difference could be noted, in these reports, between the results of soil inoculation and seed inoculation, though such differences as there are appear to be in favour of the former.

EXPERIMENTS WITH NITRAGIN.

In the spring of the present year we obtained from Messrs. Meister, Lucius and Bruning, Höchst am Main, manufacturers of bacterial cultures, *Nitragins,* for alfalfa or lucerne, clover, horse beans and vetch. The soil used in our experiments was made from clay, sand and swamp muck and would be termed a loam of medium fertility. It was not sterilized, in order that the conditions might be comparable, as far as possible, to those on the farm. The experiments were conducted in duplicate in galvanized iron pots and the methods of inoculation above described were employed, check, or uninoculated, pots being sown at the same time. After the plants had reached the height of a few inches they were thinned out to the same number in each pot. The seed in all the trials was sown on May 20th, 1897, the plants of the clover, alfalfa and vetch showing above ground in all the pots on May 25th, and the horse beans on May 31st. The soil and seed of the inoculated tests were treated with the respective *Nitragins* on the day of sowing, May 20th.

Unfortunately, the growth of the alfalfa and vetch was very meagre and it was, therefore, deemed inadvisable to weigh and analyse their crop, as the results might be misleading.

INOCULATION EXPERIMENTS WITH HORSE BEANS (FABA VULGARIS, var. EQUINA).

(Sown 20th May, collected 4th August, 1897.)

The plants were thinned out to five (5) in each pot. On August 4th, the plants being then in pod, the experiment was brought to a close. The difference in foliage in the various pots was not very marked, though the plants in the pots containing the inoculated soil (H.H.) were decidedly larger and more robust than the others. In all the pots the plants appeared healthy.

In the check, or uninoculated pots, the root systems were meagre and supplied with a few small nodules only.

In the "soil inoculated" pots there were extensive root systems, the fibres being possessed of numerous nodules of a much larger size than in the preceding series.

In the pots containing the plants grown from "inoculated seed" the root systems, though larger than in the uninoculated pots, were not equal to those in the soil inoculated pots, nor were the nodules quite so numerous.

The results showed that the *Nitragin* had a decided effect in the development of the roots, a feature that has been remarked upon by Dr. Voelcher, an English agricultural chemist, who has carried on a series of investigations with *Nitragin*.

The weight of the roots, stems and leaves on August 4th were as follows:—

		Grams.
Pots G.G., uninoculated,	10 plants, including roots.........	127
Pots H.H., soil inoculated,	10 plants, "	227
Pots I.I., seed inoculated,	10 plants, "	157

The following table presents the analytical data, including the amounts of certain constituents contained in the plants under experiment :—

TABLE I.

AMOUNTS OF NITROGEN, ASH CONSTITUENTS AND ORGANIC MATTER.

—	Pots G.G. 10 Plants = 127 Grams. Not Inoculated.			Pots H. H. 10 Plants = 227 Grams. Soil Inoculated.			Pots I. I. 10 Plants = 157 Grams. Seed Inoculated.		
	Stems and Leaves.	Roots.	Total.	Stems and Leaves.	Roots.	Total.	Stems and Leaves.	Roots.	Total.
	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.
Weight of nitrogen......	·611	·145	·756	·822	·281	1·103	·569	·267	·836
" ash or mineral matter......	2·56	2·64	5·20	2·94	4·44	7·38	2·35	4·14	6·49
" organic matter	16·49	3·67	20·16	22·57	7·66	30·23	14·53	7·56	22·09
Total dry matter..	19·05	6·31	25·36	25·51	12·10	37·61	16·88	11·70	28·58

Deductions.—(A.) The largest yield of crop was obtained from the soil inoculated pots H.H., chiefly due to the greater weight of roots.

(B.) The amounts of nitrogen, ash or mineral matter and organic matter in the plants from pots H.H., soil inoculated, were, in most instances, considerably greater than those from the inoculated seed pots I.I.

(C.) The plants from pots I.I., "seed inoculated," furnished nitrogen, ash constituent and organic matter in amounts intermediate between those from G.G., not inoculated, and H.H., seed inoculated.

We may, therefore, conclude that in this experiment there has been a decided advantage accruing from the use of *Nitragin*, especially when employed for "soil inoculation," and that "seed inoculation," while not giving such marked results, has nevertheless been beneficial in increasing the growth. I further think we may fairly conclude that the additional nitrogen in the plants of the pots H.H. and I.I. has been obtained through the agency of the *Nitragin*.

TABLE II.

THE PERCENTAGE COMPOSITION OF THE "DRY MATTER" OF THE (*a*) STEMS AND LEAVES, AND (*b*) ROOTS OF THE PLANTS.

——	From Pots G.G. Not inoculated.		From Pods H.H. Soil inoculated.		From Pots I.I. Seed inoculated.	
	Stems and Leaves.	Roots.	Stems and Leaves.	Roots.	Stems and Leaves.	Roots.
Nitrogen	3·212	2·321	3·223	2·324	2·936	2·478
Ash or mineral matter....	13·46	41·91	11·52	36·76	12·33	40·49
Organic matter......................	86·54	58·09	88·48	63·24	87·67	59·51

The data do not allow of the deduction that the plants from inoculated soil or seed are relatively richer in nitrogen than those without *Nitragin.* The larger amount of nitrogen in the treated crop is rather due to a greater development of root or foliage, or both, under the stimulating effect of the micro-organisms furnished by the preparation.

The percentages of ash or mineral matter are not to be compared too closely, as by the method employed it was found extremely difficult to separate the last traces of sand upon the roots. The presence of a small amount of sand would materially increase the percentage of "ash."

MAMMOTH RED CLOVER.

Culture used, "Trifolium pratense." The plants were thinned to 10 plants in each pot. The experiment was closed on October 22nd, when a few of the plants were in flower. Previous to the weighing of the plants a photograph of the series was taken, a reproduction of which is here given.

			Grams.
Pots D.D., Not inoculated,	weight of plants, including roots	...	147·6
Pots E.E., Soil inoculated,	do	...	163·2
Pots F.F., Seed inoculated,	do	...	189·0

These data show that considerable increase in weight of crop has resulted from the action of the *Nitragin*, though it is to be remarked that, unlike the results with the horse beans, the greater yield is obtained from the experiment in which the seed was inoculated.

The nodules or tubercles were much smaller than those on the roots of the horse beans. From mere inspection of the roots it was extremely difficult to decide which series was the richest in nodules. The root systems, as regards development, were approximately in the ratio represented by the total weight of the crops.

Illustration showing the method of collection of the roots, dead stems and leaves of clover for analysis, May 1st, 1897.

Inoculation experiments with *Nitragin* for Mammoth Red Clover, Sept. 17th, 1897. Pots D. D., not inoculated ; Pots E. E., soil inoculated ; Pots F. F. seed inoculated.

The analytical data of this series are given as follows :—

TABLE III.

AMOUNTS OF NITROGEN, ASH CONSTITUENTS AND ORGANIC MATTER.

—	Pots D.D. 20 plants=147·6 grams. Not inoculated.			Pots E.E. 20 plants=163·2 grams. Soil inoculated.			Pots F.F. 20 plants=189·0 grams. Seed inoculated.		
	Stems and Leaves.	Roots.	Total.	Stems and Leaves.	Roots.	Total.	Stems and Leaves.	Roots.	Total.
	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.
Weight of nitrogen.....	·602	·469	1·071	·740	·495	1·235	·800	·745	1.545
" ash or mineral matter.	5·18	9·76	14·94	4·98	5·14	10·12	4·66	6·84	11·50
Weight, organic matter..	21·42	10·24	31·66	26·22	14·36	40·58	27·04	20·06	47·10
" "dry matter"	26·6	20·00	46·60	31·20	19·50	50·70	31·70	26·90	58 60

Again, it is to be noticed that the amounts of nitrogen increase with the total weight of the crop; the same is also true of the organic matter. In these important constituents, larger quantities were obtained from the treated pots than from the untreated or check pots, and thus we have further testimony to the favourable action of the bacterial culture. It is worthy of note that the roots contained amounts of fertilizing constituents to the extent of at least two-thirds of those present in the foliage.

The percentage composition of the "dry matter" of the clovers under experiment is presented as follows :—

TABLE IV.

PERCENTAGE COMPOSITION OF "DRY MATTER."

	From Pots D.D. Not inoculated.		From Pots E.E. Soil inoculated.		From Pots F.F. Seed inoculated.	
	Stems and Leaves.	Roots.	Stems and Leaves.	Roots.	Stems and Leaves.	Roots.
Nitrogen..........	2·26	2·31	2·37	2·54	2·53	2·77
Ash or mineral matter..........	19·46	25·40	15·91	26·39	14·71	25·47
Organic matter.....	80·54	74·60	84·09	73·61	85·29	74·53

Slightly larger percentages of nitrogen were found in the inoculated plants, and more especially in their roots, than in those untreated, in this respect differing from the results obtained with the horse beans. The percentages of the other constituents are practically the same throughout the series.

Further experiments with *Nitragin* will be made next season. With increased data at our command we shall probably be in a position to speak more decisively as to the value of this preparation. The indications of the present investigation, however, point strongly to its usefulness in encouraging the growth of the legumes, clover and horse beans; and it is probable that where such will not grow luxuriantly, owing to the absence of the necessary microbes in the soil, inoculation with *Nitragin* will prove effective and economical.

FORAGE PLANTS AND FODDERS.

AWNLESS BROME GRASS (*Bromus inermis.*)

In bulletin No. 19, Grasses; their uses and composition (Experimental Farm series), written by Dr. Fletcher and myself in 1893, the following statement regarding Awnless Brome Grass is to be found: "We consider this to be one of the most valuable of the introduced grasses, both from its feeding qualities, as evinced by analysis, and from its free, luxuriant habit of growth. An analysis made from grass grown on the Central Experimental Farm, afforded the following data:—

ANALYSIS of Awnless Brome Grass, taken when the seed was fully formed, the right period at which to cut for hay.

——	Fresh or Green Grass.	Calculated to Water-free Substance.
Water	65·07	
Ash	1·32	3·78
Protein (albuminoids)	4·14	11·88
Fat (Ether Extract)	·84	2·41
Carbohydrates (Nitrogen-free extract)	16·90	48·03
Fibre	11·73	33·90
	100·00	100·00

These results denote that it is a grass rich in flesh-forming substances (protein) and low in fibre—the least valuable, from a feeding standpoint, of a fodder's constituents.

In the Annual Report of the Experimental Farms for 1893, on page 189, Dr. Fletcher, Botanist of the Experimental Farms, speaks very highly of this grass from trials made under his care on the Central Farm, stating that it is early and hardy, and that it is a heavy cropper, and one which produces an excellent aftermath of succulent, leafy shoots. He also quotes many favourable opinions from those who have grown it in the North-west Territories and the United States.

For several years it has been extensively sown on the Experimental Farms at Brandon and Indian Head, and reference to the reports from these farms for last year will show that great success has attended the trials on both farms (see pages 337 and 396, Report Expl. Farms, 1896). Both for hay and pasture it has already proved a most valuable grass for the North-western provinces. A feature of particular importance is the heavy aftermath of succulent grass it affords. Since the native grasses do not produce this secondary growth to any extent, Brome grass is extremely valuable in furnishing for the farmer and dairyman of these districts, during the late summer months, palatable, wholesome and nutritious feed for keeping up the milk flow.

In order to give the grass an extensive introduction, it was considered desirable to distribute seed among farmers. To obtain this, portions of the crop on the Experimental Farms at Brandon and Indian Head have been allowed to ripen, and the hay thrashed. Many farmers have also followed this practice to procure seed for themselves and their neighbours and thus, frequently, farmers have a quantity of fully ripe, thrashed hay to feed to stock. To ascertain the value of this latter, or in other words to learn what deterioration in feeding value has taken place between the period at which the grass is in prime condition for cutting and that at which the seed is fully ripe, the following investigation was carried out, the samples being furnished from the Experimental Farm at Indian Head, N.W.T., by Mr. Mackay, the superintendent :—

The samples consisted of (1) hay cut when the seed was formed (July, 13, 1896) and considered in prime condition, (2) hay cut when seed was fully ripe (July, 24, 1896) and containing seed, (3) ripened, thrashed hay (practically straw), and (4) chaff from the thrasher, containing some seed. Samples 1, 2 and 3 were of good colour, not having been bleached in the curing, a change usually accompanied by a lessening of food value, the fibre becoming hard and indigestible. The appearance of all was that of nutritious, palatable hay.

ANALYSES of Hay and Chaff of Awnless Brome Grass.

Number.	Stage of growth, &c.	Hay. Water.	Hay. Ash.	Hay. Protein, (albuminoids).	Hay. Fat (ether extract).	Hay. Carbo-hydrates (nitrogen-free extract).	Hay. Fibre.	Calculated to Water-free Substance. Ash.	Calculated to Water-free Substance. Protein (albuminoids).	Calculated to Water-free Substance. Fat (ether extract).	Calculated to Water-free Substance. Carbo-hydrates (nitrogen-free extract).	Calculated to Water-free Substance. Fibre.
1	Seed just formed; in prime condition for hay; cut 13th July, 1896	6·47	7·87	7·54	4·14	42·56	31·42	8·42	8·10	4·42	45·46	33·60
2	Seed ripe; unthrashed; cut 24th July, 1896	8·28	7·39	5·76	3·15	43·16	32·26	8·05	6·28	3·43	47·07	35·17
3	Ripened; thrashed; hay (straw)	7·62	7·23	6·05	3·80	38·75	36·55	7·83	6·35	4·11	42·15	39·56
4	Chaff from thrasher, containing some seed	8·63	9·01	10·70	4·86	42·88	23·92	9·86	11·21	5·32	47·42	26·19

In the first place we notice that of the three samples of hay, No. 1 (that cut when "the seed was just formed") is the most nutritious, since it contains most protein and fat and the least fibre. This result is in accord with those already obtained from a study of other grasses (see bulletin No. 19, page 22) and emphasizes the importance of cutting for hay as soon as the seed has formed. A loss of valuable and digestible food material always occurs when a grass is allowed to fully mature before it is cut for hay.

Thus, on comparing the analysis of Nos. 1 and 2, it is evident that a certain deterioration in food value has taken place by the ripening of the grass. This depreciation in nutritive qualities, made apparent by contrasting the figures in the columns representing the composition of the water-free substances—is not, however, in this instance a very serious one; at all events, it is not so great as to prevent the farmers from allowing the grass to mature when a supply of seed is wished.

Though the ripened, thrashed hay (No. 3) contains more fibre and somewhat less starch, &c. (carbohydrates) than the unthrashed hay (No. 2) our data do not show that there is any great difference in feeding value between these samples. Indeed it would appear that in certain respects the former is the better of the two. This is contrary to our expectation and is perhaps caused by the loss in thrashing of certain of the least valuable portions of the plant.

Sample No. 4, labelled "chaff from the thrasher," evidently contained a considerable amount of seed. Its presence in the chaff is most probably unavoidable, and may be accounted for by the extreme lightness of the seed. Our analysis shows this sample to be the richest in protein and fat and lowest in fibre of all those examined. This is undoubtedly good fodder and one that could be used to advantage as part of the daily ration.

STORKSBILL OR ALFILARIA *(Erodium cicutarium.)*

At the request of Mr. J. R. Anderson, Deputy Minister of Agriculture for British Columbia, a chemical examination of the feeding qualities of this forage plant has been made. Concerning its occurrence in that province, Mr. Anderson writes as follows :—
" Erodium cicutarium is common in the vicinity of Victoria and on the Gulf Islands,

but I am not prepared to state its prevalence in other parts of the province. It is generally found on rocks thinly covered with soil, as a small plant, but it readily accommodates itself to more congenial localities, where it assumes the large form I send you. It thrives best in a rich black loam. It has not been grown as a crop and its weight per acre is, therefore, unknown; from what I have seen of it however, I should think the yield would be about the same as that of red clover. Cattle, according to Mr. Munro, eat it with avidity, at any rate, during the winter months when green food is scarce."

Our analysis of the sample sent furnished the following data:—

COMPOSITION OF STORKSBILL OR ALFILARIA.

Constituents.	Green Material.	Hay (Air-dried.)
Water	89·02	10·32
Albuminoids (protein)	2·81	23·12
Ether extract (fat)	·55	4·53
Nitrogen-free extract (carbo-hydrates)	3·79	30·70
Fibre	1·34	10·97
Ash or mineral constituents	2·49	20·36
	100·00	100·00

These results show that this plant has nutritive qualities of a high order. The percentage of albuminoids (flesh formers) closely approximate that found in good grasses, though it must be remembered that in the young plant a part of the nitrogen (the essential element of albuminoids) exists in the form of amides—compounds which have not quite the same feeding value as the true albuminoids. Another feature in its favour is the particularly small amount of fibre it contains. Provided the plant is palatable to cattle, which upon good testimony it appears to be, it should prove a nutritious, wholesome fodder.

Storksbill or alfilaria evidently makes a large draft upon the mineral resources of the soil, for the ash content is high. This should not be considered as a disadvantage, if the manure from its feeding is carefully preserved and returned to the soil, for provided these precautions are observed this and similar plants may be used as agents for converting locked-up plant food into available forms for future crops.

Regarding the value of this plant, it will be of interest to make the following quotations from "The Agricultural Grasses and Forage Plants of the United States," by Dr. Geo. Vasey:—"This annual, supposed to have been introduced from Europe, does not seem to be mentioned in any work on forage plants. It occurs abundantly and is of much value for pasture over a large extent of territory in Northern California and adjoining regions; elsewhere in the United States it is sparingly introduced and usually regarded only as a weed, though it is not very troublesome. Besides the above name it is known as Storksbill, pin clover, pin grass, and filaree; it is neither a clover nor a grass, but belongs to the geranium family; it starts very early and grows rapidly, furnishing good, early pasture and ripens seed before the hottest weather. It is of little value as hay and is not worth introducing where the ordinary forage plants can be grown. The seed is seldom sown, but the plant comes spontaneously each year from self-sown seed." Prof. E. W. Hilgard, of the Experiment Station at Berkeley, California, says respecting this plant:—"Two species of cranesbill (*Erodium cicutarium* and *moschatum*) are even more common here than in Southern Europe, and the first named is esteemed as one of the most important natural pasture plants, being about the only green thing available to stock throughout the dry season, and eagerly cropped by them at all times."

Though not suitable for hay—since when dry it easily breaks into fine bits and dust—it appears, both from the above testimony and our analysis, to have a distinct value as a pasture plant, more especially for high lands and in districts subject to seasons of drought.

COMPARATIVE VALUES OF "HEAVY FEED" AND BUCKWHEAT BRAN.

These feed stuffs were examined at the request of the editor of the Co-operative Farmer, who states that these materials are being largely fed by the farmers and dairymen of New Brunswick, and that there is a widespread desire to learn their comparative feeding values.

As received, the former had much the appearance of fine bran, and under the microscope was found to consist chiefly of ground wheat and oats; the bran, as separated by sifting, being approximately 25 per cent of the whole. The buckwheat bran was somewhat coarsely ground and showed the appearance of a considerable quantity of hull. The sample is rather one of buckwheat middlings than of buckwheat bran.

The analytical data obtained are as follows:—

COMPOSITION OF "HEAVY FEED" AND BUCKWHEAT BRAN.

	Heavy feed.	Buckwheat bran.
Moisture	9·30	9·21
Albuminoids	16·12	18·62
Fat	5·95	6·45
Carbo-hydrates	58·56	57·92
Fibre	6·50	3·51
Ash	3·57	4·29
	100·00	100·00

The most important constituents of a fodder are the albuminoids, commonly known as flesh formers, and the fat. Other things being equal, we can assign relative values to fodders by taking into account the percentages of these nutrients, according to the following plan. We may assume for the purpose of comparison, the relative values of albuminoids, fat and carbo-hydrates (starch, &c.,) to be 2·5 : 2·5 : 1. The method of ascertaining the feeding value is then to add together the amounts of albuminoids and fat and multiply the sum by 2·5. To the result, the percentage of carbo-hydrates is added. This final amount represents the number of called "food units," which indicate the relative food values of the fodders under comparison.

	HEAVY FEED.	BUCKWHEAT BRAN.
Albuminoids	16·12	18·62
Fat	5·95	6·45
	22·07	25·07
	2·5	2·5
	11·035	12·535
	44·14	50·14
	55·175	62·675
Carbo-hydrates	58·56	57·92
Food units	113·73	120·60

In other words, presuming the digestibility of these products to be equal, one ton of the buckwheat middlings is equal in food value to 1 ton 120 pounds of the "heavy feed." To assign comparative money values, if buckwheat middlings were worth $16 per ton, the heavy feed would be worth $14.11 per ton.

It must not be supposed from the foregoing that the exclusive use of buckwheat bran is recommended; a mixed grain diet will always be found not only more palatable to the animals, but as resulting in more profitable returns. This investigation, however, shows that weight for weight the buckwheat product is the more nutritious of the two.

"GROUND FEED" USED FOR CATTLE IN TRANSPORTATION.

The comparative value of two samples of "ground feed" used for cattle on board ship, examined at the request of the Department of Marine and Fisheries, is reported upon as follows:

General Appearance—Both samples consisted largely of crushed or coarsely ground oats and Indian corn (maize). No. 1 contained a large quantity of the thin chaffy membrane of the maize kernel. No. 2 possessed a very considerable proportion of oat chaff—consisting of the palets and glumes of the seed. Judging from a general, as well as a microscopical examination, sample No. 1 would be considered, on the grounds of apparent richness in composition and mechanical condition, the better of the two feeds.

Chemical Composition.—The samples were submitted to the usual analysis of feed stuffs, with the following results:—

ANALYSIS OF GROUND CATTLE FEEDS.

——	No. 1.	No. 2.
Moisture	10·63	9·58
Albuminoids	12·08	9·17
Fat	5·27	4·42
Carbo-hydrates	63·72	62·86
Fibre	5·25	10·65
Ash	3·05	3·32
	100·00	100 00

As already stated, the most valuable constituents of a fodder are the albuminoids (or flesh formers) and the fat; the least valuable, the fibre. Hence, by reason of the greater percentage of the albuminoids, fat and carbo-hydrates in sample No. 1, and the larger amount of fibrous material in sample No. 2, the former must be considered the more nutritious of the two.

In order to make a comparison between these feed stuffs, or in other words to assign the relative values, it may be assumed as in the preceding chapter, that the feeding values of albuminoids, fat and carbo-hydrates are in the following proportion:—2·5: 2·5: 1.

If it then be further assumed that the digestibility of the two samples be equal—an assumption that gives a slight benefit to the poorer and more fibrous of the feeds—the following calculations will show their relative values as foods :—

	No. 1.	No. 2.
Albuminoids	12·08	9·17
Fat	5·27	4·42
	17·35	13·59
	2·5	2·5
	86·75	6·795
	347·0	27·18
	43·375	33·975
Carbo-hydrates	63·72	62·86
Food units	107·09	96·83

This shows that 1 ton of No. 1 is equal in food value to 1 ton 212 pounds of No. 2.

Supposing the value of No. 1 to be $20 per ton of 2,000 pounds, the value of 1 ton of sample No. 2 would be $18.08.

CANADIAN SOILS.

As explained in the letter of transmittal to this report, we here present the results obtained on certain samples sent by farmers for examination during the past year and a paper containing complete data on the virgin soils of the Dominion examined by us during the past nine years.

The following extracts, from reports furnished the farmers forwarding the soils, are here inserted for the purpose of informing our readers respecting the nature of the examination we make of cultivated soils and of the suggestions offered for the economical treatment of such lands :—

BRITISH COLUMBIA.

Soils from Enderby and Bear Valley, B.C., forwarded by the Department of Agriculture, Victoria, B.C.

Sample from the farm of John Bacon, near Enderby. This soil is rather of the nature of a deposit for it is reported by Mr. Palmer, Inspector of Fruit Pests for British Columbia, as issuing from a hillside. It subsequently hardens by simple exposure. From the vigorous growth of the vegetation in the immediate vicinity of the deposit, Mr. Palmer considered that it might be of importance as a fertilizer.

This sample was received in two parts, one representing the moist, fresh material; the other, indicative of its character after exposure. Both were similar in their composition, save for the larger percentage of water in the former.

A quantitative examination of the air-dried portion furnished the following data :—

Insoluble mineral matter	·09
Carbonate of lime	94·08
Moisture, oxide of iron, alumina, &c.	5·83
	100·00

It is, therefore, evident that this is a marl of excellent quality, being practically free from sand, clay and other inert matter. Judging of this sample, both from its mechanical condition and chemical composition, I am of the opinion that it would be an excellent source of lime for use in agriculture.

A brief review of the more important agricultural purposes of marl or rather, of the functions of lime, is given on pages 161-2 of our report for 1894.

Sample of sub-soil from the farm of Godfrey Rogers, Bear Valley, British Columbia. Its overlying surface soil was of a peaty character, from four to five feet in depth, and extending over some 600 acres. On account of its location and appearance, this sample was supposed to be marl, or at least to contain a considerable quantity of lime.

As received, it was somewhat grayish, quite flocculent and loose as to texture, and very light in weight.

The air-dried sample, on treatment with hot dilute hydrochloric acid, did not effervesce, showing the absence of carbonate of lime. The insoluble residue from this digestion amounted to 80·57 per cent. This material may be considered as inert and practically useless from an agricultural standpoint. Further analysis showed that this substance yielded only a trace of lime, even to strong acids. It cannot be used, therefore as a source of lime and cannot, as far as our work goes, be considered as of any value agriculturally.

Muck Soil from Chilliwack. This soil furnished on examination the following data:—

ANALYSIS OF SOIL (AIR-DRIED).

Moisture	10·55
Organic and volatile matter	70·31
Insoluble matter (clay and sand)	11·24
Mineral matter, soluble in acid	7·90
	100·00
Nitrogen	·946

This soil is in reality a muck of excellent quality, though, as received, rather sour, undoubtedly due to want of drainage and lack of lime. It is especially rich in humus and nitrogen.

The small quantity of clay and sand present would, of course, render it unsuitable for certain crops, more especially cereals, but if this could be remedied by a judicious admixture with the sub-soil or a heavy dressing of similar materials, a very good soil should be the result.

The sub-soil proved to contain 75·84 per cent of clay and sand and 1·04 per cent of lime, which shows that it would be valuable for the purpose suggested. Since, however, it is not rich in lime, its addition to the soil could scarcely be regarded as a substitute for this amendment.

The fertilizers to which this soil would respond are potash, lime and phosphoric acid. To furnish these, wood ashes are of special value, since they not only supply potash, but also lime and phosphoric acid in notable amounts. If potash is applied as kainit or as muriate of potash it would be advisable to add lime, either as such or as marl or gypsum. Phosphoric acids may be furnished as superphosphate or, still better for land of this character, as basic slag.

The soil is rich in nitrogen, so that with the favourable climatic conditions for nitrification largely prevalent in British Columbia it is very doubtful whether the application of nitrogenous fertilizers would be profitable.

ONTARIO.

Soils from Lefaivre, Alfred Township, Prescott Co., forwarded for examination by Hon. Senator Owens.

ANALYSES OF SOILS (AIR DRIED).

	No. 1.	No. 2.	No. 3.	No. 4.
Moisture	5·31	8·35	8·20	2·67
Organic and volatile matter	7·26	51·69	36·47	8·09
Mineral matter, soluble in acid	20·91	14·51	17·02	20·45
Mineral matter, insoluble in acid	86·52	25·45	38·31	68·79
	100·00	100·00	100·00	100·00
Nitrogen	·185	1·47	1·13	·174
Lime	1·32	....	....	·82

No. 1.—A light gray loam, full of root fibres and containing very little sand. The percentage of humus (decomposed vegetable matter) is small. The soil is strong and retentive, but needs organic manures and lime to improve it. Of the former, barn-yard manure and clover suggest themselves as the best. A composted muck would also be found of great value in lightening the soil and adding to its store of humus and nitrogen. The method of enrichment by means of clover or some other of the legumes is usually the most economical to follow. The best time to plough under such a crop is when it is in full bloom. Useful sources of lime are: lime, slaked or unslaked, marl (carbonate of lime), and gypsum (sulphate of lime). On this kind of soil lime or marl would be the best to use. Briefly, the most economical treatment may be outlined as follows: First, thoroughly drain, then dress with lime or marl; say one ton per acre of the former or twice the quantity of the latter, to which may be added with advantage 10 to 20 bushels of wood ashes. If the seed bed has been well prepared, seed with clover, sowing buckwheat or rye as a nurse crop. The first crop might be cut and fed, the aftermath, when it had attained a good growth, should be turned under.

No. 2.—This is a muck soil containing much of its vegetable matter in an undecomposed condition. Thorough drainage, in order that it may become compact and at the same time rendered sweet, is to be recommended. This should be followed by an admixture, if possible, of the underlying subsoil. Lime, potash and phosphoric acid are the chief essentials in which the soil is lacking. Wood ashes and superphosphate supply these in available forms. When sourness is corrected and tilth improved by such a treatment as is now suggested, soils like this may be made very fertile, though they are not best suited to grain crops. A small dressing of barn-yard manure, to supply immediately available nitrogen, would undoubtedly be beneficial.

No. 3.—A good muck soil. Drainage, as in No. 2 is here to be strongly advised, in order tocorrect sourness and aid in improving the tilth. Lime alone, or, still better, with a certain quantity of wood ashes or some other form of potash, would undoubtedly prove of value. Oats, buckwheat, potatoes and roots generally are, perhaps, the crops best suited to this soil.

No. 4.—A stiff clay loam, containing very little sand, and in general character similar to No. 1. It, however, has not the same amount of root fibres, nor is it as rich as No. 1 in humus and nitrogen. In lime also it is very low, the amount being less than the lowest limit allowed by agricultural chemists for obtaining good returns. It is of poor tilth and very hard when dry. Like No. 1, it should never be worked when wet. In general treatment, the course suggested for No. 1 soil is here strictly applicable.

NOTE.—In the report of this Division for 1894 will be found on page 159 some remarks on the improvement of muck soils; in the report for 1895 there is a chapter on green manures, from which may be learned the value and chief features of green manuring with the legumes.

Muck Soil from near London, Ontario. In general features, this soil is similar to that from Chilliwack, B.C., previously discussed; the treatment suggested for that soil might, therefore, be followed in this case.

ANALYSIS OF AIR-DRIED SOIL.

Moisture	12·77
Organic and volatile matter	71·64
Insoluble matter (clay and sand)	5·76
Mineral matter, soluble in acid	9·83
	100·00
Nitrogen	·933

The correspondent forwarding this sample asked for information respecting the rates of application of commercial fertilizers. As doubtless there are many desirous of obtaining similar information, the following brief note is appended.

The most economical amounts to use can only be ascertained by direct trial of the soil with the crop that it is desired to feed, but much time and money can be saved by making an intelligent study of general soil characters and the special requirements of the farm crops. The subjoined table gives the limits of application between which it is usual to employ the commercial fertilizers.

	Fertilizer.	Application per Acre.
Nitrogenous	Nitrate of soda	100- 200 Lbs.
	Sulphate of ammonia	75- 200 "
Phosphatic	Superphosphate	200- 400 "
	Bone meal	500-1,000 "
	Thomas or Basic Slag	400- 500 "
Potassic	Wood Ashes	25- 100 Bush.
	Kainit	300- 700 Lbs.
	Muriate of Potash	100- 300 "
	Sulphate of Potash	150- 300 "

NOTE.—Farmers, market gardeners and fruit growers are invited to correspond with this Division if wishful for information respecting fertilizers, their composition and application. The examination, however, of all brands of commercial fertilizers upon the market is made by the Inland Revenue Department, Ottawa.

QUEBEC.

Soils forwarded for Examination by L. Morin, St. Ours. No. 1.—Farm soil under cultivation, of light gray colour, in friable lumps and powder.

No. 2.—Garden soil, somewhat darker than No. 1, but otherwise very similar to it.

ANALYSES OF SOILS (air-dried).

	No. 1.	No. 2.
Moisture	3·96	2·85
Organic and volatile matter	4·23	9·52
Insoluble mineral matter (clay and sand)	74·10	75·15
Mineral matter soluble in acid	17·71	12·48
	100·00	100·00
Nitrogen	·099	·409
Lime	traces only	

Soil No. 1, is very poor, particularly in humus (semi-decomposed vegetable matter) and in nitrogen. To furnish these constituents, barn-yard manure, a compost made with swamp muck or a green crop (preferably clover or some other legume) turned under, are to be recommended.

Lime, in which this soil is deficient, may be applied as such in the form of marl or gypsum.

Wood ashes, supplying potash, lime and certain other constituents of plant food, would undoubtedly give good returns on this soil. Superphosphate is perhaps the best form for this soil in which to furnish phosphoric acid.

Soil No. 2, is much better, as shown by the higher percentages of organic matter and nitrogen. In general characteristics, however, it is similar to No. 1, and the treatment above suggested would apply for this soil equally well.

Lime may be applied every 5th year, or somewhat more frequently, at the rate of 40 bushels per acre. The usual dressing of gypsum is from 200 to 400 pounds per acre.

Wood ashes give good returns in applications of 40 to 80 bushels per acre. Other forms of potash are, kainit and muriate of potash; of the former, 400 pounds and of the latter, 100 pounds constitute the average amounts for an acre.

Superphosphate at the rate of from 200 to 400 pounds per acre will be found useful for the cereals, grass and turnips.

Considerable experience, together with the knowledge of the special requirements of the various farm crops, is necessary before the most economical amounts of these concentrated fertilizers can be applied. The above quantities are to be considered only as suggesting the limits between which in ordinary farm practice most profitable returns will be obtained.

Soil forwarded for examination by J. O. E. Forest, St. Jacques, Montcalm. A sandy soil, analysis showing but a small percentage of clay. In appearance, it is a loam of fair quality.

ANALYSIS OF SOIL (air-dried).

Moisture	2·60
Organic and volatile matter	8·92
Sand and clay	74·26
Mineral matter, soluble in acid	14·22
	100·00
Nitrogen	·323
Lime	Very small quantity.

Our results do not indicate that the soil is exhausted of those elements required by plants, but without doubt its fertility is capable of improvement. Containing, as it does, sand, clay and humus in fair proportions, it may be termed a soil of average quality, but, nevertheless, by judicious culture and the employment of fertilizers, its crop-producing powers may be increased.

The first care should be towards adding to its store of humus, that is, semi-decomposed vegetable matter. This naturally can be done by heavy applications of barn-yard manure. If such a course, however, is impossible, the practice of "green manuring" should be adopted. This is best and most economically effected by growing clovers, either as a crop or with the cereals, and turning under the aftermath. By such means both nitrogen and readily decomposable vegetable matter are furnished, supplying plant food for future crops, and permanently improving the tilth or texture of the soil.

To facilitate the growth of clover and for the purpose of increasing the soil's store of potash and lime, we would advise an application of wood ashes. These supply both potash and lime, elements required by clover in fairly large amounts, and also contain in notable quantities other plant constituents. Gypsum or land plaster is also a fertilizer of much value for clover, but, it should be remembered, does not contain any potash.

In the place of wood ashes, muriate of potash, at the rate of 100 pounds per acre, may be used. Superphosphate for supplying soluble phosporic acid may also be employed at the rate of 200–300 pounds per acre. For wheat and grass a top dressing of 100 pounds of nitrate of soda in the spring, after growth has commenced, will prove of value in encouraging the young plants.

Soil forwarded for examination by Messrs. Gervais & Frère, Lawrenceville. This is a grayish-yellow, sandy loam, very loose in texture and slightly acid. It contained a considerable quantity of undecomposed root fibres.

ANALYSIS OF SOIL (air-dried.)

Moisture	2·57
Organic and volatile matter	7·58
Insoluble mineral matter (clay and sand)	81·45
Mineral matter, soluble in acid	8·40
	100·00
Lime	·27
Nitrogen	·220
Coarse sand	72·0

This soil, underlaid by coarse sand, has according to accounts been cropped for several years without an application of manure. Its store of available plant food must thereby have been greatly diminished—a process undoubtedly assisted by the leachy character of the soil.

To improve the soil, we would advise organic manures, together with an application of lime, in which the soil is deficient. Barn-yard manure will, of course, be valuable, but if this is difficult to obtain we counsel the occasional turning under of a green crop of clover. A compost made with swamp muck will also prove of service for supplying organic matter and nitrogen.

Commercial fertilizers, such as muriate of potash and superphosphate, may be applied to such soils in the autumn, or, if necessary, in spring, being harrowed in after the ploughing and before seeding. Wood ashes will supply potash and lime and a notable quantity of phosphoric acid. Forty bushels per acre applied every fourth or fifth years should prove remunerative. Muriate of potash at the rate of 100 pounds per acre may be used if wood ashes are not readily obtainable. Potash is required especially for leafy crops.

Superphosphate, for furnishing soluble phosphoric acid, can be used to advantage for cereals, turnips, &c., at from 200 to 400 pounds per acre.

To induce vigorous growth in the early part of the season, 100 pounds of Nitrate of Soda per acre can be used as a top dressing, applied in, say two portions at intervals of 3 or 4 weeks after the appearance of the crop.

THE COMPOSITION OF CERTAIN CANADIAN VIRGIN SOILS.*

Of the many investigations carried on by the Chemical Division of the Dominion Experimental Farms during the past ten years, not the least in scientific interest nor in agricultural value have been those which have had for their object the determination of the amounts of plant food in certain typical and virgin soils of the Dominion. The data are not as yet voluminous, for this work is one that consumes much time, and other and more pressing demands have only permitted an intermittent attention to it; nevertheless we have been able to place on record results which go far towards indicating the character of many soils representative of large untilled, or, at all events, but partially settled districts in Canada.

In all, we have submitted to complete analysis about ninety samples. These comprise surface and sub-soils taken from the Atlantic to the Pacific in the various provinces of the Dominion, and, to the best of our knowledge, from areas which had never been manured or cropped.

It is not my purpose to present in this paper all the data obtained, nor to attempt an interpretation of all the figures, chemical and physical, that have resulted from this work, for such would scarcely be possible. My intention rather is to bring before you the percentage composition of these soils as regards certain of the more important elements of fertility, and to draw such deductions as to relative richness or deficiency in plant food as may seem warranted when comparing the figures with those obtained from the examination of soils in other countries.

The Value of Ordinary Soil Analysis.—The exact value of a chemical analysis towards ascertaining the fertility of a soil is a question that probably will always be open to discussion, and doubtless all present are aware that no problem in agricultural science has excited more interest or been debated with greater warmth. We are obliged to confess that a knowledge of the amounts of nitrogen, potash, phosphoric acid, &c., as estimated by our present methods of determining "total" or maximum amounts of plant food constituents by strong solvents, is not in itself sufficient for making a diagnosis as to the crop-producing power of a soil. Why this is so, will be apparent upon reflection. In the first place, hydrochloric acid of the strength employed in the analysis dissolves from the soil the mineral constituents in much larger amounts than are present in an immediately available condition; and secondly, there are factors other than the amount of plant food present that are equally important in determining a soil's fertility. The physical condition of the soil, including retentivity of moisture, capillarity, permeability, &c., the meteorologic conditions, including rainfall, mean temperature, sunshine, &c., must all be carefully considered in conjunction with the analytical figures when endeavouring to interpret the latter with a view of ascertaining the soil's probable crop-producing ability. The case is very similar to that of water analysis, in which it is universally held that all possible information respecting the source and its environment must be in the possession of the chemist before he can intelligibly and correctly give judgment from his figures upon the quality of the water under examination.

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* Read before the Chemical Section of the British Association for the Advancement of Science, at Toronto, August, 1897.

It is often urged that our usual method of soil analysis, using hot, strong hydrochloric acid as a solvent, only indicates the amounts of plant food that may become available, not the amounts that are immediately assimilable. This is true, and it is certainly a drawback, but it in nowise makes the results of no value, as some would have us believe. It gives, we may suppose, the maximum amounts of the mineral elements present which under the influence of favourable climatic and mechanical conditions may become useful to crops. It shows decisively deficiencies in any of the plant food constituents, if such exist, and consequently affords valuable information regarding the suitability of the soil for various farm crops, and, further, indicates the direction in which fertilization may be economically and profitably carried on. Soils with large stores of plant food, even if such be partially or largely in a locked-up condition, have repeatedly been shown to have a greater agricultural value than those that furnish to the same solvent less amounts. The probabilities are that, other things being equal, soils of the former class will contain, or, at all events under favourable circumstances, will yield, larger amounts of readily assimilable food than those possessing smaller "totals" or maximums. Soils showing percentages of maximums above the average invariably prove fertile, if climatic influences are favourable. We cannot argue very closely, I admit, but from such an analysis we are able to predict possibilities as to productiveness, provided agencies favourable to the unlocking of soil plant food are present.

Soil Tests for Ascertaining Available Plant Food—Pot or plot experiments are as yet, the only tests that can infallibly indicate a deficiency in available fertilizing constituents. Such methods, however, consume much time, are cumbersome, and from their very nature scarcely suited to wide application. What is needed is a laboratory method or methods, in addition to those we now use, which will furnish data in accordance with the results obtained by actual soil trial crops. This is a question that at present many agricultural chemists are engaged upon, and I venture to hope that ere long the renewed interest in this work will result in satisfactory methods being established, both for available mineral constituents and nitrogen.

Dr. Dyer's Work.—In March, 1894, Dr. Bernard Dyer's work on available plant food in soils appeared. It was the beginning of a new era in soil analysis. Since that date increased attention has been paid to this branch of research, and especially so on this continent. Every year sees new and interesting data, the results of the labours of agricultural chemists of the experimental stations of the United States. Dr. Dyer, it will be remembered, showed, among other valuable results, that the root sap and the exudation of rootlets possessed an acidity approximately equivalent to that of a one per cent solution of citric acid. From this he argued that such a solution would have a solvent action on the mineral constituents of the soil similar and equal to that exerted by growing crops. Further, he showed that results obtained by this method were strictly in line with the deductions made from the data of actual field trials. He therefore proposed that this solvent should be used to determine available potash and phosphoric acid in soils. Workers in the United States, members of the Association of Agricultural Chemists, besides using this solvent during the past few years, have proposed and worked with other solutions, such as ammonium chloride and calcium chloride. None of these, however, have had the support or corrobation of experiments to show that they were similar or comparable in their action upon the soil to the solvent action of root exudations. Consequently they do not as yet appeal to agricultural chemists with the same force as the solvent proposed by Dr. Dyer.

Solvents Employed.—The solvent used by us in the determination of "total" or maximum percentages of the mineral constituents has been hydrochloric acid, sp. gr. 1·115 (corresponding to 22·86 per cent, HCL.), 10 grms, of the air dried soil being digested with 100 c. c. of the acid at the temperature of the water bath for ten hours.

For the estimation of the "available" potash and phosphoric acid, 1 per cent, citric acid solution has been employed, digesting 100 grms. of air-dried soil with 500 c. c. of the solvent for five hours at room temperature.

Standards of Fertility.—It has been remarked that climate and the physical condition of a soil are potent factors in determining fertility. To this might be added the statement that fertility (i.e., crop-producing power) is a relative quality, depending to a large extent on the crop grown. The ability of plants to forage for and appropriate their food varies greatly, so that what might be an adequate supply of food for one might prove an insufficiency for another. Buckwheat and wheat will very well illustrate this variation in foraging and assimilating ability. For these reasons chiefly—for of course there are others—it is impossible to establish rigid standards as regards the minimum amounts of plant food that must be present in order that a soil may be classed as economically productive.

It is not impossible, however, using a large number of analyses of soils, the productive power of which is approximately known, to deduce percentages or limits of plant food, below which, under ordinary circumstances, soils may be considered as deficient or lacking, and above which they may be considered as well supplied or rich in the essential mineral elements. Professor Hilgard, of the California Experiment Station, the highest authority on American soils, considers that less than 0·09 per cent of potash indicates a deficiency in this element, and that the limits of this constituent in good soils range, approximately, from 0·8 to 0·5 per cent in heavy clays, from 0·45 to 0·30 per cent. in medium loams, and from 0·3 to 0·1 per cent in sandy loams. Regarding phosphoric acid, he says that 0·2 per cent, is sufficient when associated with a good supply of lime, though it may in certain soils reach or exceed 0·3 per cent. Respecting lime, Hilgard states 0·1 in sandy loams as the lowest limit for good crops, 0·25 per cent, in clay loams, and 0·3 per cent, in heavy clay loams.

Standards of Fertility in Canadian Virgin Soils.—Our data indicate that good agricultural soils in Canada possess usually between 0·25 per cent, and 0·5 per cent, potash; less than 0·15 per cent, in our experience, points to the necessity, or at all events to the value, of potassic fertilizers, though with good climatic and soil conditions the limit might be reduced to that suggested by Hilgard.

The phosphoric acid in Canadian virgin soils of average fertility lies usually between 0·15 and 0·25 per cent. Some good soils contain from 0·25 to 0·3 per cent, and a few exceed the latter figure. The adequacy, or otherwise, of phosphoric acid in a soil would appear to depend largely on the accompanying amount of lime. Increased crop production has usually followed the application of phosphatic fertilizers to soils containing less than 0·15 per cent, phosphoric acid.

Lime ranks next in importance to potash and phosphoric acid in a consideration of the mineral constituents of plant food. Our experience goes to show, that clay soils containing less than 0·5 per cent will have their productiveness increased by a dressing of lime in one or other of its agricultural forms. Peaty soils, and soils generally that are rich in organic matter, are frequently poor in this element. All such have been found to respond to an application of lime, and more particularly so when given in conjunction with potash and phosphoric acid. For these classes of soils, therefore, I deem it advantageous that they should contain at least 1 per cent of lime.

Richness in nitrogen may be measured to a large degree by the organic or humus content, though the condition or stage of decomposition of this organic matter is an important factor in determining the nitrogen's availability. The larger number of our good soils contain between 0·1 and 0·2 per cent, though many reach 0·5 per cent, and some exceed 1 per cent nitrogen.

In the following brief review of Canadian virgin soils I have not given any detailed data of their physical condition or composition, for the determinations in our laboratory have been confined simply to the separation of the mineral components into (*a*) clay and fine sand, and (*b*) coarse sand, according to the method of Schloesing. The results in this separation, together with remarks on the physical condition or tilth of the soils, have been indicated in general terms in discussing the samples. If it had been possible to have made a more extended physical examination I believe the data would have proved most valuable, for the degree of permeability to water and air, the relative size of the soil particles, compactness, water-holding capacity, etc., are important factors towards establishing a soil's suitability for the various agricultural crops.

BRITISH COLUMBIA.

Beginning on the west or Pacific coast, attention is first directed to the statement of the composition of certain typical British Columbian soils, as set forth in the following table.

TABLE I.

ANALYSES OF SOILS (WATER-FREE)—BRITISH COLUMBIA.

Number.	Locality.	Surface or Sub-soil.	Character of Soil.	Potash.	Phosphoric Acid.	Nitrogen.	Lime.	Loss on Ignition.
1	Victoria, Vanr. Isd..	Surface	Valley soil, black loam.	·23	·19	·594	1·29	15·69
2	" " ..	Depth, 12 to 18 in......	....	·23	·19	·506	1·12	13·61
3	" " ..	Depth, 18 to 24 in......	....	·26	·12	·146	1·01	4·63
4	Alberni " ..	Surface	Dark red clay loam....	·32	·08	·127	1·14	10·79
5	" " ..	"	" sandy loam.....	·17	·34	·163	1·00	11·32
6	Cowichan " ..	"	" " b'ch soil	·39	·32	·102	1·37	7·10
7	Ladners, N. Westr..	"	Alluvial gray blk. loam	·52	·28	·610	·50	17·25
8	Squamish " ..	"	Valley soil...........	·38	·20	·091	1·68	3·38
9	Pitt Meadows " ..	"	Alluvial black loam...	·36	·52	1·050	·32	31·14
10	" " ..	Sub-soil	Grayish yel. sandy loam	·45	·13	·995	·33	6·37
11	Agassiz " ..	Surface	First bench	·32	·24	·159	·86	6·87
12	" " ..	"	Second "	·35	·14	·101	·78	4·34
13	" " ..	"	Valley	·39	·18	·154	·96	6·92
14	" " ..	"	"	·35	·26	·155	·97	7·12
15	Chilliwack " ..	"	" soil, alluvial....	·63	·21	·166	·98	7·72
16	" " ..	Sub-soil	....	·51	·23	·108	·90	5·90
17	Mission, Yale. ...	Surface	Light gray clay loam..	·45	·28	·124	1·86	3·96
18	" "	Sub-soil	....	·62	·33	·076	1·90	3·35
19	Guisichan "	Surface	Light gray sandy loam.	·32	·30	·077	1·22	2·66
20	" "	"	Dark gray "	·53	·30	·236	1·70	6·18
21	" "	"	" "	·65	·38	·255	1·76	6·59
22	" "	"	" "	·55	·34	·259	1·25	7·13
23	" "	"	Light gray "	·45	·27	·045	1·61	2·02
24	Quesnelle, Cariboo...	"	Dark gray "	·39	·22	·399	17·77	12·01
25	" " ...	Sub-soil	....	·53	·19	·108	3·80	4·60
26	Cottonwood River...	Surface	Yellowish sandy loam.	·32	·34	·234	1·14	8·28
27	" " ...	Sub-soil	Very sandy...........	·16	·29	·057	·99	3·03
28	" House ..	Surface	D. gray sandy loam....	·57	·24	·412	1·07	13·04
29	" " ..	Sub-soil	Yellowish gray... ...	·47	·10	·050	1·22	3·02

These include three well marked groups :

1. Deltaic Soils.—These have been formed by the accumulation of detritus, as at the mouths of the Fraser, Pitt, and other rivers ; very rich in plant food.

2. Valley Soils.—Largely alluvial as regards origin ; rich, as a rule, in both mineral constituents and organic matter.

3. Bench and Plateau Soils.—At varying altitudes on the sides and summits of elevations and mountains ; variable, but usually light and sandy ; of medium fertility, though sometimes very poor.

Possibly there may be other classes of soils in the province, but our investigation has as yet only included those now referred to.

Soil No. 1.—Taken from a valley near Victoria, Island of Vancouver, and representative of a large area that is considered good farming land. When air-dried, it is a dark brown, almost black loam, of excellent texture, homogeneous throughout, and containing clay and humus in good proportions.

In nitrogen and organic matter this soil ranks very high, and, though not as rich in total potash and phosphoric acid as many of our virgin soils, it is by no means deficient in these important constituents.

Soils Nos. 2 and 3.—Represent the soil immediately beneath the preceding sample at the depth of 12 to 18 inches and 18 to 24 inches respectively. In physical appearance and condition, as well as in composition, No. 2 is very similar to sample No. 1; showing that the surface soil has practically a depth of 18 inches. While, as might be expected, the lower sample (No. 3) is considerably poorer in organic matter and nitrogen, the percentages of potash and phosphoric acid are identical with those in the overlying soil. It is of a yellowish-gray colour with streaks of black soil throughout its mass. It will be seen to be of excellent quality for a sub-soil.

It will be interesting now to consider the proportions or percentages of these elements that may be looked upon as more or less immediately available for plant use, *i. e.*, the amounts extracted by the 1 per cent citric acid solution before referred to.

TABLE II.

Comparison of "Available" with "Total" Amounts of Potash and Phosphoric Acid.

No.	Soil.	Potash.			Phosphoric Acid.		
		Total Potash.	Available Potash.	Percentage of total potash available for plant use.	Total Phosphoric Acid.	Available Phosphoric Acid.	Total percentage of phosphoric acid available for plant use.
1	Surface	0·23	0·00483	2·20	0·19	0.01020	5·66
2	Between 12 and 18 ins..	0·23	0 00299	1 36	0·19	0·01055	5·85
3	Between 18 and 24 ins..	0·26	0·00169	0·64	0·12	0·00588	4·90

In speaking of minimum limits of available plant food, Dr. Dyer says:—"From a careful consideration of the whole of the results, it would perhaps not be unreasonable to suggest that, when a soil is found to contain as little as about 0·01 per cent of phosphoric acid soluble in a 1 per cent solution of citric acid, it would be justifiable to assume that it stands in immediate need of phosphatic manure."

In potash he obtained results that led him to consider that an application of special potash fertilizers would prove valuable when the soluble potash fell below 005 per cent.

In available mineral plant food the surface soil now under consideration is seen to give results approximating these limits. The estimations above tabulated are, however, more particularly useful in showing that the upper or surface portions of the soil contain much larger amounts of available food than the underlying soil. We are thus furnished with data to support the view that the greater productiveness of a surface soil, compared with its sub-soil, apart from the presence of nitrogen, is due in large part to the availability rather than to the total amounts of mineral fertilizing constituents present.

Soil No. 4.—From Alberni, Island of Vancouver; a clay loam of a deep red colour which masks entirely the presence of the large amount of organic matter present. This sample is said to represent the soil to a depth of 9 inches over an approximate area of 10,000 acres. The sub-soil of this area is variable, sometimes clay, sometimes gravel and sand. In potash this soil is comparatively rich; in phosphoric acid, however, it is much below the average. As regards nitrogen it is of medium quality.

Soil No. 5.—Also from the district of Alberni, but differing from No. 4 in certain important features. It is known locally as "fern and sallal" soil, for the reason that on this virgin soil these plants grow most luxuriantly, crowding out to a great extent other vegetation. Our correspondent writes that at first this soil gives but poor returns, but after several ploughings, i.e., several seasons working, the yield increases, and good crops are obtained. An examination of the soil showed it to be distinctly acid to litmus paper. There is in this, no doubt, an indication of the cause of the unproductiveness of the land when first broken up. The effect of exposure to the air through culture would be to correct this sourness, while at the same time locked-up plant food would be set free. Lime and wood ashes have given excellent returns on this soil.

The very large percentage of oxide of iron in these soils—exceeding, frequently, 20 per cent—is a feature worthy of note. It is probable that in the virgin soil a part of this iron is in the ferrous condition, due to the presence of organic matter and to certain other factors. The oxidizing of this iron through cultural methods would free the soil of compounds injurious to the tender rootlets of agricultural crops. It is further important to point out that this soil, though yielding 1·0 per cent of lime to hydrochloric acid, sp. gr. 1·115, had a distinctly acid reaction, and was much benefited by an application of lime.

Soil No. 6.—A bench soil, deep red, of sandy character, from Cowichan, Island of Vancouver, and very similar in appearance to Nos. 4 and 5. It contains less organic matter and nitrogen than these soils, and while somewhat below the average in this respect, it is not to be regarded as deficient in these essential elements.

A determination of the amounts of available potash and phosphoric acid, ascertained by the citric acid method, afforded the following data :—

Available potash	0·0089
Available phosphoric acid	0·0171

While these amounts do not fall below the limits named by Dr. Dyer, they are, however, such as to suggest that both potash and phosphoric acid would prove beneficial, and give good returns in increased crop yields.

Soil No. 7.—A grayish-black soil of excellent texture, from the valley of the Fraser River near one of its mouths, and resulting from the deposition of silt brought down by this river. An area of over 30 square miles is, it is stated, covered by soil of this origin and character. Both from chemical and physical data, this soil would be judged an extremely fertile one, and practical results confirm this opinion. Of phosphoric acid, potash and nitrogen it possesses quantities considerably above the averages already discussed for fertile soils.

Soil No. 8.—From the Squamish Valley, in the district of New Westminster. The valley is said to have an area of 14,000 acres of arable land. Its sub-soil is clay, though sometimes running into sand. Though containing adequate amounts of mineral food for crop requirements, it is below the average in nitrogen and humus. The ploughing under of green crops—preferably one of the legumes—has been found to improve this soil, both as regards tilth and productive power.

Soil No. 9.—From the Pitt Meadows, New Westminster, an alluvial deposit, composed of the detritus brought down by the Pitt River. It is a black loam, in moderately fine granular condition, and possessing a large amount of vegetable organic matter. On moistening it does not become plastic or sticky, and easily crumbles when dry. The soil granules display a remarkable homogeneity, proving the very intimate incorporation of the vegetable organic matter with the inorganic basis of the soil.

Its mechanical texture seems to be such as would allow freedom for root development, for permeation of air and percolation of water, while at the same time it is sufficiently compact and heavy to prevent easy leaching and to be retentive of moisture.

In potash and phosphoric acid it is seen to be well supplied, comparing most favourably in this respect with soils of great productiveness.

In nitrogen the soil is particularly rich, possessing about 34,000 pounds per acre, estimating the weight of an acre of soil to the depth of 1 foot to be 3,500,000 pounds. The physical condition of this soil being such that nitrification would proceed satisfactorily, the value of this large amount of organic nitrogen becomes obvious.

Soil No. 10.—Is the sub-soil of the above, and is a grayish-yellow sandy loam. From its texture we should expect it to offer a very fair drainage to the surface soil.

Soils Nos. 11, 12, 13 and 14.—Are surface soils from the Experimental Farm at Agassiz. They are all of medium quality; in tilth rather light, and, though possessing a fair amount of clay, sand predominates. Though not presenting any marked differences, that of the first bench approaches closely in composition to that of the valley soil No. 14. The valley soils are, as a rule, distinctly richer than those occurring at higher elevations.

Soils Nos. 15 and 16.—Are from Chilliwack, on the Fraser River. They are valley soils, alluvial in origin. While not so rich as the delta soils of the Fraser and Pitt Rivers already discussed, they are by no means poor, possessing a good supply of potash and fair amounts of phosphoric acid and potash. They probably represent more or less truly the character of those soils of medium fertility found in British Columbia in many of her river valleys.

Soils Nos. 17 and 18.—A surface and sub-soil, respectively, from Mission, on Okanagan Lake, Yale district. Both are excellent as regards potash and phosphoric acid, but of poor tilth, caking on being dried into hard masses. The surface soil is somewhat deficient in organic matter, and might be much improved by drainage, judicious culture, and the turning under of a green crop—technically known as green manuring.

Soils Nos. 19, 20, 21, 22 and 23.—Are surface soils from the ranch of His Excellency the Governor General at Guisachan. They are sandy loams of varying shades of gray, and, with the exception of Nos. 19 and 23, might be termed, as far as composition is concerned, soils of more than average fertility. These latter are, however, somewhat deficient in humus and nitrogen.

Soils Nos. 24 to 29.—Are from plateaux and upper benches on the Fraser in the Cariboo district, a practically as yet unsettled area. Clover and indigenous grasses of good quality, it is stated, grow well upon them, and the probabilities are that much of the area here represented will be found suited for grazing purposes. Surface soils Nos. 24 and 28 are particularly rich, judging from the chemical analysis, and should prove very fertile if climatic conditions are favourable.

NORTH-WEST TERRITORIES AND MANITOBA.

The prairie soils of the North-west Territories and Manitoba are justly noted for their productiveness. They contain, as a rule, large percentages of all the essential constituents, and are characterized by percentages of humus and nitrogen far above the average. The prevailing surface soil, speaking generally, is a black or grayish black loam in which the vegetable matter is well decomposed and thoroughly incorporated with the inorganic compounds of the soil. It varies in depth from a few inches to one, two, or even more feet, and over large areas is underlaid with a heavy clay sub-soil.

Occasionally we have had sent to us soils from certain districts in the North-west Territories, in which it is stated that poor yields are obtained. On examination, these soils have been found to possess plant food in adequate quantities for crop requirements. Further, they have usually been found to be free from alkali. Investigation has shown that the trouble was, not in the lack of plant food, but rather in the meteorologic conditions; a scanty rainfall being really the cause of the poverty of growth. In districts subject to drought irrigation, if feasible, would render such soils most fertile. An illustration of this is afforded by the late irrigation trials at Calgary, which have proved so successful from an agricultural point of view. In this connection we have to add that unfortunately no means for extensive irrigation appear practicable for several of the districts here referred to in the North-west Territories.

The presence of "alkali" in the soil in patches over certain areas in Manitoba and the North-west Territories is intimately connected with the question of rainfall. An alkali area may be restricted to a few square feet, or it may cover some acres. Patches of alkali soil occur surrounded by land of great productiveness.

The formation and retention of alkali are dependent upon the amount of water the soil receives and the facility for sub-soil drainage. We need not now discuss the occurrence of alkali nor its nature, but it is important to note that, though the amounts of alkali found in samples submitted to us are often so great as to render the growth of wheat impossible, we have invariably found such soils to be rich in mineral and organic constituents. This shows that the soil proper is capable of acting as a fertile one, provided the alkali were got rid of by drainage, irrigation, or treatment with gypsum.

TABLE III.

ANALYSIS OF SOILS (WATER-FREE)—NORTH-WEST TERRITORIES AND MANITOBA.

No.	Locality.	Surface or Sub-soil.	Character of Soil.	Potash.	Phosphoric Acid.	Nitrogen.	Lime.	Loss on Ignition.
30	Yorkton, N.W.T....	Surface...	Black, sandy loam.	·49	·21	·501	·06	14·01
31	" "	Sub-soil	....	·42	·09	·130	·75	8·18
32	Saltcoats "	Surface.....	Black, sandy loam.	·34	·21	·571	2·90	13·54
33	Moosomin "	"	Black loam.......	·36	·11	·479	·95	11·79
34	Calgary "	"	....	·44	·17	·447	·92	12·23
35	Tilley Tp. "	"	....	·27	·18	·398	·37	11·13
36	Vermillion Hills,....	"	....	·17	·17	·354	·50	10·43
37	Red Riv. Valley, Man	"	....	1·03	·29	1·005	1·89	26·29

In the foregoing table we have given analytical data of seven surface soils from the North-west Territories. Though there is a greater uniformity in the texture and composition of soils upon the prairies than among soils of the eastern provinces, no claim is made that the vast extent of the territories is represented by these samples—they are altogether too few in number. They may serve, however, to indicate the general character of the soils over certain large areas.

Without discussing these soils in detail, attention may be called to their high nitrogen content and the large amounts of organic matter that are almost invariably present. These soils also contain, as a rule, more than the average amount of potash. Our results do not show them to be noted for phosphoric acid, though they possess quantities quite equal to those in many very fertile soils. It seems more than probale to the writer that the successive cropping of the land with wheat, which has been so common a practice in Manitoba and the Territories for some years, must lead in the near future to the necessity of replacing more particularly of available phosphoric acid.

The great depth of the surface soil over large areas accentuates our deductions respecting the vast stores of plant food laid up in the plains for future crops. We are of the belief that where poor crops only are procurable the climatic conditions are rather at fault than that there is a lack of plant food. Even in soils containing injurious amounts of alkali we have found, as already pointed out, an abundance of fertilizing constituents; drainage, if there is an adequate rainfall, frequently being all that is necessary to bring them into a state of productiveness.

Soil No. 37.—Represents the unfertilized and uncropped prairie soil of the Red River Valley, Manitoba. It was taken from section 31, township 4, range 1, west. The uniformity in the character of the soil over a very large area in Manitoba makes the data here presented of more than ordinary importance.

The surface soil, which is fairly uniform throughout its depth, averages a little over two feet in thickness and merges gradually into the subsoil, which is blue clay. The latter, as tested by boring for water at this spot, extends at least to a depth of 250 feet.

The soil is a deep black loam, of a fine and peculiarly characteristic granular order. It reduces easily between the fingers in the air-dried condition to a grayish brown powder. Though there is present a considerable amount of undecomposed root-fibre, the soil proper exhibits a remarkable homogeneity, indicating a process of physical refining in its formation and a uniformity in the chemical composition. The very large amount of organic matter present is undoubtedly most intimately incorporated with the clay and sand which constitutes the basis of the soil.

Though containing a large amount of clay, laboratory experiments show that this soil does not readily "puddle" on moistening, nor on subsequent drying does it form into a hard mass, but readily granulates on slight pressure. The large amount of organic matter present has already been remarked; it exceeds 25 per cent of the water-free soil. The nitrogen is found to be practically 1 per cent, which would show that there is contained in an acre of soil to the depth of 1 foot more than 30,000 pounds of this element. Since ordinary fertile soils to a like depth contain from 3,500 to 10,000 pounds of nitrogen per acre, the vast reserve of this valuable constituent in this prairie soil is apparent.

The soil is also very rich in potash, containing an amount far in excess of that ordinarily met with in fertile soils. But two other virgin soils examined by us approach its potash content, 1·03 per cent.

Of phosphoric acid it contains 0·29 per cent. This is somewhat above the average, most of our good soils showing between 0·15 per cent and 0·25 per cent phosphoric acid.

We may safely conclude that there is here ample scientific proof of the well-nigh inexhaustible stores of plant food, and that this prairie land, as regards the elements of fertility, ranks with the richest of known soils.

Concerning the prairie soil of the Red River Valley, Dr. Geo. M. Dawson, Director of the Geological Survey of Canada, wrote some years ago as follows:—

"Of the alluvial prairie of the Red River much has already been said, and the uniform fertility of its soil cannot be exaggerated. The surface, for a depth of two or four feet, is a dark mould, composed of the same material as the subsoil, but mingled with much vegetable matter. Its dark colour is no doubt due in part to the general accumulation of the charred grasses left by the prairie fires. The soil may be said to be ready for the plough, and in turning the tough thick prairie sod, the first year a crop of potatoes may be put in, though it is not efficiently broken up till it has been subjected to a winter's frost. When the sod has rotted, the soil appears as a light friable mould, easily worked and most favourable for agriculture. The marly alluvium underlying the vegeable mould would, in most countries, be considered a soil of the best quality, and the fertility of the ground may, therefore, be considered as practically inexhaustible.

"The area of this lowest prairie has been approximately stated as 6,900 square miles but the whole is not at present suitable for agriculture. Small swamps are scattered pretty uniformly over its surface. The greater part of these swamps are, however, so situated as to be easily drained, either into the Red River or some of its tributaries, which are usually depressed 30 or 40 feet below the level of the surface.

"As a measure of the possible agricultural capacity of this great valley, take one-half of the entire area, or 3,400 square miles, equalling 2,176,000 acres, and for simplicity of calculation, let it be supposed to be sown entirely in wheat, then at the rate of 17 bushels per acre, which according to Prof. Thomas, is the average yield for Minnesota, the crop of the Red River valley would amount to 40,992,000 bushels."

ONTARIO.

The review of soils in this province will be restricted to certain surface and subsoil samples collected in the district of Muskoka a district lying somewhat more than 100 miles to the north of Toronto, and considered for the most part, more picturesque than agricultural; it is rocky and abounding in lakes, well timbered, save where destructive fires have swept through—with stretches of fairly good, though as a rule, light soils along the river valleys and on the lower levels. Our data respecting virgin soils in other parts of the province of Ontario are too fragmentary to warrant their insertion in this paper.

TABLE IV.

ANALYSES OF SOILS, (WATER-FREE)—ONTARIO.

No.	Locality.	Surface or Subsoil.	Character of Soil.	Potash.	Phosphoric Acid.	Nitrogen.	Lime.	Loss on Ignition.
38	Sinclair Tp. Muskoka	Surface.....	Sandy loam......	·11	·27	·186	·12	8·74
39	Chaffey Tp. "	"	"	·08	·12	·139	·40	6·79
40	" "	Subsoil.....	Sand............	·08	·18	·074	·20	3·53
41	Franklin Tp. "	Surface.....	L. grey loam......	·61	·18	·103	·76	6·31
42	" "	Subsoil.	....	·02	·08	Trace.	·66	3·70
43	Perry Tp. "	Surface.....	Sandy loam.......	·04	·18	·296	·08	9·40
44	" "	Subsoil.	....	·06	·18	·119	·13	5·10
45	Brunel Tp. "	Surface.....	Clay loam........	·46	·17	·084	1·28	2·94
46	" "	Subsoil.	....	·29	·09	·064	1·07	2·39

Soil No. 38.—From Sinclair township. A shallow, very loose, sandy soil; the subsoil of hard-pan is found at a depth of from 6 to 12 inches. Though moderately rich in phosphoric acid, nitrogen and humus, it is below the average in potash and lime.

Soils Nos. 39 and 40.—Surface and subsoil from township of Chaffey. A shallow sandy loam, running into a subsoil of sand. Hard-pan exists at a depth of 15 inches. The surface soil is deficient in potash, but is otherwise of medium quality as regards plant food.

Soils Nos. 41 and 42.—From Franklin township. The surface soil is a light gray clay loam, high in potash, fair in phosphoric acid and low in nitrogen; lime is present in an amount that might be considered large for Muskoka soils.

Soils Nos. 43 and 44.—Perry township, Parry Sound district. Soil and subsoil. The country is described as level or gently sloping, with no rocky bluffs, as well as timbered with excellent hardwood.

Both samples are light and sandy in character, and exceedingly low in potash and lime. Regarding the surface soil, we may say that the percentage of phosphoric acid is fair, and that in nitrogen it is above the average soils of this district.

Soils Nos. 45 and 46.—Surface and subsoil from Brunel township. The surface soil is a clay loam of a light gray colour, from 8 to 12 inches in depth. It is a fairly strong and retentive soil, and in this respect differs from the preceding members in this series. The features in its favour are the comparatively high percentages of potash and lime. In nitrogen and humus, however, the soil is poor.

It is thus seen that the soils of this northern part of Ontario are characterized by a preponderance of sand, the larger number being such as would be classed as light or very light loams. It is further of importance to note that in lime these soils are, generally speaking, poor. They are loose in texture and very apt to dry out in season of drought. Though not heavy enough to make good wheat soils, they grow good crops of oats and potatoes. Being responsive to manures, large yields of root and fodder crops can, under good system of culture, readily be obtained in favourable seasons. The district is better adapted for grazing and dairying than for the growth of cereals.

QUEBEC.

The following table presents the data obtained from the examination of ten soils from the province of Quebec. They, as the preceding samples, have been selected as typical average soils; not on the one hand, representing the richest; nor, on the other, the poorest lands.

TABLE V.

ANALYSES OF SOILS (WATER-FREE)—QUEBEC.

Number.	Locality.	Surface or Subsoil.	Character of Soil.	Potash.	Phosphoric Acid.	Nitrogen.	Lime.	Loss on Ignition.
47	Arthabaska County	Surface	Sandy loam	·16	·17	·296	·35	8·68
48	"	Subsoil		·17	·18	·184	·29	5·46
49	St. Adelaide de Pabos, Gaspé	Surface	Red sandy loam	·44	·07	·215	·16	7·85
50	Soulanges County	"	Gray sandy loam	·39	·33	·198	·47	7·76
51	" "	Subsoil		·47	·30	·049	·73	3·67
52	Lièvre River, Ottawa Co.	Surface	Clay loam	11	·19	·179	1·23	5·77
53	" "	Subsoil		·10	·19	·171	1·17	5·62
54	Joliette County	Surface	Black clay loam	·40	·28	·218	·82	8·06
55	" "	Subsoil		·44	·29	·030	1·05	2·09
56	Bonaventure "	Surface	Reddish yel. clay l'm	1·17	·19	.249	·10	12·37

Soil No. 47.—Surface soil from Arthabaska county. A sandy loam of fair quality; nitrogen and organic matter are present in quantities somewhat above the average, but the soil ranks rather low as regards mineral constituents.

Soil No. 48.—Subsoil to the above, and very similar in its proportion of potash and phosphoric acid. For a subsoil it may be considered high in nitrogen.

Soil No. 49.—A surface soil from Gaspé. It is a red sandy loam, containing fair quantities of potash and nitrogen, but low in phosphoric acid and lime.

Soil No. 50.—A dark gray sandy loam from Soulanges county. A light, warm, responsive soil. In all the elements of plant food it may be placed with soils of average fertility.

Soil No. 51.—Subsoil to the above, in which the mineral elements are present in fair amounts.

Soil No. 52.—A heavy clay loam from the valley of the Lièvre River, Ottawa county. A strong retentive soil. With drainage it should be well adapted to the growth of cereals. Though low in potash for a clay soil, it may be regarded as of average fertility. Drainage, the application of lime and the turning under of a green crop have vastly improved its productiveness.

Soil No. 53.—Subsoil to the above, and very similar to it, both chemically and physically.

Soil No. 54.—A clay loam from Joliette county; grayish black in colour, compact and cohesive. Both in mineral constituents and nitrogen this soil is above the average. An application of 20 bushels of lime per acre, however, resulted in almost doubling the yield.

Soil No. 55.—Subsoil to No. 54. Stiff clay, gray to reddish brown.

Soil No. 56.—A surface soil from the county of Bonaventure. A reddish yellow loam, containing a slight preponderance of sand. The large amount of iron present masks the presence of the organic matter, of which there is a notably high percentage. Not unfrequently, indeed, one may say usually, a rough estimate of the organic matter, and, incidentally, of the nitrogen, present, can be made from the colour of the air-dried soil. In soils, however, such as the one under discussion, containing high percentages of iron, the colour can no longer be used as a criterion of the soil's richness in these constituents.

Much variation, as might be expected, in character and composition is to be observed among these soils. Though several possess but small amounts of certain constituents, indicating inadequate quantities for the best returns, yet none fall below the limits of fertility previously discussed, and many are seen to compare most favourably with soils of recognized productiveness.

THE MARITIME PROVINCES.

The soils from New Brunswick and Nova Scotia examined by us have been so few in number that it would be unwise to draw from the data conclusions as to the general character of the soils of these provinces. A few examples are here given which, though representative of large areas, must not be considered as the only provincial types; the figures are inserted here to render the data somewhat more complete than they otherwise would be.

TABLE VI.

ANALYSES OF SOILS (WATER FREE)—MARITIME PROVINCES.

No.	Locality.	Surface or Subsoil.	Character of Soil.	Potash.	Phosphoric Acid.	Nitrogen.	Lime.	Loss on Ignition.
57	Sackville Marsh, N.B	Surface...	Clay loam.........	·16	·16	·131	·13	5·83
58	Restigouche, N.B....	" ...	Yellow sandy soil...	1·02	·10	·113	·23	5·46
59	Cumberland, N.S....	" ...	Sandy loam.........	·16	·09	·090	·06	3·37
60	S. W. Mabou, N.S...	" ...	"	·37	·09	·212	·05	6·97
61	Kings Co., P.E.I....	" ...	"	·47	·09	·106	·08	5·10

NEW BRUNSWICK.

Soil No. 57.—From the Sackville Marsh, at the head of the Bay of Fundy. A clay loam; of interest as an example of a soil area very uniform in character—a fact no doubt due to the origin of the soil, which is practically a tidal deposit. When thoroughly drained, an operation which frees them from salt and improves their texture, these reclaimed marsh soils are found to be exceedingly fertile. A glance at the analytical data shows that this is not altogether to be ascribed to large percentages of plant food; it is more than probable that the fine state of division and the intimate incorporation of the soil particles—due to the manner of the soil's formation and deposit—render the elements of fertility more easily obtained and assimilated by the plant.

Soil No. 58.—Balmoral settlement, Restigouche. A yellow loam, derived principally from the decomposition of felspar, through showing some quartz fragments. The percentage of potash is considerably above that found in average fertile soils—a fact undoubtedly due to the felspathic origin of the soil. With the exception of potash, however, the soil cannot be considered one equal to Canadian soils of average fertility.

NOVA SCOTIA.

Soil No. 59.—A reddish, sandy soil, from Hansford, Cumberland county. It is below the average in the more important elements, and to be regarded as a poor soil. It would probably, however, respond well to judicious culture and manuring.

Soil No. 60.—A soil from South-west Mabou, Inverness county ; very similar in appearance to No. 59, but analysis shows it to be much richer. The small percentage of lime is particularly noticeable in both these soils ; the knowledge of this fact has assisted towards the economical treatment of them with fertilizers.

PRINCE EDWARD ISLAND.

Soil No. 61.—This soil partakes of the same colour as the light red Triassic sandstone from which it has been derived, and in this respect at least this sample is representative of the characteristic soil of the province. It differs from the preceding specimens in that it is not a truly virgin soil. Some difficulty was experienced in procuring a sample which had not been cropped or manured; indeed, no guarantee of such could be obtained. The soil, however, is said to fairly represent the unmanured but cultivated soil that extends over a large area in the eastern portion of the island. It is a light sandy loam, the texture of which is fairly good. Though containing more than the average amount of potash, this soil could not be ranked, from a chemical standpoint, with our richer Canadian soils—possessing but small percentages of nitrogen, phosphoric acid and lime.

This agricultural province is justly known as a fertile one ; and we therefore presume, judging from such data as we have, that this fertility is due rather to good soil texture and favourable climatic influences than to richness of its land in plant food constituents.

The last table (Table VII) that is presented for consideration, showing the average amounts of fertilizing ingredients in the surface soils that have been examined, taken province by province, has been prepared with no little diffidence. If it were to be interpreted as placing before you data from which deductions could be made as to the average soil fertility of the yet untilled areas of the respective provinces, it must be regarded as misleading. It is not my intention that such a conclusion should be drawn. A hundred or so samples, though they are typical, and, as far as possible, thoroughly representative of large areas, taken from the thousands of square miles of uncultivated soil in the Dominion, do not afford sufficient basis for such generalizations. They are not provincial averages, they are rather averages from large untilled areas in the several provinces, and may therefore serve to indicate the general character of much of the yet unoccupied lands of Canada.

TABLE VII.

ANALYSES OF SURFACE SOILS—AVERAGES.

No. of Samples.	Province.	Potash.	Phosphoric Acid.	Nitrogen.	Lime.
21	British Columbia..........	·42	·27	·262	1·17
7	North-west Territories and Manitoba..........	·44	·19	·537	1·08
6	Ontario (Muskoka only)..........	·22	·15	·135	·44
6	Quebec..........	·44	·20	·226	·52
5	Maritime provinces..........	·44	·11	·130	·11
45	Average of all..........	·39	·18	·258	·66

When we remember that care and judgment were exercised in the selection and collection of these samples, that the analyses were carefully conducted according to modern and approved methods, that very few of the samples fall below the standards or limits fixed by agricultural chemists, and that many contained such ample stores of plant food as to warrant them in being classed among the most fertile soils, we may, I think, safely conclude that the data here set forth clearly indicate that while there are many types of soils represented in Canada, there are in all her provinces large tracts of land that, as far as plant food is concerned, compare favourably with the most productive of other countries.

Canada is fast becoming known in the markets of the world as a food-producing country. Soil rich in plant food and favourable climatic influences are the chief factors that have assisted the Canadian agriculturist in building up this reputation. These are the factors, together with intelligent, rational methods of farming, and safe and cheap means of transportation, that will continue to make agriculture here a prosperous industry. It is therefore gratifying to know that ample scientific proof is now on record to show that in our virgin soils there is such an abundance of those crude materials which crops draw upon directly, and farm animals indirectly, for their sustenance and growth.

NATURALLY-OCCURRING FERTILIZERS.

SWAMP MUCK.

We have so fully discussed in previous reports the agricultural uses of this naturally-occurring fertilizer that it will only be necessary on the present occasion to record the analytical data obtained on the samples examined during the past year, and briefly indicate their quality.

ANALYSES of Swamp Muck (air dried) 1897.

No.	Locality.	Sender.	Nitrogen.		Organic and volatile matter.	Sand and clay.	Mineral matter, soluble in acid.	Water.
			Per cent.	Pounds in one ton of air-dried muck.				
1	Chilliwack, B. C	G. M. Stuart......	·946	18·9	70·31	11·24	7.90	10·55
2	Alberni, Vancouver I'd, B.C.	Albert E. Reeve...	2·470	49·4	71·77	·43	10·21	17·59
3	" "	" ...	1·027	20·5	32·24	36·15	21·25	10·36
4	Loch Garry, Ont..........	J. Fraser.........	1·767	35·3	67·04	13·18	9·07	10·71
5	Near London, Ont	G. P. Collyer......	·933	18·6	71·64	5·76	9·83	12·77
6	St. Williams, Ont.	Andrew McCall...	1·010	2·0	31·93	55·90	6·65	5·52
7	Aitken's Ferry, P.E.I.	D. J. Stewart.....	2·54	50·8	67·89	9·91	10·36	11·84
8	" "	"	1·45	29·0	43·30	40·50	9·78	6·42
9	Egmont Bay, P.E.I..... ...	E. Arsenault......	1·515	30·30	71·43	12·61	12·61	15·96

No. 1. A sample representative of an area of considerable size near Chilliwack, covered with peat or muck. It is of excellent quality, but at present rather sour, due to lack of lime and want of drainage. Owing to the small quantities of clay and sand

present this soil is unsuitable for certain crops, but if this could be remedied by a judicious admixture with the subsoil or surface dressings, a very good soil would result.

With good drainage and the addition of mineral fertilizers, nitrification would proceed satisfactorily and there would be no necessity to apply nitrogenous fertilizers. Wood ashes would be of especial value, as supplying potash and notable quantities of lime and phosphoric acid. If potash is applied as kainit or muriate of potash, it will be necessary to add lime, as such or as marl or gypsum, and to furnish phosphoric acid as superphosphate or, better still for such soils, as basic slag.

No. 2. From an area of 2,500 acres covered by swamp muck in section 7, township Alberni. The depth of muck in the centre of the swamp, it is stated, exceeds ten feet; at the edges, the subsoil of clay outcrops. It is practically all vegetable matter.

No. 3. From a swamp in section 8, Alberni township. "In times of high water it is frequently covered."

As regards nitrogen, No. 2 is much the better of the two, but both may be classed as excellent, They are, however, distinctly sour, pointing to the necessity of drainage and the application of an alkaline mineral fertilizer, such as wood ashes, lime, &c., before they could be used profitably as soils.

No. 4. Contains too much undecayed wood to be of any immediate value, but perhaps could be used, after being air-dried, to advantage as an absorbent for liquid manure and in the manure pile. It contains a considerable amount of nitrogen.

No. 5. As a muck to be used as a fertilizer, it may be considered of good quality, but as a soil it would need the admixture of clay and sand and the application of mineral fertilizers.

No. 6. This sample, owing to its large amount of clay and sand and comparatively small proportion of nitrogen, could not be recommended for absorbent purposes; nor would it pay to compost it, unless it could be handled very cheaply.

Nos. 7 and 8. These samples are from the surface and bottom of a swamp, respectively. No. 7 is loose and consists, for the greater part, of root fibres. It could be used as a coarse bedding and for composting. No. 8 is, when freshly dug, of a sticky nature, but dries to a hard, brittle mass. It would require to be subjected to the disintegration action of the winter's frost before becoming of any value.

No. 9. This sample is from a Cedar swamp. It contains a considerable quantity of undecomposed woody fibre. It requires weathering and composting with wood ashes or lime. It would probably make a fair absorbent in the barn-yard.

MARSH, CREEK AND TIDAL DEPOSITS.

These are generally known in the maritime provinces as "muds." Brief reports of those samples examined in the farm laboratories during the past year are given, but it has not been thought necessary to consider in detail their origin, composition, and their effect on soils, since such a consideration has already appeared in the reports of this Division.

The most important of the samples analysed are from large unreclaimed marshes in New Brunswick and Nova Scotia. Time has not permitted complete analyses of these, though such would have been desirable. A further question to be taken up in connection with marsh muds is the determination of the *relative availability* of their elements of plant food. We hope to be able to undertake this investigation during the coming year.

Other samples, the details of which are now given, were forwarded from the provinces of British Columbia, Quebec and Prince Edward Island.

Nos. 1 and 2. "Mud" or soil from a large, unreclaimed marsh near Nappan, N.S., sent by Wm. Blair.

ANALYSIS OF AIR-DRIED "MUD," NAPPAN, N.S.

—	*No. 1.	†No. 2.
Water	2·16	3·78
Loss on ignition, chiefly organic matter	4·12	5·86
Mineral matter, insoluble in acid	79·24	75·33
Mineral matter, soluble in acid	14·48	13·04
	100·00	100·00
Nitrogen	·137	·136
Coarse sand	37·95	16·60
Clay and fine sand	41·29	58·73

* No. 1, 4 feet below surface. † No. 2, 1 foot below surface.

When received, the samples were in a plastic, pasty, compact condition of a grayish colour and were slightly acid to litmus paper. On drying a portion at 212 degrees Fah., is was found that No. 1 contained 30·5 per cent of water, No. 2 contained 36·0 per cent of water. Root fibres were to be noticed in both samples, but curiously enough were in greater abundance in sample No. 1.

On allowing to dry spontaneously in the air, both soils became hard and somewhat difficult to break with the fingers.

Save in the relative proportion of sand and clay, there would not appear to be any marked differences in these two samples, and it may be fairly assumed that there is a great degree of uniformity in the character of the soil—at all events to the depth of four feet.

The analytical data, as far as they are complete, would go to show a strong similarity in composition between these samples and other specimens of marsh mud from the Bay of Fundy that we have previously examined in our laboratories. The percentages of organic matter and nitrogen now found are somewhat below the averages obtained from the samples just referred to, but nevertheless, they are quite equal to those found in many fertile soils. A comparison of the figures will make apparent a fact worthy of note, viz.: that the amount of nitrogen is the same in both samples. This would lead us to conclude that the percentage of this element remains constant to a depth of at least four feet. As nitrogen is one of the essential elements of fertility, and at the same time one of the most costly when purchased in commercial fertilizers, this feature is necessarily one of great importance.

The percentage of lime, as judged from a qualitative examination, is not large, probably about ·5 per cent or somewhat under.

Reviewing the facts, we conclude there is no reason to suppose that this soil, if thoroughly drained and properly worked, would fall behind in fertility any of the dyked lands of Nova Scotia and New Brunswick that have originally been formed by tidal deposits.

In conclusion it may be pointed out that drainage is necessary to bring about a better mechanical condition and also to ensure aeration of the soil. Aeration would correct the slight sourness that now exists and convert any soluble iron compounds into insoluble and innocuous forms—a desirable end to be attained in marsh muds. Drainage would also free the soil of the small quantity of common salt it contains.

No. 2. Marsh mud from an unreclaimed marsh at St. Martin's, St. John Co., N.B., forwarded by Mr. Howard Trueman, Pointe de Bute, N. B.

This soil or "mud" is from an area of 400 acres covered with a tidal deposit. At high tide it is overflowed by the waters of the Bay of Fundy. The marsh has never been properly dyked and is not under cultivation.

ANALYSIS OF AIR-DRIED "MUD," ST, MARTINS, N.B.

Moisture	7·66
Organic and volatile matter	7·61
Insoluble mineral matter (clay and sand)	71·96
Mineral matter, soluble in acid	12·77
	100·00
Lime	·42
Nitrogen	·281
Common salt	1·4

There is nothing in the results against the prediction that if properly drained and treated this would make a fertile soil.

Considering that it is not yet drained, its tilth or physical condition may be judged as good. It contains fair amounts of organic matter and nitrogen. The percentage of salt is high, too high for the best results with farm crops, but the excess could be easily removed by drainage, which would at the same time sweeten and aerate the soil.

An application of lime, say 40 to 60 bushels per acre, would, in all probability, greatly increase this soil's productiveness.

No. 3. "MUD" FROM NEAR VANCOUVER, B.C.

The correspondent forwarding the sample writes as follows :—

"The sample was taken from beneath a slaughter-house built on piles close to the salt water where a number of pigs are kept, the urine and dung flow through the flooring, but being covered and laid bare by every tide, I am doubtful as to whether there would be any fertility left."

Our data are as follows :—

ANALYSIS OF AIR-DRIED "MUD," VANCOUVER, B.C.

Moisture	4·25
Organic and volatile matter	17·45
Mineral matter, insoluble in acid	63·33
Mineral matter, soluble in acid	14·97
	100·00
Nitrogen	·548

This material has undoubtedly a fertilizing value, though it cannot be regarded as the equal of barn-yard manure. The percentage of nitrogen is very similar to that in fresh manure, but the greater part of it judging from the appearance of the material is in an unavailable condition.

No. 4. "MUD" FROM BARACHOIS DE MALBAIE, GASPÉ, QUEBEC.

This was obtained from the bed of a brook running into Barachois Bay, being forwarded by Rev. P. F. Sirois. It contained a large quantity of sand and a considerable amount of orgamic matter.

ANALYSIS OF AIR-DRIED "MUD," GASPÉ.

Moisture	1·71
Organic and volatile matter	8·35
Mineral matter, insoluble in acid	80·25
Mineral matter, soluble in acid	9·69
	100·00
Nitrogen	·274

This cannot be considered as a fertilizer of marked value, though on poor soils it might prove useful as an amendment. Both in composition and appearance it is similar to a light, though fairly good soil.

No. 5. "MUD" FROM NEAR SUMMERSIDE, P.E.I.

This sample was taken from the bed of a creek running through the farm of Wm. Lefurgey, and is very similar to the mud, the particulars of which appear on page 193 of our 1896 report. The analytical data may be tabulated as follows :—

ANALYSIS OF AIR-DRIED "MUD."

Moisture	2·37
Organic and volatile matter	9·30
Mineral matter, insoluble in acid	65·70
Mineral matter, soluble in acid	22·63
	100·00
Lime	·92
Nitrogen	·33

This deposit though not profitable for composting with barn-yard manure, is undoubtedly of some value for supplying the elements of plant food. It might be dug in the autumn and piled to dry. The winter frost will tend to disintegrate it, improving its mechanical condition. It might then be composted with lime, which will serve to set free its plant food ; or if wished, it may then be applied directly to the land, though used in this way it is not so immediately effective.

MARL.

This material is essentially carbonate of lime. The value of a sample depends upon the percentage of this constituent; marls in which the carbonate of lime is associated with much clay or sand are of inferior quality.

Marl occurs in various parts of the Dominion as an earthy gray or grayish-white deposit ; it usually shows the presence of fresh water shells. Marl frequently underlies a bed of peat or muck in a swamp or forms the bed of a dried-up lake.

In districts where it is found, marl is the cheapest of all lime fertilizers. Marl, not being of a caustic nature, is frequently known as "mild" lime. It is owing to this characteristic that an excess of marl does not injure a soil, as frequently occurs from an over application of lime.

The following samples from different parts of Canada have been examined in our laboratories :—

British Columbia.—Sample from Stanley, Cariboo District: Yellowish white, very porous and soft; contains traces only of inert matter (clay and sand) and is practically all carbonate of lime. It may be considered an excellent sample of marl.

Ontario.—This sample, collected near London, consisted of lumps and powder of a grayish-white colour, the lumps powdering under slight pressure. It contained a large number of shells, indicating its origin as a fresh-water lake or pond deposit.

ANALYSIS.

Moisture	·49
Insoluble matter (clay and sand)	·25
Carbonate of lime	95·95
Undetermined mineral matter and traces of organic matter.	3·31
	100·00

This is an excellent sample of marl, both as regards composition and texture. It is practically free from inert foreign substances, and could be used with advantage on all soils deficient in lime.

Sample from Lot 34, Con. 4, Edwardsburg. Light-gray, flakey, light, easily crumbled, contains shells. Insoluble matter probably in the neighbourhood of 10 per cent. This may be regarded as a very fair sample of marl.

Quebec.—Sample from Metapedia. Grayish-white, easily crumbled and in excellent mechanical condition; contains some few shells. It is almost entirely soluble in hydrochloric acid, showing absence, or but traces only, of inert matter. A very good sample.

Samples from township of New Richmond. No. 1. From a lake bed. Wet and plastic when received. A small quantity of organic matter; very little sand or clay.

No. 2. Grayish-white, more inert matter than in preceding sample. A number of fine roots and shells present. Of medium quality.

Nova Scotia.—Sample from Antigonish. Of a dull reddish-gray colour. It has the appearance of a semi-decomposed limestone and probably is not of the same immediate benefit to land as shell marl.

THE USES OF MARL.

An application of marl has been found useful to all soils deficient in lime, and especially to such as are rich in humus, assisting greatly in the nitrification of this constituent.

For correcting the acidity of soils, a property injurious to crop growth, marl is very effective. Recent experiments have shown that soil acidity is by no means rare, even in sandy loams situated in upland districts. A dressing of lime or marl to such soils has always resulted in increased crop yields. These materials have also proved useful to old pastures and waste lands where sorrel and bracken have obtained a foothold.

Though a less active agent than lime for liberating potash from its locked up stores and for the amelioration of heavy clays, marl serves in bringing about these ends, and can be used for such with safety, since an excess will not injure the soil.

A further use of marl is in compost heaps containing vegetable and animal refuse, swamp muck and other organic matter. It here promotes nitrification, providing conditions of moisture and temperature are favourable, and thus assists in converting useless nitrogen into valuable plant food.

A chapter stating more fully the various agricultural uses of this naturally-occurring fertilizer is to be found in the report of this division for 1894.

LOBSTER REFUSE FROM THE CANNING FACTORIES.

Several inquiries being received respecting the fertilizing value of this waste product, and there being no data on record as to the composition of this material, it was deemed advisable to make an analysis and thus ascertain its agricultural worth. Through the kindness of Professor E. E. Prince, Dominion Commissioner of Fisheries, two samples of the refuse were obtained from a canning factory near Pictou, N.S. One of these consisted of the bodies of the lobsters, the other of the tails, claws, shells, &c. Their composition as received may be tabulated as follows:—

ANALYSIS OF LOBSTER REFUSE.

Constituents.	Bodies.	Tails, &c.
Water	69·28	56·37
Organic matter	22·44	24·23
Mineral matter	8·28	19·40
	100·00	100·00
Nitrogen	1·78	1·56
Phosphoric acid	1·01	1·66
Lime	3·25	9·99
Value per ton, estimating nitrogen at 10 cents per pound and phosphoric acid at 5 cents per pound	$4.57	$4.68

The comparatively large percentage of water present in the fresh material would prevent it being used economically at any great distance from the factory, but the figures show that it has an undoubted value as a fertilizer for supplying nitrogen and phosphoric acid. Owing to the large amount of organic matter present, it may well be supposed that this material will decompose readily in the soil, setting free its plant food in available forms. It may be regarded as a quickly acting manure, and one well adapted for the making of rich compost with muck or peat.

Where this material is produced in large quantities and fuel is cheap, in would seem that a fertilizer of considerable value could be profitably made by simply drying and grinding the refuse. For if dried to 10 per cent moisture, one ton would contain the following amounts of nitrogen and phosphoric acid:—

FERTILIZING CONSTITUENTS AND VALUE PER TON OF DRIED LOBSTER REFUSE.

Fertilizing Constituents.	Pounds per ton.	
	Bodies.	Tails, &c.
Nitrogen	104.	64·
Phosphoric acid	56.	69·
Value, estimating nitrogen at 10 cents per pound and phosphoric acid at 5 cents per pound	$13.35	$9.95

Lobster refuse, it appears, is at present a frequent source of danger to the canning industry, being, in certain districts, allowed to decay in the neighbourhood of the factory. The preparation of this material as a fertilizer would not only tend to prevent the spoiling of the canned lobster,—which has occurred of late to such an extent as to threaten the industry with disaster,—but also furnish a profitable means of disposing of a product hitherto considered useless.

LIME KILN ASHES.

Several inquiries from the maritime provinces having been received respecting the amounts of fertilizing constituents in lime kiln ashes, a sample obtained from Cape Breton was submitted to analysis, with the following result:—

ANALYSIS.

Moisture	2·04
Insoluble matter (clay and sand)	9·45
Potash	2·64
Phosphoric acid	2·15

Though not so rich in potash as wood ashes, it is evident that this material has a distinct fertilizing value. The phosphoric acid is approximately equal in amount to that in wood ashes.

It is to be supposed that much variation in the composition of different samples will occur, but there can be no doubt that well preserved ashes from the kiln contain notable quantities of the more important mineral elements of plant food. Leaving out of consideration the lime and other constituents of minor value, the ashes now examined possess per ton, approximately 53 pounds potash and 43 pounds phosphoric acid. The former may be valued at 5c. per pound, the latter at 3½c. per pound. At these prices the value per ton would be in the neighbourhood of $4. It is to be remarked that the sample examined was very dry, a larger percentage of moisture present would necessarily reduce the amounts of the other constituents. The average composition of seventeen samples of lime kiln ashes as ascertained by Dr. Goessman, of the Experiment Station of Massachusetts, U.S.A., is as follows:—

Moisture	14·48	per cent.
Potash	1·28	"
Phosphoric acid	1·09	"
Lime	42·57	"

FERTILIZING CONSTITUENTS IN PURSLANE.

(Portulaca oleracea).

This common pest in gardens is frequently known as "pusley." It delights in rich soil, spreads rapidly and is exceedingly difficult to eradicate owing to its intense vitality. This quality, as laboratory experiments showed, it possesses in a most remarkable degree; cuttings half an inch in length after being exposed for five weeks to the drying atmosphere of the room, sprouted and grew readily on being placed in damp soil.

To ascertain the extent to which this troublesome weed might exhaust the land of its plant food, the following investigation was made. The plants from an area of 4 ft. by 10 ft. were collected by Mr. Craig, the horticulturist, and found to weigh 28 pounds. This would be equivalent to a crop of 15 tons 492 pounds per acre. Mr. Craig adds "the plants are about half grown (2nd August), but they nevertheless cover the ground with a fairly heavy and close 'mat' of vegetation."

On analysis, we found the green, fresh material to have the following composition:—

ANALYSIS OF PURSLANE, CUT 2ND AUGUST, 1896.

Moisture	93·54
Organic matter	4·82
Ash and mineral matter	1·64
	100·00

FERTILIZING CONSTITUENTS IN PURSLANE.

	Per cent.	Pounds per ton.
Nitrogen	·219	4·38
Potash	·661	13·22
Phosphoric acid	·079	1·58

On the assumption that the crop over an acre would weigh 15 tons, by no means an extravagant estimate, we obtain the following weights of the essential elements of fertility withdrawn from that area by this weed :—

	Pounds per acre.
Nitrogen	65
Potash	198
Phosphoric acid	24

It is apparent from these data that purslane extracts from the soil very considerable amounts of soil plant food, especially of potash. Analysis shows that forty per cent of the ash consists of this valuable element.

Besides this robbing of the growing crop, it is evident that this weed uses very large quantities of soil water, thus depriving the legitimate crop of its rightful supply at a critical time in its growth. This moisture-extraction we have come to recognize in recent years as one of the most direct and injurious results from weed growth.

FERTILIZERS FOR MAKING COMPOSTS—A WARNING.

From time to time irresponsible and fraudulent parties endeavour to sell farmers receipts and materials for making composts. These may be useless, or indeed, injurious, but more frequently the fraud consists in misrepresentation and the selling of the "manure makers" at prices far exceeding their agricultural value. On several occasions we have been appealed to for advice and chemical assistance in such matters and usually with the result that a fraud has been discovered and exposed.

In the early part of the present year, letters were received from several correspondents in Prince Edward Island directing our attention and asking for information regarding "Kay's process for making manure" and the nature of the material accompanying the receipt. For the "directions for use" sums were asked varying from $10 to $20—the price fluctuating, apparently, according to the supposed wealth of the purchaser, the cost of the compound—to be employed at the rate of one pound to one load of marsh mud, &c.—being $5 per 100 pounds.

As received, this was a whitish-gray powder, having the appearance of lime. It was strongly caustic and effervesced vigorously on the addition of acid.

The results of our examinations are as follows :—

ANALYSIS OF KAY'S COMPOUND.

Moisture	·84
Loss on ignition	2·06
Sand, clay, oxide of iron, &c	5·20
Lime, as oxide (equivalent to 78·98 per cent slacked lime or 104 per cent carbonate of lime)	58·24
Magnesia	small quantity.
Common salt	4·35
Potash	·58
Phosphoric acid	traces.
Nitrogen	none.

This material is composed practically of lime, in part slacked and carbonated by exposure to the atmosphere, together with a small quantity of salt.

The essential elements of fertility—nitrogen, potash and phosphoric acid—which alone give value to commercial fertilizers, are, with the exception of ·5 per cent potash, *conspicuous by their absence.*

A mixture of lime and salt has long been used as a material for composting with muck and substances of a like character. The lime is slaked with brine—the proportion used being about 1 part of salt to 20 parts of lime. The "fertilizer" under examination is evidently of this character.

The commercial value of the material is approximately that of lime, plus that of the small amount of salt it contains. Though no statement is made by the vendor as to the plant food it contains, we are of the opinion that asking $5 per cwt. for a mixture of lime and salt practically constitutes a fraud. Agriculturally, it may be considered useful for composting purposes (though it should not be used in conjunction with barnyard manure in the compost heap) and for supplying lime to soils deficient in that element, but for this purpose its value would not exceed $4 to $5 per ton. It may be pointed out that wood ashes would make a much richer compost, since they contain both potash and phosphoric acid.

We may again repeat that this so-called fertilizing compound is in no sense comparable to those commercial fertilizers upon the market that supply the necessary and more costly constituents of plant food, viz., nitrogen, potash and phosphoric acid.

MOSS LITTER.

Attention was drawn to the usefulness of this material for bedding purposes in our report for 1895, Vide, pp. 212-13. It was pointed out that its high absorptive capacity for fluids and gases render it particularly valuable as a litter for use in city stables. Since the appearance of the information there conveyed, several samples from large bogs in New Brunswick and Nova Scotia have been sent for examination, in order to ascertain the absorptive value of the Canadian produced litter as compared with that exported from Holland. The results now recorded have been obtained from samples collected by Mr. W. Saxby Blair, Horticulturist, Experimental Farm, Nappan, N.S., from Big Plain Bog and Weldon Bog, N.S., in both of which the supply is said to be well nigh unlimited. They were both clean and bright specimens, consisting of fine straight fibres and free from all foreign matter. The analytical methods used were the same as those detailed in the aforementioned report.

ANALYSIS OF MOSS LITTER (AIR-DRIED).

Constituents.	Big Plain Bog.	Weldon Bog.
Moisture	15·7	16·20
Organic matter	82·5	81·75
Ash	1·8	2·05
	100·00	100·00
Nitrogen	·527	·596
Absorptive capacity	1395	1533

As regards composition, these samples are very similar, and, it may be remarked do not materially differ from the litter mosses previously reported upon. Their absorptive capacity is very satisfactory ; their low "ash" shows absence of earth, and their nitrogen content indicates that the resulting manure would be materially enriched in this valuable constituent of plant food.

A further and most important use for moss litter has recently been found. It has been used with good success as a packing material for fruits and other perishable articles in transit. Its absorbent power keeps the fruit dry and thus assists in arresting or preventing that decomposition which always follows "sweating," due to imperfect ventilation and other causes. From a hygienic, as well as a mechanical standpoint, moss litter should commend itself as a packing medium.

WELL WATERS FROM FARM HOMESTEADS.

It should be realized by all farmers and dairymen that an ample supply of pure water for the use of the household and stock is a matter of the greatest importance. Careful investigations have furnished proof as to the danger to the health of human beings from drinking polluted water, and what must be injurious to man cannot be good for beast. Until quite recently all that was thought sufficient was to provide nourishing, palatable food for farm animals; but little heed has been paid in the past to the quality of the water the animals drank. It is with pleasure, therefore, that we record a deeper interest year by year on the part of our agriculturists in this question, a greater desire to know the character of the water supplied to their stock and a stronger inclination to rectify matters when it has been pointed out to them that the supply was polluted.

Water contaminated with excrementitious matter, we are, or ought to be, fully aware, has been frequently the cause of spreading typhoid fever and other serious and often fatal infectious diseases. In such water all the most favourable conditions are present for the growth and rapid development of disease germs should they find an entrance. As a people, however we have failed to recognize that the continued use of water containing the decomposing dejecta of animals has a peculiarly baneful and, at the same time be it noted, insidious effect on the general health. Undoubtedly many cases of indigestion, diarrhœa, sick headache and many similar illnesses have had their cause in the use of polluted water.

But not only is the health of the farmer and his family endangered by a bad water supply, the health and thrift of his stock must likewise be impaired. Good health and freedom from disease in stock, are dependent to a great extent upon an abundant, pure water supply. Similarly, in the dairy, creamery and cheese factory, pure water is an absolute necessity if the products are to be first class and preserve a good flavour. Several of the samples examined during the past year were sent from cheese factories in which trouble had arisen in the matter of flavour, and in all the instances the water was found to be foul and polluted. This is a significant fact and carries its lesson to those engaged in dairying.

The most common cause of well pollution has been the sinking of the well in the barn-yard or under one of the farm buildings. We object to this practice on principle and hold that only under the most exceptional circumstances can it be followed with impunity. From our experience, it would appear that in the majority of instances it is only a matter of time before such wells act as cess pits. Unless most careful provision is made to prevent the liquid manure from soaking into the ground, it sooner or later, according to the nature of the soil, finds its way into the well. If this be so it behooves all farmers and dairymen to locate their well at a safe distance from such infecting sources.

The greatest care should be taken at cheese factories and creameries that the waste water does not find its way into the water supply, and to insure this thorough and efficient drainage is necessary.

Further, there is much room for improvement in keeping the buildings and barn-yard clean. If greater care had been exercised in this matter, many wells might now be free from impurity. Apart from the questions that a dirty barn-yard means a loss of valuable plant food—a question well worthy of closer consideration—there remains the equally important fact that such is usually a menace to health through the contamination of the well water.

The analyses of the waters examined in the Central Farm laboratories during the past year are given in tabular form and condensed reports respecting the quality of the waters is to be found in the last column. A perusal of this table will show that a very many of the samples were seriously and dangerously polluted. We would not have it inferred from this that a similar percentage of Canadian farm wells are in a like condition, for in all probability only suspected waters are sent for examination, but nevertheless, it reveals a condition of affairs that is by no means satisfactory and one that ought to receive our earnest and immediate attention. The natural waters of Canada, as found in her lakes, streams and springs, are unexcelled for purity—to prove which there are ample data—and we believe there is no insuperable barrier or insurmountable obstacle to obtaining on the majority of farms a pure supply. Once obtained, let it be carefully guarded against pollution.

The samples examined comprise one from British Columbia, six from the North-west Territories, twenty-eight from Ontario, eight from Quebec, seven from New Brunswick, and seventeen from Prince Edward Island. Of these, 50 per cent were reported dangerously polluted and unsafe for drinking purposes; 25 per cent as suspicious and in all probability as unsafe; 25 per cent as unpolluted and wholesome.

The examination of well waters from farms only is undertaken. Theso analyses are made free of charge, provided the sample is taken according to the directions furnished on application, and the express charges are prepaid. It is absolutely essential that the instructions issued should be faithfully followed in the collection and shipment of samples. Farmers and dairymen who are desirous of availing themselves of this privilege should first write to this Division for the necessary information.

ANALYSES OF

RESULTS STATED IN

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.
			1896.				
1	Elmsdale, P.E.I.	W. C. McN.	Nov. 12	·16	·082	3·603	68·0
2	Knowlton, Que	E. G.	〃 19	·11	·112	5·308	15·8
3	Nappan River, N.B.	Dr. B.	Dec. 4	·03	·43	·008	2·5
4	Ste. Thérèse de Blainville, Que.	C. D. T.	〃 4	·592	·146	·132	3·0
5	St. Williams, Ont.	A. McC.	〃 12	·02	306	2·776	28·0
			1897.				
6	Sussex, N.B.	T. J. P.	Jan. 8	Free.	·02	·0313	44·0
7	〃	E. L.	〃 8	·036	·02	·0017	10·0
8	Fort William, Ont.	No. 1, Dr. S.	Feb. 2	·715	·047	·037	1150·0
9	〃 〃	〃 2 〃	〃 2	1·340	·114	·0082	3540·0
10	〃 〃	〃 3 〃	〃 2	1·955	02	None.	370·0
11	Farm near Burlington Bay, Ont.	No. 22, W. G. W	〃 17	3·098	·23	·238	1670·0
12	Barton, Ont.	No. 23, F.W. per W.G.W.	〃 17	·08	·068	8·843	60·0
13	〃 〃	No. 24, W. G. W	〃 17	·03	·055	·041	6·0
14	Sussex, N.B	W. W. H.	〃 18	Free.	·03	1·170	6·6
15	Little Ridgetown, N.B.	A. B	〃 24	·026	·068	2·004	23·0
16	Lynden, Ont.	D. A. W	March 8	3·15	·13	4·455	140·0
17	Abernethy, N.W.T.	D. G	〃 23	·01	·192	·0329	1·0
18	Kingston, N.B.	W. S.	〃 27	·115	·125	·680	3·8
19	Branchton, Ont.	J. F.	〃 31	·096	·032	·0527	11·5
20	Carievale, N.W.T.	J. T. C.	April 6	·08	·248	None.	1·0
21	Kneehill Creek, N.W.T.	G. B. B.	May 1	·088	·232	·207	8·0
22	Huttonville, Ont.	J. H. C., No. 1	〃 6	·02	·374	6·45	28·2
23	〃 〃	〃 〃 2	〃 6	Traces.	·167	3·65	4·0
24	Prescott, Ont.	T. C. per F. J.F.	〃 11	·01	·07	·585	2·6
25	Hintonburgh, Ont	J. A. O.	June 14	·016	·14	6·545	92·0
26	Kneehill Creek, N.W.T.	G. B. B.	〃 15	·84	·246	·05	15·0
27	Lefaivre, Ont.	W. O.	〃 17	3·198	·196	·156	29·6
28	Regina, N.W.T.	J. A. M., Ind. Sc.	〃 21	1·373	·09	·533	13·2
29	Woodstock, Ont	J. G. J., "R".	〃 23	·20	·052	·715	3·6
30	〃 〃	〃 "S".	〃 23	·04	·02	·948	4·3
31	Harriston, Ont.	W. W. McL.	〃 30	·18	·38	None.	42·0
32	Grindstone, Magdalen Isds., Q.	A. S. D. Van B.	July 7	3·60	·26	3·725	110·0
33	Aylmer, Que.	A. C. C.	〃 9	·025	·09	2·36	11·5
34	Ashton, Ont.	S. McK.	Aug. 2	·04	·775	4·858	32·0
35	Gibson, N.B.	T. D. B.	〃 2	Free.	Free.	None.	3·7
36	Summerberry, N.W.T.	J. S. F	〃 3	·02	·45	〃	44·8
37	Rideauville, Ont	J. B.	〃 10	·52	·20	·346	32·0
38	Douglas Road, Victoria, B.C.	S. E. C.	〃 13	·63	·205	338	69·0
39	Almonte, Ont.	B. R.	〃 18	·025	·029	3·782	4·5
40	Chelsea, Que.	W. R.	Sept. 13	·086	·065	·67	4·5
41	〃	W. H.	〃 17	·02	·31	6·992	40·0
42	Beechridge, Que	J. C.	〃 21	Trace.	·48	1·268	3·5
43	Summerside, P.E.I.	R. H., spring	Oct. 14	·05	·045	5188	9·5
44	〃 〃	〃 brook.	〃 14	·08	·45	·585	10·0
45	〃 〃	〃	〃 14	Traces.	·05	6·465	48·0
46	Murray Harbour, South, P.E.I.	C. B.	〃 16	·132	·044	4·39	62·0
47	〃 〃 〃	W. H.	〃 16	6·658	1·154	20·066	555·0
48	Branchton, Ont.	J. F.	〃 21	·064	Traces.	·0198	11·1
49	Milton, Ont	J. A. R	〃 26	·032	1·28	1·864	33·0
50	Summerside, P.E.I.	R. H., No. 1.	〃 27	·435	·11	11·71	180·0
51	〃 〃	〃 〃 2.	〃 27	Free.	·06	·667	9·6
52	〃 〃	〃 〃 3.	〃 27	·04	·053	·660	8·8
53	〃 〃	〃 〃 4.	〃 27	·025	·04	9·557	55·0
54	Longue Pointe, Que.	F. L	〃 30	1·080	·052	·089	30·6
55	Kingston, Ont.	I. S.	Nov. 11	1·920	·048	None.	1000·0

WELL WATERS, 1897.

PARTS PER MILLION.

Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
302·8	232·8	70·0	Very heavy traces...	Polluted; use probably attended with danger.
158·8	114·0	44·8	Slight traces......	Seriously polluted.
65·2	8·8	56·4	Very slight traces...	No contamination; pure and wholesome.
....	....	....	....	Suspicious.
430·8	294·8	136·0	Heavy traces.......	Receives soakage; not a good water.
2867·2	2295·2	572·0	Traces.............	Free from pollution; very large amount of mineral matter.
2909·2	2319·2	590·0	"	" " " "
2078·0	1644·0	434·0	Heavy traces......	Dangerously polluted; unfit for household purposes.
7273·6	4614·0	2659·6	Traces.............	" " " "
682·0	630·0	50·0	Very slight traces...	" " " "
3727·5	2617·5	1110·0	Heavy traces......	A very bad water.
580·0	388·0	192·0	Traces........	Highly suspicious.
414·0	352·0	62·0	Heavy traces......	Unpolluted; good and wholesome.
76·0	66·0	10·0	Traces.............	Probably safe and wholesome.
143·5	97·5	46·0	Heavy traces.......	Evidence of contamination; highly suspicious.
594·0	482·0	112·0	Slight "	Excessive pollution; condemned for use.
620·0	412·0	208·0	Very slight traces...	Free from drainage pollution.
40·0	16·0	24·0	Traces.............	Decidedly suspicious; strong indications of pollution.
2200·0	1790·0	410·0	"	Of doubtful purity.
235·0	155·0	80·0	Heavy traces.......	Free from pollution; safe and wholesome.
1107·0	1033·0	74·0	Very heavy traces...	A fair water; probably safe.
792·0	552·0	240·0	" " ..	A very bad water.
252·0	162·0	90·0	Traces.............	Of doubtful purity; very suspicious.
364·0	300·0	64·0	....	Entirely free from contamination.
991·2	519·2	472·0	Traces.............	Dangerously polluted.
1226·0	1022·0	204·0	None.........	Very suspicious; probably contaminated.
375·2	285·2	90·0	Slight traces........	Very seriously polluted; condemned.
1180·0	928·0	252·0	Heavy "	Pollution of a most pronounced character; very bad water.
258·0	220·0	38·0	Traces......	Impure and unfit for use.
304·0	238·0	66·0	Slight traces.......	Fairly satisfactory; probably safe.
476·0	346·0	30·0	Traces.............	Condemned for domestic use.
463·0	285·0	178·0	Very heavy traces...	Very bad water; dangerous to use.
298·0	190·0	108·0	Traces.............	Suspicious.
234·0	138·0	96·0	"	Polluted with drainage from cheese factory.
254·0	236·0	18·0	Slight traces........	A remarkably pure water.
2782·0	2235·6	546·4	Traces........... ...	No pollution; of the nature of a mineral water.
496·0	384·0	112·0	Heavy traces........	Seriously polluted.
332·0	244·0	88·0	" "	" "
372·0	284·0	88·0	Traces.............	Of somewhat doubtful quality.
216·0	186·0	30·0	Heavy traces......	Suspicious; not first class.
348·0	240·0	108·0	Traces..	Contaminated; dangerous.
172·0	124·0	48·0	Slight traces	Decidedly suspicious.
106·8	86·8	20·0	Traces.............	
117·2	103·2	14·0	Slight traces........	
311·2	255·2	56·0	Heavy "	Seriously contaminated.
342·8	196·8	146·0	Traces.............	Impure; not fit for drinking purposes.
1831·2	1510·0	321·2	Heavy traces.......	An exceedingly bad water.
2336·0	1848·0	488·0	None..............	Free from pollution.
1208·0	514·3	694·7	Very heavy traces...	Decidedly suspicious.
1034·8	774·8	260·0	Traces.............	A bad water; use attended with risk to health.
129·2	72·0	57·2	Slight traces........	Unpolluted; wholesome.
116·0	62·0	54·0	" "	" "
406·0	250·0	156·0	Traces.............	A dangerous water; receives pollution.
770·0	544·0	226·0	None...........	Seriously polluted; unsafe for household use.
2194·8	1658·8	536·0	Heavy traces.... ...	Unmistakably polluted; unsafe for household use.

ANALYSES OF WELL

RESULTS STATED IN

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.
			1897.				
56	Lanark, Ont........	R. R....................	Nov. 16	4·618	·152	·6638	93·0
57	Hawkesbury, Ont.............	R. O. B.......	" 17	Free.	·056	6·917	318·0
58	" "	M. W. F.....	" 17	Traces.	·092	9·035	33·4
59	" "	T. R...	" 17	·048	·090	1·472	162·0
60	" "	J. H. B. of O............	" 17	Traces.	·048	·299	23·4
61	Summerside, P.E.I	H. S. M., No. 1..........	" 26	Free.	·062	7·514	60·0
62	" "	Gr. Brk., No. 2..........	" 26	"	·052	1·308	12·6
63	" "	J. McL., No. 3........	" 26	·028	·070	22·460	94·0
64	Alberton, P.E.I..............	W. C. McN., No. 1......	" 27	Trace.	·075	·605	7·0
65	" "	J. L. D., No. 2	" 27	Free.	·041	5·861	47·5
66	" "	" pump, No. 3...	" 27	·0325	·025	7·274	85·0
67	" "	M. R. L., No. 4........	" 27	Traces.	·012	4·550	23·5

WATERS, 1897—*Concluded.*

PART PER MILLION.

Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
645·2	444·4	200·8	Traces	Dangerously polluted; condemned for use.
948·0	604·0	344·0	Heavy traces	Very heavily polluted; dangerous.
552·0	348·0	204·0	Traces	Dangerously polluted; unsafe.
922·0	660·0	262·0	Slight traces	Polluted and unsafe for use.
516·0	391·6	124·4	Very heavy traces	Not first class, but probably a safe water.
488·0	377·2	110·8	Traces	Seriously contaminated; unsafe to use.
135·2	93·2	42·0	"	Not a first class water.
660·8	502·8	158·0	Heavy traces	Heavily polluted; a very dangerous water.
....	....	....	....	Unpolluted; a good water.
....	....	....	....	Polluted; not a safe water.
....	....	....	....	Very seriously polluted; condemned.
....	....	....	....	Polluted and probably unsafe.

REPORT

OF THE

ENTOMOLOGIST AND BOTANIST

(James Fletcher, LL.D., F.R.S.C., F.L.S.)

Dr. W. Saunders,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to hand you herewith a report on some of the most important subjects which have been brought officially under my notice during the past season.

Many other subjects which have required attention have already been treated of at sufficient length for present purposes in former reports of the Division, or are as yet incomplete. The correspondence during the year has been large and of a varied character. There were 1,920 letters received and 2,110 sent out. During the past year I have had several opportunities of attending meetings in different parts of Canada, and of studying in the field some of the important problems connected with the protection of crops from their insect and fungous enemies.

The experiments with grasses and fodder plants, native and exotic, have been continued and have proved of great interest to visitors. This part of the work of the division is in the charge of Mr. Berthold Nothnagel, who has shown great interest in his work and is untiring in his efforts to explain to all comers the value and nature of the experiments which are being carried on.

The Awnless Brome Grass having proved to be very successful in all parts of the Dominion, about 600 1-pound samples were last spring sent out to farmers in all the provinces. Such reports as have been received up to the present are, almost without exception, enthusiastic in their praises of this valuable grass. A special interest has been added to it lately by the discovery that it is particularly well suited for cultivation on alkaline patches where little else will grow.

During the year several thousands of specimens of plants and insects have been sent in for identification from naturalists in all parts of the Dominion. From these collections several valuable additions have been made to the Experimental Farm museum.

Meetings.—Whenever official duties would permit of my absence, every opportunity has been taken of attending farmers' meetings to meet farmers and to deliver addresses on the work of the Division.

In January last I attended the convention of the Eastern Dairymen's Association at Brockville, Ont., from 6th to 8th of January. The following week I went to St. Mary's, Ont., and was present at the convention of the Creameries Association, 14th to 16th of January. From 20th of January to February 2nd I was in Nova Scotia and New Brunswick, attending meetings of farmers and fruit growers. The annual meeting of the Fruit Growers' Association of Nova Scotia was held at Wolfville on 20th and 21st of January. The annual meeting of the Nova Scotia Farmers' Association was attended at Middleton on 26th, 27th and 28th. On my way back to Ottawa I stayed off at Sussex, in New Brunswick, and held meetings with Mr. W. W. Hubbard at Hampton, N. B., on 29th of January, and at Sussex, N. B., on the following day. In passing through St. John, N. B., I met the members of the New Brunswick Natural History Society, and examined their museum on Monday, 1st of February. On 2nd and 3rd of March I was present at the annual meeting of the District of Bedford Dairymen's Association, at Cowansville, Que. On 3rd of June, by instruction of the Honourable the Minister of Agriculture, I went to Ste. Thérèse, Que., to examine some "drowned lands," representative of hundreds of acres along the Ottawa River, and to advise what grasses could be most advantageously grown on land liable to be under water during the spring freshet for two or three weeks. Some experiments are being tried and will be reported on later. The next day I started for St. Catharines and met a number of leading fruit growers, with whom I visited the orchard and beautiful grounds of Mr. Charles Thonger, near Niagara, where, unfortunately, the San José Scale has been introduced. I was commissioned by the Honourable Minister to meet these gentlemen and learn from them what their views were as to proposed measures asked for by fruit growers to prevent the spread of the San José Scale. The following morning I was driven by Mr. A. M. Smith to St. David's, to examine an orchard of Mr. Hendershott's, in which the San José Scale was said to occur. This report proved to be inaccurate, the insect in Mr. Hendershott's orchard being the Cherry Scale, *Aspidiotus Forbesi*, Jnsn., a less injurious species. Mr. Smith's nursery was also examined and no trace of the San José Scale was found.

On the following Monday, 14th of June, I left for Nova Scotia, where some meetings had been arranged by the Board of Trade of Kentville, and by the Fruit Growers' Association of Nova Scotia. Meetings were held at Kentville, Berwick and Auburn. The first meeting was largely of townspeople, but there were also several farmers and gardeners present who had been brought together by Mr. M. G. DeWolfe, the energetic President of the Board of Trade. The next day I was driven to Wolfville and had the pleasure of being shown over the School of Horticulture by Prof. Faville. The same afternoon, through the kindness of Mr. Barclay Webster, I was driven from Kentville through the luxuriant orchards of King's county to Berwick, where a good meeting had been convened by Mr. S. C. Parker, the Secretary of the Fruit Growers' Association of Nova Scotia. The morning of the 18th was devoted to examining the well-kept orchards of Mr. Parker and others at Berwick. In the afternoon I proceeded to Auburn, where I was met by Mr. J. S. Bishop, and driven through the surrounding country, visiting the cranberry bogs which have been so successfully worked for the last few years. In the evening a well attended meeting of cranberry growers was addressed and Cranberry insects were discussed. The next day I returned to Kentville and then went on to Halifax to attend the meeting of the Royal Society of Canada. I left Halifax for home on 23rd of June. On 3rd of July I proceeded to Manitoba by instruction of the Hon. Minister of Agriculture and at the request of the Manitoba Government. In company with Mr. Hugh McKellar, the Deputy Minister of Agriculture, I held a series of meetings in some of the important wheat growing districts of the province. Meetings were held at Neepawa, Gladstone, Dauphin, Glenlyon on the Gilbert Plains, Portage la Prairie. Brandon, Beresford, Blythefield and Glenboro'. The subject treated of at all these meetings was "Noxious weeds, their nature and habits and the best means to adopt for their eradication." We were accompanied at some of these meetings by the Rev. W. A. Burman, Mr. George Greig, of Winnipeg, and Mr. J. B. Hobson, of Guelph, who all took an active and useful part in the meetings. I returned to Ottawa again on 22nd of July. On 12th and 13th of October, I attended the annual meeting of the Entomological Society of Ontario at London, Ontario.

Acknowledgments.—As in previous years, I am under great obligations to my friends, Prof. John Macoun and Mr. W. H. Harrington, both of Ottawa, for frequent assistance in the identification of difficult plants and insects. I also take pleasure in again acknowledging the valuable assistance I have received from my many correspondents in all parts of the Dominion, who have much aided the work of the Division by making observations and by sending me prompt notice of the occurrence of injurious insects and weeds. My thanks are also particularly due to Dr. L. O. Howard, the

United States Entomologist, and his staff at Washington, as well as to Dr. C. H. Fernald, of Amherst, Massachusetts, and Lord Walsingham, F.R.S., of Merton Hall, Thetford, England, for many favours in identifying insects and for valuable publications.

I again thank my kind friend, Miss E. A. Ormerod, for her most useful publications and valuable advice. On the occasion of a short visit to England in August last I had the great pleasure of again calling on this energetic worker and of learning from her many things of great use to me in my official duties.

The following donations have been received during the year :

Prof. J. Lamson Scribner, Washington : A large collection of seeds of grasses and fodder plants.

M. G. DeWolfe, Esq., Kentville, N. S. : Several living roots of greenhouse plants, bulbs and perennials.

T. W. Ramm, Esq., Bewdley, Ont. : Insects.

Rev. G. W. Taylor, Gabriola Island, B. C. : British Columbia plants and insects.

T. N. Willing, Esq., Olds, Alta. : Rare plants and insects from Alberta.

In conclusion, I beg again to acknowledge the great help I receive continuously in all branches of the work of the division from my assistant, Mr. J. A. Guignard, B.A., who has done much by his assiduous attention to bring the Division of Entomology and Botany to such degree of efficiency as it has attained.

I have the honour to be, sir,
Your obedient servant,

JAMES FLETCHER,
Entomologist and Botanist.

CEREALS.

The large wheat crop of the Dominion was got in for the most part in good condition. In some sections of Ontario late rains were a cause of loss, from the grain sprouting in the field. There was no serious damage from injurious insects in any of the provinces, although in Manitoba some loss resulted from an unknown cause, by which many ears of wheat turned white before the grain was mature and the stems remained standing in the field; this injury was spoken of generally as "dead heads" and was in places of much importance. It was thought by some to be due to the attacks of a fungus, but other observers spoke positively of finding insects which were actually attacking the roots. From the information given by correspondents, I judge that this was not the work of the Wheat-stem Saw-fly (*Cephus pygmæus*, L.) treated of in my last report but of a dipterous larva. During the past summer the perfect flies of *Cephus pygmæus* were reared from straws sent from Souris, Man., by Mr. Wenman, thus proving without doubt the identity of the species which injured Mr. Wenman's wheat last year. During the past summer some harm was done by the same insect near Indian Head, N.W.T.

With regard to the "dead heads," Mr. A. C. Hawkins, of Swan Lake, Man., writes —and his opinion seems well supported:—"I still think that the 'fungous disease' is an after effect and not the cause of the death of the wheat plant, the cause being, in my opinion, the larva forwarded in my last letter which you could not find, but of which, at the time that it was collected, I had no difficulty in finding many more than I wanted, one or two in the root of every plant I examined of which the heads were just beginning to dry up."

Mr. A. W. Pritchard, of the Manitoba Department of Agriculture, writes:—"Numerous reports have been received by the Department, of damage done to the wheat crop by an insect which is commonly spoken of as attacking the root, though some of our reporters call it a 'Joint-borer.' The effect of its attack is everywhere the same, to cause the plant to turn white and produce an empty head. The ravages of this insect, if insect it be, have extended over a large area. The damage done is reported is some cases as much as one-half the crop."

Arrangements have been made to study this attack more fully next year, and specimens of injured stems will be thankfully received.

The JOINT-WORM (*Isosoma*).—An attack on wheat by a joint-worm is reported from Verdun, Bruce Co., Ont., by Mr. William Welsh, who has studied the matter with some care. He writes as follows:—

"July 28.—The year before last was the first when I noticed this new pest; it was, detected in the broken straw at threshing time, the larvæ of the insect being easily seen by splitting the hard pieces of broken straw with a sharp knife. Last fall there was much more of the broken straw in the threshed grain. It seems almost impossible to get thes e pieces out with the fanning mill, and consequently many larvæ are sown with the fall wheat. I think this insect must have had much to do with the injured grain of last fall. On looking in the bins of wheat at mills or elevators, I became convinced that this insect is worthy of full inquiry and that it is rapidly spreading here.

"November 25.—Since corresponding with you I have felt much interest in this subject, and have made special observations and inquiries concerning the joint-worm. I send you by this mail specimens of infested straws which I have picked from the fall wheat stubble. The piece of ground where I had my fall wheat having been seeded to clover gave me a chance of getting some specimens nearly as good as those I sent before harvest. I also inclose some samples of the broken straw as found in threshed wheat. You will find that these short pieces are hard and woody from the action of the insect upon the growing stem. The pupæ are still alive and ready in the warm days of spring to eat their way out and go through the same routine as their parents before them. In some of the pieces of straw, a little over an inch in length, there may be found from five to ten insects. A bushel of such straw lying loose about a barn would give enough insects to destroy many fields before the grain ripened. I think you will agree with me that every farmer should see that the cleanings from the fanning mill are either fed or burned to destroy the insect."

Remedies.—As stated by Mr. Welsh, the broken hardened pieces of straw noticed when threshing and cleaning grain should be collected and burned. The grain should also be examined for these pieces which should be picked out by hand.

Most of the galls or hardened sections of stem in which the insect passes the winter are low down near the root. The burning of stubbles and deep ploughing are therefore useful in destroying large numbers of the pupæ. The term "joint-worm" probably covers more than one species of minute hymenoptera which attack the stems of wheat and barley; but, fortunately, the attack is of rare occurrence in Canada, and there have been few opportunities of examining the mature insects.

Young plants of fall wheat sent by Mr. Welsh from Verdun in November were found to be attacked by both HESSIAN FLY and the WHEAT-STEM MAGGOT. These two pests were also somewhat abundant in Prince Edward Island. Mr. Edward Wyatt, writing from Pleasant Grove, P.E.I., September 18, says:—"The FRIT FLY for many years now has been doing considerable harm to our wheat and hay crops. The Hessian Fly I have no doubt is the principal aggressor, but the Frit Fly and Wheat-stem Maggot have been associated with it. Some of the maggots which infest the straw are of a yellowish colour, others are green. These pests have been on the island continuously for the last 17 years. The damage was slight until the last three or four years. Many who sow early have poor crops and with no knowledge of the cause. We all sow now from May 20 to 24, thus escaping the first attack which, if bad, ruins the crop. We have never grown better wheat crops than in the past two years—that is, generally; fully one-third of my wheat this year fell down two weeks before it was ripe, still the crop was a fairly good one; but should the season prove favourable to these pests, the damage might be serious."

THE GRAIN PLANT-LOUSE (*Siphonophora avenæ*, Fab.)—Specimens of wheat and oats attacked by the Grain Plant-louse have been sent in from several localities. The worst attacks were reported by Mr. John Tolmie, of Cloverdale, Victoria, B.C., on oats and by Mr. Lewis Rogers, of Cooksville, Peel Co., Ont., on fall wheat, where much damage was done to the young plants in October and early in November. In a case of this kind, if the vigorous wheat plants which have passed the winter are found to be too few in spring for a paying crop, clover may be broadcasted over the land before rolling, or the crop may be helped with a top dressing of some special fertilizer.

GRASSHOPPERS.—A noticeable feature of the correspondence of the division during the past season, as compared with last year, was the almost total absence of complaints of injury to farm crops by grasshoppers. This state of affairs was anticipated on account of the abundance of parasites of several kinds noticed last year and mentioned in my report for 1896. Hair-worms (*Gordius*) have been sent in from Ontario and Quebec more frequently than any other parasites. The account of the strange life-history as far as known, never fails to excite the interest of inquirers. The only localities from which grasshoppers have been mentioned as injurious are: Sable Island, N.S., where they destroyed Brome grass which was being experimented with as a sand binder; Manitoulin Island, Ont., where they did much harm to turnips; and parts of Peterborough County, Ont., where hay and oats suffered to a limited extent from their ravages.


Fig. 1. The Red-legged Locust.

THE PEA WEEVIL OR "PEA BUG"

(*Bruchus pisi*, L.).

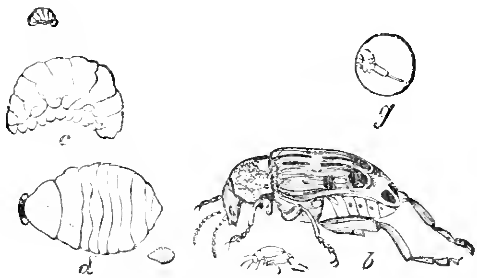


Fig. 2.—The Pea Weevil—natural size and enlarged.

Attack,—A small, brownish gray, very active beetle, $\frac{1}{5}$ of an inch long, with two conspicuous black spots on the end of the body, which emerges from seed pease in autumn or in spring, leaving a small round hole. This insect is generally spoken of under the incorrect name of "pea bug," and infested pease, as "buggy" pease. The egg is laid on the outside of the young pod, and the grub, on hatching, eats its way in and penetrates the nearest pea. Here it remains until full-grown, consuming the interior of the pea and passing through all its stages from a white fleshy grub to the chrysalis and then to the perfect beetle. Some of the beetles, the percentage varying with the season, escape from the pease in the autumn and pass the winter hidden away under rubbish or about barns and other buildings. The greater number, however, do not leave the pease until the following spring, so that they are frequently sown with the seed.

The perfect insects fly easily and resort to the pea fields about the time the blossoms appear. They have been observed feeding upon the leaves and flowers of the pea vines before the pods were formed, but the injury so done is inappreciable compared with the much greater loss from the injury to the seeds by the grubs.

From the large numbers of beetles which I once found dead, after a severe winter, beneath the shingles of a barn, I am led to believe that, in those seasons when a large percentage of the beetles issue in the autumn, many are apt to be destroyed by severe cold.

Frequent inquiries come in every year for information concerning the Pea Weevil and the best means of preventing its injuries.

During the past season, from such reports as have been received, it would appear that on the whole the Pea Weevil has not been quite so injurious as in former years. Some correspondents, however, report that the injury is still considerable.

"Picton, Prince Edward Co., Nov. 6—Our big pea houses report that the Weevil this year was not as bad as usual. Every effort is now made to destroy the Weevil by what is called "bugging" the pease as soon as they are received from the farmers."—[Wellington Boulter.]

The insect itself and its life history are now well known in the districts where it occurs; and, if more care were taken to sow only uninfested pease or those which have been properly fumigated, there would be no difficulty in reducing very considerably the numbers of this pest, which every year affects so materially the value of the pea crop of the Dominion. There are vast areas in Canada where good seed pease can be grown as a paying crop, and where the Pea Weevil does not occur at all. The advantage of obtaining seed from these districts is obvious and has already been recognized by some of the large seed firms. In addition to this, the method usually adopted of killing the weevils, either as grubs or as perfect beetles inside the seed pease, by subjecting them to the fumes of bi-sulphide of carbon, is perfectly effective. Most of the seed houses at the present time treat their seed carefully and conscientiously, and the injury to the crop is now done chiefly by grubs from eggs laid by weevils which have either left the pease in the autumn and wintered over, or else from pease saved for seed in small quantities by farmers who took no steps to destroy the weevil before sowing time.

Writing early in the present season, Mr. T. G. Raynor, of Rose Hall, Prince Edward Co., Ont., says:—"I do not think the pea weevil was nearly as bad in this county in 1896 as in previous years. Perhaps the season had something to do with it.

Still, every year for some time past, there have been fewer pease owned and sowed by the farmers themselves. The company pease, which are treated for the bug, have replaced the others. This must necessarily have its effect for good. I have no doubt that the pease had more bugs in them than was generally supposed, as the fancy pease grown here are cut and marketed early, before the weevil has developed much or can be detected, and the pease are generally treated for the bugs as soon as they are marketed."

Late sowing is sometimes recommended as a preventive remedy, but is more or less uncertain in its good effects according to the season, and has never become very popular, although the method has always a few adherents in all districts visited, the idea, of course, being to delay the development of the pease until after the season when the weevils lay their eggs. The chief danger is that late sown pease are apt to be attacked by the ordinary white mildew of the pea, which reduces considerably the crop.

I quote from my annual report for 1890, a statement by Mr. J. H. Allan, of Picton, Ont., one of the best informed authorities in the pea trade:—"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 insure a paying crop."—(*Report of Ent. and Bot., C. E. F. Report, 1890*, p. 173.)

"Weston, York Co., Ont., March 8:—The pea weevil, which eats out the centre of the pease in the barn, around here destroys about one-quarter of the crop. Some people sow late to escape the weevil, but they do not get half the crop as when they sow early. To sum up, if you sow early, you get a good crop of pease and weevil. Sow late, you get a poor crop of pease and few weevils. We sow about forty acres of pease on our 250 acre farm."—[J. La F. Stonehouse.]

Remedies.—Bisulphide of Carbon.—Where the crop is large, undoubtedly the wisest course to adopt in districts where the pea weevil occurs, is to fumigate the pease with bisulphide of carbon as a regular practice as soon as possible after harvesting. In this way, any weevils contained in the pease will be destroyed in the grub state before they have consumed much of the substance of the pease in which they are undergoing their transformations. This may be done by placing the infested seed, according to the quantity to be treated, in some suitable receptacle, as a tight barrel, box or bin, or, if the quantity is large, in a specially prepared building. Mr. Allan describes his method, which is practically that generally adopted, as follows: "Nearly every large grower has a building for the purpose. If properly made, it works well. The whole building must be very tight to be of any use. Some use tin, others cement and paint and paper lining, with a double floor and tarred paper between. The pan we use to put the carbon bisulphide in is about three feet across and only about four inches deep. The chemical is thus exposed to more air than it would be in a deep dish, from which it could 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, works down through them. We fill the building with bags as close as possible up to where the pan hangs, empty the bisulphide into the pan and get out as quickly as possible, close the door up tightly and leave it for 48 hours. This must be done in warm weather, as the liquid does not vaporize well when the temperature is lower than 10 degrees above zero." (*C. E. F. Report, 1890, loc. cit.*)

Perhaps the most convenient receptacle for treating weevilly pease, for farmers, is an ordinary 45 gallon coal oil barrel, into which 5 bushels of pease may be put at a time; the quantity of bisulphide of carbon which has been found necessary is one ounce to every hundred pounds of seed; therefore, for the above quantity three ounces should be poured into some flat pan placed on the top of the seed or sprinkled over the surface, and the barrel covered closely, first with a thick cloth or canvas which has been damped in water, and then with boards. The barrel should be in an outside shed and left closed for 48 hours.

Bisulphide of carbon is a colourless liquid which volatilizes very readily at ordinary temperatures; the vapour, which is quite invisible but has a strong unpleasant odour, is heavier than air, and therefore sinks readily to the bottom and permeates the whole contents of any closed receptacle in which it is used to free grain of infesting insects.

Great care must be taken in the use of this chemical on account of the extreme inflammability both of the liquid and its vapour. No fire, such as a flame or even a lighted pipe or cigar, must be taken near either the liquid or the bin in which the pease have been treated, for some time after it is opened and the heavy and inflammable vapour has been let out. Treating seed of any kind with bisulphide of carbon has no deleterious effect upon the vitality of the seed nor upon its wholesomeness as food.

The question sometimes arises whether pease badly infested with weevils can be used safely for feed. I find upon inquiry that it is a general practice to grind up weevilly pease and use them for feed, and no injury to stock has been reported so far. Mr. T. G. Raynor, answering this very question in the *Farmer's Advocate* for March 1, 1897, says:—"The cull pease from re-cleaning the pease at the seed houses, after being treated for the bug, are used for feeding purposes, and I have not heard of any injury." Mr. Wellington Boulter, the Mayor of Picton, Ont., one of the most important centres of the seed-pea trade in Canada, also writes as follows:—"November 26.—*In re* your inquiry as to grinding pease infested with pea-weevil for pigs, injury to stock, &c., I would most emphatically say no injury could happen. I have ground up quantities in the past. I have also fed pigs with the pease in the natural state and never heard of any injury. In grinding, the bugs would be ground to powder."

Holding over seed.—Some people may not care to have such a dangerous material as bisulphide of carbon about their premises. For such, an excellent remedy is holding over until the second year after harvesting any pease required for seed. This may be done in the case of pease without any injury to their vitality. They should be inclosed in paper or cotton bags, which will be sufficient to prevent the beetles from escaping when they emerge. At the time of sowing the pease, they should be examined and if necessary hand-picked; every grain which has been perforated should be discarded, as frequent experiments have proved that it is impossible to grow strong plants from weevilled pease, although unfortunately there is a widespread belief to the contrary.

The Pea Moth (*Semasia nigricana*, Steph.).—This enemy of the pea, which has been treated of in former reports without a specific name, has this year been identified (from specimens bred from larvæ collected last year at Ottawa) through the kindness of Prof. C. H. Fernald, of Amherst, Mass., who writes:—Your pea insect was greased and unspread, and therefore difficult to determine; but I believe it to be *Semasia nigricana*, which is now considered distinct from *nebritana*, Treits, under which it was placed as a synonym by Wocke in Staudinger's Catalogue. It is probably identical with *pisana*, Guen., and has long been placed under the genus *Semasia*, but Meyrick in his *Handbook of British Lepidoptera* puts it under the genus *Laspeyresia*, Hbn.

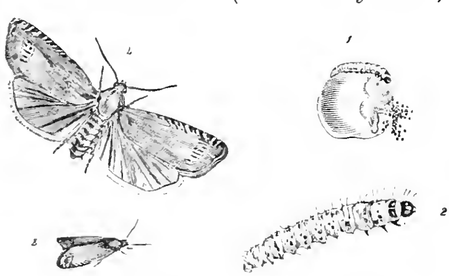


Fig. 3.—The Pea Moth—natural size and enlarged.

The accompanying figure has been kindly supplied for this report by Messrs. Blackie & Son, of Glasgow, Scotland. It is by John Curtis, and was used in his great work "*Farm Insects.*"

Six specimens of the moth were bred, and all emerged between the 12th and 15th of July. As the cocoons were kept under natural conditions this is probably the time when the moths appear in nature, which would emphasize the value of the remedy already suggested of early sowing. The moth is small and inconspicuous, ¼ of an inch long when the wings are closed, mouse-coloured, bronzed towards the tips of the wings, silvery gray beneath. The only markings are along the front margin or costa and near the apex of the upper wing. The costal marks consist of about 10 or 12 short black triangular streaks, separated from each other by similar clear white dashes all directed backwards; two of the black streaks, however, the third and fifth, which start from about the middle of the costa, are much longer than the others and run parallel to each other diagonally one-quarter across the wing towards the apex; these are narrowly margined with bronze scales and broadly shadowed on the side towards the apex with bands of pearly gray scales. These bands run right across the wing and unite at the other margin, thus inclosing a somewhat oval or flask-shaped space, which bears in its centre 4 or 5 short longitudinal dashes and also includes in its neck the outer of the two long black diagonal streaks from the costa.

The injury from the caterpillars of the Pea Moth was not so marked in Ontario and Quebec as in previous years, but in the Maritime Provinces it has been as wide-spread as usual. Mr. J. E. Wetmore, of Clifton, King's Co., N. B., sent me on 16th of September last several pods of Stratagem and Crown peas, also of the wild Tufted Vetch, *Vicia Cracca*, with the following notes: "I find that they attack the Stratagems in all stages of growth, from the most immature to those nearly ripe. I have found but few in the green Crown pease. In this variety they are almost always among the ripe ones. Nearly every pod of Stratagem is affected, while but about one-third or one-quarter of the Crown pease are attacked. Early pease ripening in July are not liable to be attacked, but, as the season advances, their numbers increase till the tender late varieties are almost wholly destroyed. I have examined some pods to see where the attack generally occurs. I thought it was always at the upper end, but of fourteen specimens before me three are attacked at the upper end and three at the lower end, while eight are at intermediate points, so that there does not seem to be any regular spot for the egg to be laid and the young caterpillar to enter the pod."

"Berwick, King's Co., N. S., 26th November.—The Pea Moth has been very destructive to both garden and field pease."—[S. C. Parker.]

ROOT CROPS AND VEGETABLES.

Garden vegetables and root crops during the past season have been little attacked by insect pests.

CUTWORMS.—There have been the usual local occurrences of cutworms in different parts of the Dominion; but, with the exception of a severe outbreak on Vancouver Island, there was no widespread devastation complained of. No mention of cutworms was made in the provincial crop reports of Ontario, Nova Scotia, or Manitoba. Rev. Father Burke reports from Prince Edward Island: "Cutworms seem to dislike a wet season, like some other insects. We were relieved very much in this respect last spring."

"Yarmouth, N.S.—Cutworms were not as destructive as usual."—[C. E. Brown.]

"Clifton, King's Co., N.B.—Last season cutworms were very destructive here, so that it was almost impossible to raise any vegetables; this year there have been very few losses from them. 1896 was very dry; this season, 1897, has been moist and cool; would this account for the difference in their numbers?"—[J. E. Wetmore.]

"Victoria, B.C., Nov. 8.—Cutworms were numerous and destructive this spring and destroyed quantities of young garden stuff."—[R. M. Palmer.]

"Thetis Island, B.C., June 3.—I send specimens of an insect which is working havoc to the root crops here; my onions are all gone, and beets and carrots are slowly disappearing; it cuts off the young plants close by the ground."—[Peter Hunter.]

"Mattawa, Nipissing, Ont., June 21.—Inclosed find grubs which are working great havoc in crops attacking almost everything in the shape of vegetables, particularly beans, corn and cabbage."—[C. G. Hurdman.]

"Stonefield, Argenteuil Co., Que., June 25.—The farmers in this neighbourhood, who have sown feed corn, are troubled to a serious extent by a grub, which cuts off the young plant as soon as it appears above the ground."—[Reuben Wilden.]

"St. Patrick, Temiscouata Co., Que., June 26.—All the gardens in this neighbourhood are suffering from the depredations of a grub, which is devouring all the young vegetables. It is a common grub, but is in such unusual numbers that the poor people fear that every vegetable will be destroyed."—[Mrs. D. W. Macdonell.]

No new remedies have been discovered for these troublesome pests of the garden and farm. The remedies given in my last report have been found very serviceable, particularly the poisoned bran remedy, when the material was used either dry or moistened.

Potatoes have been an uneven crop, very good in many places, but in as many others, there was loss from neglecting to use Paris green for the Colorado Potato-beetle and to spray for the potato-rot. Mr. W. W. Hubbard, of Sussex, N.B., the editor of the *Cooperative Farmer*, says:—"We had a very wet spring with considerable damp, sultry weather through the summer, and this was very favourable to spore growth. Potatoes were early struck with rust. Scarcely any one will use the Bordeaux mixture." This is a great pity, for the results of spraying to prevent the potato-rust, which later produces the potato-rot, are so marked that any one who will try a small experiment, must be soon convinced of the value of this remedy.

BLISTER-BEETLES.—The Black Blister Beetle (*Epicauta Pennsylvanica*, DeG.) appeared in large numbers at St. Denis, Kamouraska Co., Que., on potatoes. Several specimens were sent by Mr. J. C. Chapais. The Gray Blister-beetles (*Macrobasis unicolor*, Kirby) did much harm to potatoes and beans at South River, Muskoka, Ont., and Mr. J. I. Sheil, having read in previous reports of the difficulties of some of my correspondents in treating these insects without injuring the crop, tried some experiments with the insecticide "Slug shot," which he prefers very much to the ordinary mixtures of Paris green used for this insect, finding it equally effective, with no danger of injuring the foliage of the plant treated.

APHIDES or plant-lice were very abundant last season, almost everything being attacked severely. No specimens were received, but several correspondents refer to injury to carrots by a species of plant-louse which spotted the foliage and stunted the roots of the carrots. This occurred in Ontario, Quebec and Nova Scotia. Mr. C. E. Brown, of Yarmouth, N.S., reports:—"Among hardy vegetable crops there was injury and in some cases there was a total loss of carrots from the attacks of aphides. These pests were prevalent not only throughout this county, but in the adjoining counties."

THE CARROT RUST-FLY (*Psila rosæ*, Fab.).—*Attack.*—Early in the season the leaves of young carrots turn reddish and the roots will be found to be blotched with rusty patches, particularly towards the tip. These carrots when stored for winter use, although sometimes not showing much injury on the outside, may be found to be perforated in every direction by dirty brown burrows, in which are many semi-transparent yellowish maggots about $\frac{1}{4}$ of an inch long. These maggots are blunt at the tail end, but taper toward the head, where is a black hooked tip, forked at the base, by which the maggot makes its way through the the roots. The puparium is reddish-brown, and the maggots, as a rule, leave the carrots before assuming this form. The fly and its work are shown very well in the figure (Fig. 4) by John Curtis, which I am able to present herewith through the courtesy of Miss Ormerod and Messrs. Blackie & Son. The mature fly is two-winged, $\frac{1}{4}$ of an inch long, bright shiny black, with yellow legs and red eyes. The wings are beautifully iridescent. The winter is passed either as a maggot or in the puparium. Miss Ormerod, the eminent English entomologist, who has studied the insect for many years, describes the attack as follows:

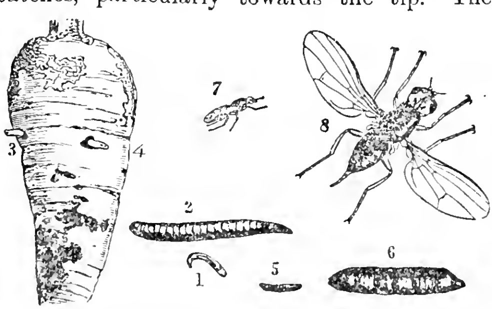


Fig. 4.—The Carrot Rust-fly—natural size (1, 5, 7), and enlarged (2, 6, 8.)

"The method of life of the Carrot Fly is to go down into the ground, where she can find a chink or cranny by the carrots. There she lays her eggs on or by the roots, and the little yellowish or whitish maggots which hatch from these work their way into the root itself, or, if this is still very small, often destroy the lowest part. When full fed they leave the carrots and turn to the chrysalis state in the ground. The chrysalis cases are cylindrical and of a rusty or ochreous colour, and from these (in summer) the little blackish-green, two-winged flies, with rusty, ochre-coloured heads, come out in about three or four weeks." (*E. A. Ormerod. Ann. Rpt., 1898*, p. 11.)

During the last ten or twelve years occasional complaints have been received of injuries to carrots by the larvæ of the Carrot Rust-fly. These have been mostly from the province of New Brunswick, but also once or twice from Ontario and Quebec. This attack is a serious one, the carrots stored for winter use being rendered useless for the table from the discoloured burrows of the numerous maggots which sometimes occur in a single root. In 1895, Mr. J. S. Armstrong, of Rothesay, King's County, N.B., who had suffered severely from the ravages of this insect, noticed that late sown carrots were less injured than those sown at the ordinary time. This practice has since been recommended, and has been adopted with considerable success.

"Upper Sackville, Westmoreland Co., N.B., March 4, 1896.—My son William has written me that he was talking to you about the carrots we grew in our garden the past two years. He wished me to send you a sample; but they were so badly affected in the fall that we fed them to the cattle. I send you 2 small roots I found in the cellar. They will show the disease, but they do not represent the growth, as they are too small. The crop was large enough, but I think every carrot was diseased. It was in 1894 that we first noticed that something was wrong. In 1895 I planted in another place, but they were no better. Carrots had been grown on the same land previous to 1894 and were sound and good."—[John Fawcett.]

"Brookville, St. John Co., N. B., Dec. 20, 1896.—I send you carrots badly infested by some maggot which entirely destroys them, burrowing in every direction through the root. The carrots came up well, but after I weeded and thinned them they began to wither down in spots. The remainder seemed to grow pretty large, but when pulled were all full of maggots and are not fit for use."

"Feb. 15.—In reply to your letter, I sowed my carrots the first week in May. I have made inquiries of some of the farmers here and find that those who sowed later had their carrots not nearly so badly attacked as mine. Do you think cropping the same ground year after year would affect the roots?"—[Benjamin Hevenor.]

"Upper Sackville, Westmoreland Co., N.B., Jan. 5, 1897.—I sowed a much larger patch of carrots on another part of my farm later in May and had an excellent crop. No appearance of the maggot; but last year ours were so bad that we had to buy for table use. The man we bought of lives some eight miles from here. This year his carrots are affected, to all appearances as ours have been. I know of no other cases. He has been growing carrots on the same plot for some time."

"Dec. 15.—We have had no trouble with carrot-fly this year since we changed the place of cultivation. I have heard of another attack, however, on a friend's place ten miles distant. I will send you some infested roots as soon as I can get them."—[W. W. Fawcett.]

"Clifton, King's Co., N. B., Sept. 16.—I find it almost impossible of late years to get a crop of carrots on account of a small white grub which attacks the roots from the time they are very young and continues its ravages throughout the season."

"Dec. 10.—In reply to your favour inquiring about injury to my carrots this year. Last year they attacked the carrots severely. I did not harvest more than one-third of a crop. This year they attacked the young plants and cut them down very badly in my field, and in disgust I ploughed them under and sowed late turnips. From appearances, had I left them, I would not have had more than one sixth of a crop, if any at all. One of my neighbours had about one-third of a crop, and another still less. There are very few carrots raised here of late years, on account of this pest."—[J. E. Wetmore.]

Remedies.—Where remedies have been applied by my correspondents, the best results have been secured by the use of ordinary coal oil, either in the form of sand saturated in the proportion of one half a pint of coal oil to three gallons of dry sand, ashes or land plaster, which was sown at short intervals along the row, or of kerosene emulsion, one part of the ordinary Riley-Hubbard formula to 10 of water sprayed along the rows.

Miss Ormerod gives the following advice:—"For prevention of attack generally, what is needed is a well prepared soil which will push on good growth of the plant, and also not be liable to crack, and also such management of ground and plants at thinning-time as will not allow the Carrot Fly to get down to lay its eggs by the roots. *This point is the important matter in the prevention of the Carrot-grub attack, commonly known as 'rust.'* If the fly *cannot* get to the roots to lay her eggs, obviously there will be no maggots to harm them, and the reason why carrots which have done well up to thinning-time often fail afterwards, is *because the ground is thrown open* in the operation.

"I always advise that the greatest amount of thinning that can be managed should be done as early as possible, then give good waterings after thinning, and from time to time afterwards to drive the surface soil together."

From our Canadian experience it would appear that late sowing has a particularly good effect. When carrots are grown as a farm crop, it is, of course, well to sow them as early as convenient and thus secure as heavy a crop as possible; but, for table use, I have found by experiment that this vegetable may be sown very much later than is the usual practice, and, if frequently hoed or cultivated, will give a good crop of excellent roots, while at the same time the danger of loss from the Carrot Rust-fly will be much lessened. Carrots sown as late as the third week in June produced a crop of table carrots of good size and excellent quality.

Where this fly is known to be prevalent, carrots should be sown every year as far distant as possible from land which is known to have been infested. Where carrots are stored during the winter in sand or earth, this, of course, must be treated to destroy the pupæ which leave the roots and enter the soil to pass their last preparatory stage. Miss Ormerod suggests that this earth might be put into a wet manure pit so as to prevent the hatching out of the flies. Should neither of these methods be convenient, at any rate, it might be buried in a deep hole dug in the ground for the purpose.

THE SPINACH CARRION-BEETLE (*Silpha bituberosa*, Lec.).—*Attack*.—Shiny black, very active, flattened grubs $\frac{3}{4}$ of an inch in length, shaped like wood-lice, which devour the leaves of plants belonging to the spinach or goosefoot family (*Chenopodiaceæ*) and also members of the Gourd family. In my Report as Entomologist for 1893 is given an account of injuries to crops by this carrion-beetle. During the past summer there was a new outbreak at Calgary, Alta. Mr. E. D. H. Wilkins writes:—"May 30.—A black grub is swarming in my garden this spring and devouring the leaves of the spinach and beet. I also find it on the weed commonly called lamb's quarters. Please advise me as to a remedy, for this grub is doing a great deal of damage, and I do not like to use poison on the spinach leaves."

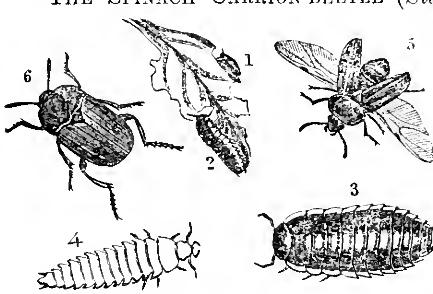


Fig. 5.—Carrion-beetle (5, 6); larvæ (1, 3, 4).

"June 13.—I sent you a few days ago some more grubs, as you wished. I have tried Paris green traps and used overgrown spinach plants. We have had only five hours' rain this year, so that it is a struggle to keep things going. There is very little succulent vegetation to use for traps such as you suggest. Your advice about keeping the place clean of all weeds is more to the point here. Last year I was careless and let lamb's quarters grow in great quantities in waste places in the garden. That is evidently why I am now plagued with these beetles. After trying the Paris green traps I counted twelve corpses in one row. I am satisfied that with these, as I have found it is the case with cutworms, the best preventive measure is to clean up everywhere and leave no weeds or lamb's quarters growing, so that the insects can have no chance to breed."

Remedy.—The only remedy which can be suggested for this insect when it attacks such plants as beetroots and mangels is to dust the young plants at the end of May and during the first part of June, when the grubs appear, with a poisonous mixture such as Paris green and some powdery diluent, *e.g.*, flour, land plaster or ashes, one part to 50. In the case of spinach, it may be necessary to cover the plants with netting or cheese cloth for a time; or a more attractive food plant such as lamb's quarters, or the native weed of the West, *Monolepis*, which is stated to be the favourite food plant of this insect, may be sown close to the spinach to draw off the attack.

FRUITS.

The fruit crop of Canada for the year 1897, although in no way comparable for quantity with that of last year, has been, on the whole, a good crop, and where spraying has been adopted good profits have been made. It is to be regretted, however, that some of our less progressive fruit growers have not yet adopted this most useful means of saving money. This is in some measure due to the ignorance of fruit buyers, who, it seems, cannot be taught that there is not the slightest danger from the use of fruit from trees which have been sprayed, and that, if sufficient poison were used to make the practice dangerous, the fruit grower would be the first to suffer, because the amount of poison necessary for that would cause both leaves and fruit to fall from the trees long before the fruit was ripe.

It would take too much space to give extracts from letters of practical business men who have learnt from experience the value of the practice of spraying against injurious insects and fungous diseases; but hundreds might be cited.

Among fruit insects of the present season the San José Scale has been the subject of extensive correspondence; but many other insects which, except for the anxiety thus aroused, would not have attracted notice, have also been inquired about. Some of those species which may be called the standard pests of the orchard and fruit garden, have been less in evidence than usual. Next to the San José Scale, TENT CATERPILLARS called for most information, and occurred in injurious numbers both in orchards and upon forest trees. In the Ottawa district basswoods (*Tilia*) were much injured and groves of aspen (*Populus tremuloides*, Michx.) for many miles along the Ottawa River were stripped perfectly bare of foliage in the month of June. At Bewdley, Northumberland Co., Ont., Mr. T. W. Ramm, says:—"I never saw so many Tent Caterpillars as there were here this spring." Mr. Ramm also bred from the cocoons several specimens of the useful "ichneumon fly" *Pimpla pedalis*, Cress. Mr. F. W. Payne sent specimens of the Forest Tent Caterpillar from Hall's Glen, Peterboro' Co., Ont.:—"July 17. As I drove along the road $2\frac{1}{2}$ miles from here, I noticed that the maple trees were defoliated to the extent of $\frac{1}{3}$ to $\frac{2}{3}$ of their foliage, and hundreds of moths were flitting through the branches. The cocoons hung in the maples, by hundreds, one to each leaf with the edges drawn together by a web."

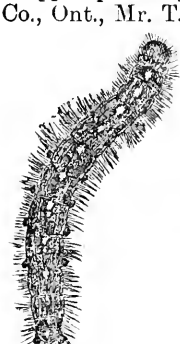


Fig. 6.—Forest Tent Caterpillar.

Tent Caterpillar injuries are also reported from the Annapolis Valley, Nova Scotia, by Mr. S. C. Parker, of Berwick, and Mr. M. G. DeWolfe, of Kentville, N.S.; and in Manitoba Mr. H. W. O. Boger found them unusually abundant at Brandon, attacking currant bushes, roses, choke cherries and the mountain ash.

In British Columbia these insects swarmed on every hedge and also did much harm in orchards.

"Victoria, B.C., April 28.—Tent Caterpillars are hatching and are very numerous.—[R. M. Palmer.]

"Victoria, B.C., May 18.—Tent Caterpillars swarm everywhere, but as usual a large proportion bear the eggs of parasites (*Tachina*). I am sending you a specimen of the Caterpillar with no less than 8 eggs on it; from this you will see the abundance of the parasites."—[E. A. Carew-Gibson.]

The specimens represented in Mr. Carew-Gibson's sending were *Clisiocampa Californica* and *C. Americana*.

"Agassiz, B.C.—We have this year swarms of Forest Tent Caterpillars. The hazel, willow, crab apple, birch and alder in the woods, all seem to be infested."—[Thos. A. Sharpe.]

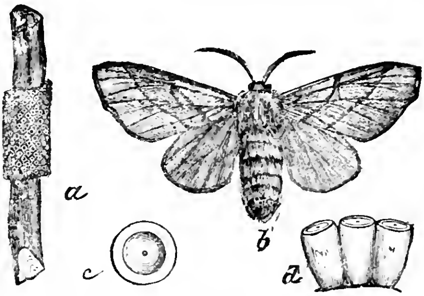


Fig. 7.—Forest Tent Caterpillar; eggs and moth.

Fig. 6 shows the Forest Tent Caterpillar and Fig. 7 the eggs (natural size and enlarged) and female moth of the same. All the Tent Caterpillars resemble each other very much and will be easily recognized from these cuts.

The remedies for Tent Caterpillars of all kinds are hand-picking of the eggs and young colonies and the spraying of the foliage of infested trees before the caterpillars get large enough to do much harm.

CANKER-WORMS (*Anisopteryx*).—Two references only to injury by Canker-worms have been made this season; but I observed while travelling through Nova Scotia in June last the abundant presence of these insects in certain localities. I was much pleased to notice the general adoption of spraying by the leading fruit growers. These caterpillars must be treated while they are young, or the ordinary spraying mixtures are not strong enough to destroy them.

"Grimsby, May 31.—Mr. Laws has handed me a box of apple boughs cut from his father's orchard near Camden, Ont., where the Canker-worm is very bad. He says he has tried Paris green faithfully without effect. The orchard looks as if fire had been through it in summer."—[L. Woolverton.]

"Berwick, N.S.—The Canker-worm still crops up in some sections; an infected district takes a long time and careful work to clear up. I do not know of any serious losses this year from its ravages."—[S. C. Parker.]

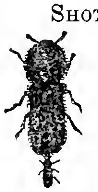


Fig. 8.—Shot-borer nat. size & enlarged.

SHOT-BORER (*Xyleborus dispar*, Fab.).—This injurious enemy of the apple continues to commit serious depredations in the orchards of Nova Scotia and Prince Edward Island, where it attacks both apple and plum trees. The most extensive injury brought to my notice during the past season occurred at Grand Pré, King's County, N.S., where Mr. George Johnson, the Dominion Statistician, found the beetles working much havoc in his own orchard as well as in those of several of his neighbours. The best remedy for this insect is the wash mentioned by Mr. John S. Woodworth, of Berwick, N. S., in my Report for 1894, viz., washing the trees liable to attack three times,—early and late in June and once in July, with the following: Soft soap, 1 gallon; water, 3 gallons; carbolic acid, ½ pint. This same mixture has been used successfully against the Peach Bark-borer (*Phlœotribus liminaris*, Harris).


Fig. 9.—Oyster-shell Bark-louse.

OYSTER-SHELL BARK-LOUSE (*Mytilaspis pomorum*, Bouché).—Every year brings numerous complaints of the deadly work of this enemy of the fruit grower, and 1897 has been pre-eminently a scale-insect year, owing to the anxiety about the San José scale having directed a more than usual amount of attention to these inconspicuous but frequently fatal enemies of fruit trees.

The best remedies for all scale-insects which, like the Oyster-shell Bark-louse, have only one brood in the year, is to spray the trees before the buds burst, and again in June when the young are moving, with the Riley-Hubbard kerosene emulsion (1 to 9), or with whale oil soap, 1 lb. in 2 gallons of water. In addition,—and this is of great importance,—a healthy, vigorous growth should be induced by manuring liberally, frequent cultivation of the land, and judicious pruning of the trees. On this point Mr. S. C. Parker, the Secretary of the Nova Scotia Fruit Growers' Association, writes:—"I notice in your report for 1896 many complaints from Cape Breton, Prince Edward Island, etc., of the Oyster-shell Bark-louse. I would like to wager a trifle that in four out of five cases these orchards are in grass, perhaps a cow pasture. It is of little use to try to grow trees in Nova Scotia or Prince Edward Island without thorough cultivation and annual application of fertilizers. I have yet to see a healthy tree growing vigorously that will spend any time bothering with bark-lice."

The APPLE MAGGOT (*Trypeta pomonella*, Walsh), referred to in my last report as the cause of considerable injury in Dr. Young's orchard at Adolphustown, Lennox Co., Ont., has apparently not increased during the past season. Dr. Young writes: "September 27.—We have a few of the Apple Maggot in the fruits of the same trees as last year, but not nearly so many as there were then. We ploughed and cultivated the ground last fall, and once in the winter when there was quite a thaw, and then again gave it a deep ploughing in the spring."

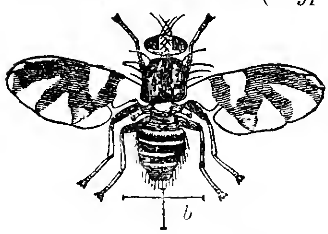


Fig. 10.—Fly of Apple Maggot.

The Apple Maggot is extremely abundant in the state of Vermont close to the borders of the province of Quebec, and Mr. J. T. Macomber, of Grand Island, Vt., writes to me that "it occurs every year and is increasing fast; in some orchards more than 50 per cent of the fruit is ruined. Numbers of the maggots are found in each apple tunnelling all through the pulp and utterly ruining it, except for stock." Fruit growers in the Eastern Townships should be on the lookout for any such injury to apples as is shown on the cut of an infested apple given herewith, or for an insect resembling Fig. 10, which shows the fly enlarged. These flies will be found after midsummer. They are dark in colour, with yellowish head and legs, with clear white bands across the abdomen. They are not very active and may be looked for on the apple trees in late summer and autumn. The remedy which is most relied on is the prompt gathering and destruction of all windfalls before the maggots leave them to go into the ground. This can be done by keeping poultry, pigs, sheep or other stock in the orchard.

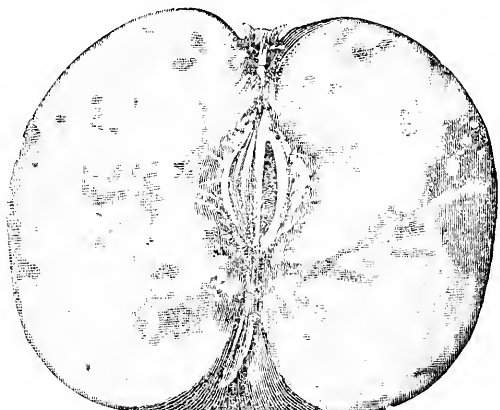


Fig. 11.—Apple infested by Apple Maggot.

The APPLE FRUIT-MINER (*Argyresthia conjugella*, Z.).—Considerable space in my last report was devoted to a new enemy of the apple which in British Columbia caused last year great anxiety from the extent and serious nature of its injuries, which closely resemble those of the Apple Maggot. Last spring the perfect insect was successfully reared both

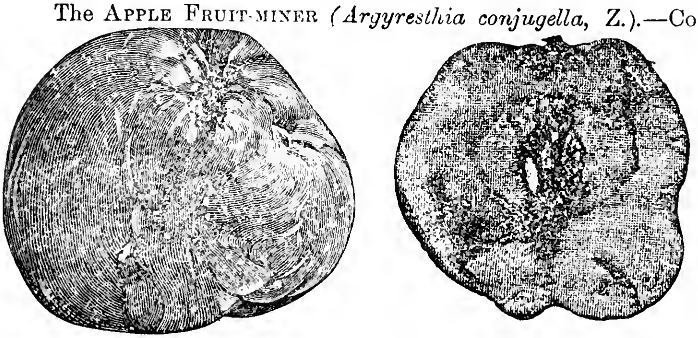


Fig. 12.—Apple injured by Apple-fruit Miner, and the same cut open.

by Mr. E. A. Carew-Gibson, in Victoria, B.C., and by myself at Ottawa. It proved to be a beautiful little Tineid moth belonging to the genus *Argyresthia.* One of the specimens was sent to Lord Walsingham, of Thetford, England, a high authority on Microlepidoptera, who reports as follows :—

"Merton Hall, Thetford, England, Dec. 13, 1897.—The moth which you have submitted for determination is *Argyresthia conjugella*, Z., which in Europe feeds in the fruit of *Pirus Aucuparia*, but has not been recorded, so far as we know, from *Pirus Malus.* Lord Walsingham has a worn specimen from Esquimalt, Vancouver Island, and he is inclined to think that his identification of the allied species *mendica*, Hw. (*Insect Life, III*, 118), as occurring at Washington, may have been erroneous, as the specimen was evidently not in good condition, and he would suggest that search should be made for the larvæ there and elsewhere."—[Jno. Hartley Durrant, Ent. Asst. to Lord Walsingham.]

The moth is a slender insect measuring $\frac{3}{8}$ inch across the expanded wings. Upper wings silvery gray, mottled with darker patches. Along the inner margin, from the base to the middle of the wing, is a broad silvery band of white ending abruptly on the inner margin but in a spur running backwards at the outer angle of the band. This is followed by a conspicuous black patch, which, widest at the inner margin, runs diagonally backwards across the wing ; next to this is an elongated triangular white patch mottled with brown, having the base on the inner margin of the wing and the apex elongated and directed backwards toward the tip of the wing, which terminates with an eye-like spot somewhat like a peacock's feather. The dark gray lower wings are heavily fringed all round with long silky gray hairs, as also is the lower apical margin of the upper wings. The frontal tuft and the thorax are of the same silvery white as the broad bands on the upper wings, which come together when the wings are closed and, joining with the thorax, form a continuous white dorsal stripe from the front to half way down the wings, where it is cut off by the dark bands which cross the wings diagonally. The two white triangular patches also come together when the wings are closed, forming a crescent-shaped saddle toward the tip of the wings. When at rest the posterior end of the body is raised up at an angle of 45 degrees and the insect is supported on four legs very widely separated. At such times the moth bears very little resemblance to an insect and may certainly be easily overlooked.

Mr. Carew-Gibson was the first to breed this moth ; one of his specimens which he kindly forwarded to me, emerged from the cocoon on May 20, and another a few days later. The single pair which I bred at Ottawa from apples collected at Agassiz, B.C., by Dr. William Saunders, emerged on June 2 and 3, the cocoon having been taken out of the cellar May 24. Although they were male and female, I failed to get them to pair ; thus no studies could be made of the eggs and the mode of oviposition. There has been little complaint of injury by the Apple Fruit-miner during the past season. Mr. R. M. Palmer, in a valuable report on the insect injuries of the year in British Columbia, with which he has favoured me, says :—"The Apple Fruit miner, as I expected, has been very little noticed this season, although I occasionally see specimens of apples injured by it ; so, it has not quite disappeared. The apple crop of the province this year has been an exceptionally good one, and the fruit better coloured and freer from scab than for many years past. The practice of spraying is now pretty general, and the season has also been favourable."

PLANT-LICE (*Aphididæ*) of all kinds and upon almost every crop cultivated have been particularly abundant during the past season in all parts of Canada except British Columbia, where, strangely enough as this province in most years suffers severely from them, there were less than usual :—

"Victoria, October 4.—Aphides of all kinds have been less numerous this summer than any year since I have been in the province. *Aphis brassicæ*, however, was an exception and was very troublesome on the islands."—[R. M. Palmer.]

"Yarmouth, N.S., November 30.—The excessive rains of April, May and the first half of June during which there was a precipitation of 18·8 inches were not propitious to insect life, except that we were visited by unprecedented swarms of Aphides that covered all the young growth of fruit trees and were most destructive to the fruit crop. In some varieties of apples, the Gravenstein suffering most, the crop was utterly ruined, and in all it was greatly diminished. Young trees in the nursery were destroyed, or the growth for the year stopped."—[Charles E. Brown.]

"Sussex, King's Co., N.B., November 19.—On young apple trees the green aphis was in very large numbers, always with the attendant ants."—[W. W. Hubbard.]

Mr. Martin Burrell, of St. Catharines, Ont., has favoured me with the following useful observations on some Plant-lice of the orchard made by him during the past season :—

"As far as fruit-growing is concerned the different species of Plant-lice have been by far the most serious pests we have had this season. I do not recall such a scourge for many years. Every kind of fruit tree was affected, and even the weeds did not escape.

"The principal damage has been done by the Cherry Aphis (*Myzus cerasi*, Fab.), whose attacks on the sweet cherry of this peninsula were simply disastrous. I do not think I should be overshooting the mark if I said that half the crop was ruined. I saw many cases where not only the foliage was covered but even the fruit, and especially the stalks, with lice. The application of kerosene emulsion is such a "messy" business and the pressure of other work is so great at that season of the year that the pest is rarely checked on its first appearance. We shall have to din it thoroughly into our heads that the stamping out of the early generations of both the black and green aphis is the most important work of the day. The green species did an enormous amount of harm, not only to the growing shoots of young plum and pear trees, but to the foliage of the fruiting trees, thereby impairing both the size and flavour of the fruit and further depressing already congested markets by dumping on them large quantities of half-coloured, insipid and worthless plums. It is, of course, well known that the black species of lice are more resistant to insecticides than the green. I find that the kerosene emulsion should be diluted with only 6 or 7 times the quantity of water to be effective against *Myzus cerasi*, while 1 to 12 or 14 is all right for the green forms.

"Tobacco water should be on the strong side too. I did not find 1 pound to 6 gallons thoroughly effective. A closer proportion would, I think, be advisable, and the tobacco should be boiled thoroughly. The lady-birds did good work this year among the lice, as might be expected, especially *Coccinella 9-notata*, Hbst., and *Anatis 15-punctata*, Oliv. *Myzus cerasi*, which usually keeps pretty much to the sweet cherries, appeared in my orchard of Early Richmond cherries toward the end of June, and by July 1st was increasing very rapidly. During this time the larvæ of *Anatis 15-punctata* were doing good work on the lice. By July 4th most of the larvæ had pupated. The pupal period was only from 4 to 6 days, and by July 10th any quantities of the beetles could be seen, the predominant colour being a creamy white or even lavender, with the characteristic markings. The lice by this time had decidedly lessened in numbers and I felt that I could leave them safely in the hands of our coccinellid friends."—[Martin Burrell.]

The Plum Aphis (*Aphis prunifolii*, Fitch) has been unusually abundant in many parts of the Dominion, being the Plant-louse most often inquired about in correspondence. Reports of Plant-lice on plum from Manitoba, the North-west Territories and British Columbia probably referred to a different species, *Hyalopterus pruni*, Fab., which is also stated by Prof. C. P. Gillette in the Proceedings of the Ninth Annual Meeting of the Association of Economic Entomologists to have been particularly wide-spread and very injurious to plum trees in Colorado during the past summer."

"Woodville, Lot 2, P.E.I., June 10.—I send you specimens of an insect that has over-run our orchards of plums and Damsons. They cause the leaves to curl, dry up and die in a short time. Please let me know what they are and how to get rid of them."—[Michael McGrath.]

The specimens sent with this letter were *Aphis prunifolii*, Fitch.

"Nappan, Cumberland Co., N.S., July 8.—I send you specimens of *Aphis prunifolii*. These are a terrible pest on our plum trees. The kerosene emulsion is a sure cure if it strikes the insect, but it seems almost impossible to get at the Plant-lice when they are on the underside of the leaves."—[W. S. Blair.]

Several specimens were also sent from different localities in Ontario. Mr. A. W. Donaldson found them very troublesome at Shakespeare, Oxford Co., Ont.

"Leamington, Essex Co., Ont., Nov. 24.—The most troublesome insects we had to contend with this season were Aphids on the plum and cherry trees. They were especially bad on the plum. I have never before seen them so numerous. They came in such numbers that we could do nothing with them. I sprayed, but after the leaves had curled it was hard to get at the insects. I had to make the emulsion as strong as we dared to use it; otherwise it would not kill them."—[W. W. Hilborn.]

Remedies.—Many of my correspondents, while acknowledging the efficacy of kerosene emulsion as a remedy fatal to all Plant-lice, at the same time dislike using it on account of its odour and destructive effect on India-rubber hoses. Recent experiments have shown that good work can be done with some of the other washes usually recommended. Mr. R. M. Palmer, who has had a great deal of experience in treating the Apple Plant-louse and other species in British Columbia speaks very strongly in favour of the following tobacco and soap wash: "Soak 4 pounds waste tobacco in 9 gallons hot water for 4 or 5 hours (or in the same quantity of cold water for 4 or 5 days); dissolve 1 pound whale-oil soap in one gallon hot water; strain the tobacco decoction in the dissolved soap, and apply the mixture to affected trees with a spray pump, using a fine nozzle and all the force possible."

Prof. Gillette, when speaking of the attack on plums in Colorado by Plant-lice, says:—"In our experiments whale-oil soap, in the proportion of 1 pound to 8 gallons of water has been more effectual than the ordinary kerosene emulsion in destroying the lice. The powdery excretion upon the surface of these lice interferes greatly with any successful treatment unless the application be made with much force."

THE BRONZE APPLE-TREE WEEVIL (*Magdalis ænescens*, Lec.).—Complaints have been received from time to time of injury from this weevil, the larvæ of which infest the bark of apple trees in British Columbia. Last summer a new attack was observed by Rev. G. W. Taylor on Gabriola Island, B.C., when the perfect beetles swarmed in myriads on cherry trees and devoured the foliage.

THE WESTERN STRAWBERRY CROWN-BORER (*Tyloderma foveolatum*, Say).—Specimens of this British Columbian beetle were received from Vancouver Island last summer. References have been made occasionally to injuries to the strawberry plant in British Columbia by a crown-borer. As I had never found nor received from that province specimens of the ordinary Srawberry Crown-borer I was very anxious to secure specimens of this western pest, for identification. In June last I was pleased to receive specimens of the mature beetle, from Messrs. E. A. Carew-Gibson and R. M. Palmer of Victoria. These proved to be *Tyloderma foveolatum*, Say, which had not been previously recorded as a pest of cultivated crops. Mr. Carew Gibson writes "I am sending you some weevils from a strawberry patch which they have completely wiped out this spring;" and Mr. Palmer writes on the same subject—"Thank you for the name of the strawberry weevil; the specimens were sent to me from Cowichan, where they had entirely ruined a small strawberry bed."

THE CURRANT MAGGOT, Currant Fly (*Epochra Canadensis*, Lœw.).—Another question which has been settled during the past summer, is the indentity of an insect which does an enormous amount of injury to Black Currants in British Columbia, the fruit being rendered quite unfit for use owing to the large numbers of maggots which infest it. I have for years endeavoured in vain to get specimens of the fly or infested fruit so as to breed the fly. I am now under obligation to Mr. Carew-Gibson, for an opportunity to examine some flies bred by him from these maggots.

"Victoria, May 21.—I am sending you some specimens of the flies hatched from my currant fruit worms, i.e., the insect which lives in the larval stage inside the fruit of the currant. Is this *Epochra Canadensis?* The flies hatched out yesterdy (May 20), and I now recognize them as a very common fly here at certain times." The flies received were well marked examples of *Epochra Canadensis*, Lœw., an insect which notwithstanding its name *Canadensis*, I had never before seen in Canada, nor have I heard of its injuries in any other part of the Dominion than British Columbia.

In a very complete monograph upon this insect, published in 1896, by Prof. F. L. Harvey, of Maine, full details are given of the life history and habits. With the exception of British Columbia, this insect is certainly nowhere common in Canada, although like the Apple Maggot it is abundant in some seasons in the State of Maine close to our borders.

THE NATIVE CURRANT SAW-FLY. (*Gymnonychus appendiculatus*, Hartig).—This insect which was formerly called *Pristiphora grossulariæ*, Walsh, is by no means common in Canada, but last spring the larvæ did considerable damage on Vancouver Island. The Rev. G. W. Taylor wrote from Gabriola Island, B.C., on July 29 last:—"The saw-flies of the gooseberry and currant appeared early this season and practically spoiled the bushes for the year. A second brood appeared at the middle of June, but the larvæ were much less numerous." Several specimens of the mature insects were bred by Mr. Taylor and forwarded for examination. These were submitted to Mr. W. H. Harrington, who has made a special study of this class of insects and he has kindly provided me with the following report upon them:—

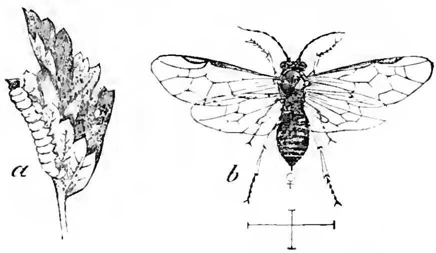


Fig. 13—The Native Currant Saw-fly—larva and adult.

"*Gymnonychus appendiculatus*, Hartig.—I have made a careful examination of the sawflies received by you from Rev. G. W. Taylor, and find them to be *Gymnonychus appendiculatus*, Hartig. On my first examination the insects were referred to the genus Pristiphora, and seemed to answer very closely to Norton's description of his *P. relativa*, the type of which was from Great Slave Lake, collected by R. Kennicott. On reference to Cameron (*Brit. Phytophagous Hymenoptera*, II., p. 66) the description of *Nematus appendiculatus* was found to apply very closely to the Vancouver Island specimens, and a microscopical examination of the claws shows that the species belongs to the new genus *Gymnonychus* erected by Marlatt (*Nematinæ of N. A.*, p. 122) for those species of Pristiphora having the claws entirely untoothed (*gumnos* = naked, and *onux* = a claw). The species, therefore, is now named as above cited and is the currant saw-fly named by Walsh as *P. grossulariæ*, and treated of under that name by Walsh, Packard, Glover, Riley, Saunders and other writers (see Marlatt, *loc. cit.*). Norton's *P. relativa* may possibly be identical.—[W. H. Harrington.]

THE SAN JOSÉ SCALE

(*Aspidiotus perniciosus*, Comstock).

"Well, how about this San José Scale we hear so much about?" is a trite question which has been very frequently put to the Entomologist during the past season.

Early in the present year undoubted specimens of the San José Scale were received for examination from orchards near Chatham, Kent Co., and from near Niagara, Lincoln Co., in western Ontario.

In 1894, in anticipation of the spread of this most injurious pest of the orchard from infested States to the south of us, and so that our fruit growers might be warned beforehand, articles were prepared and published in the report of this Division, the *Annual Report of the Entomological Society of Ontario* for the same year, and the *Farmers' Advocate* of London, Ont., an influential agricultural journal with an extensive circulation. In these articles will be found a full account of the life history and development of the insect, characters by which it may be recognized, and what were at that time thought to be the best means of fighting against it. Ever since it became known certainly that this scourge had effected a footing in our orchards, great anxiety has been shown by fruit growers in all parts of the Dominion, to obtain reliable information about it. Numerous specimens of various kinds of insects, fungi, corky excretions on the bark, etc., have been sent in for examination. The importance of every one concerned being enabled to recognize this pest as soon as possible, so that prompt action might be taken to control it, suggested the advisability of issuing last summer a large wall poster which could be put up in conspicuous places such as post offices, railway stations, newspaper offices and public halls throughout the district, where the scale was likely to occur.

This poster (2 ft. 3 in. by 1 ft. 8 in.) was got up much in the same form as a similar poster issued by Prof. Webster, the State Entomologist of Ohio, on the same subject and gave the excellent illustrations prepared by direction of Dr. Howard, the United States Entomologist, showing an infested pear and a piece of a branch, also enlarged figures of the female insect and her scale. The object of this poster was to warn fruit growers that the scale was already in Canada and that if it were allowed to spread great loss would certainly result. The best way to recognize the pest was given, with advice as to the course to pursue, should it be discovered in an orchard.

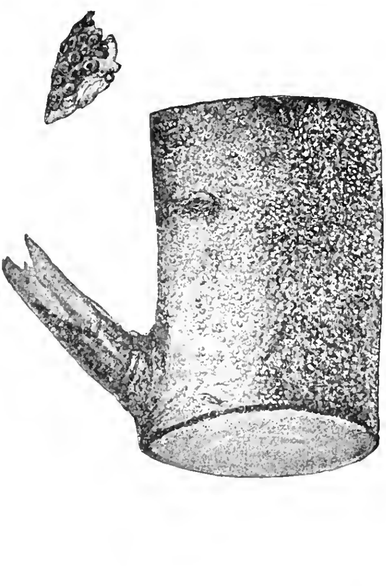


Fig. 14—Branch infested by San José Scale.

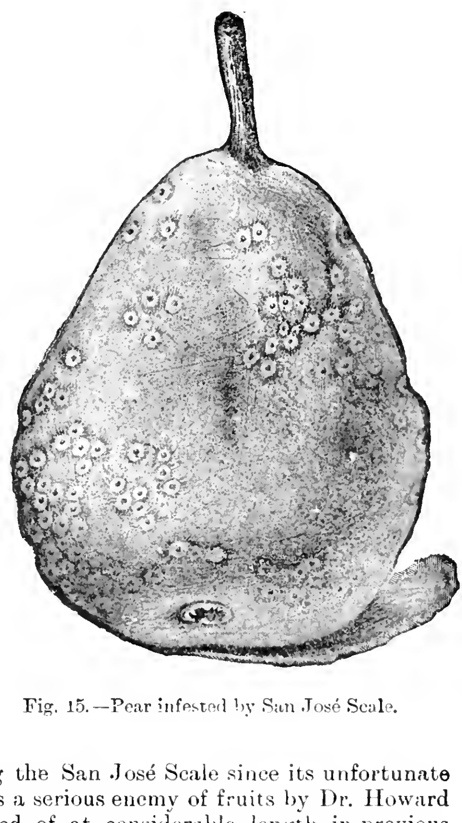


Fig. 15.—Pear infested by San José Scale.

A great deal has been written concerning the San José Scale since its unfortunate introduction into the East, and its detection as a serious enemy of fruits by Dr. Howard in August, 1893. This scale has been treated of at considerable length in previous reports of this division, and numerous articles in government publications are accessible to any one who wishes to inform himself on the subject.

For the purposes of this report, it seems more useful to give a concise account of the insect, its appearance, so that it may be recognized, its life history, occurrence in

Canada, and the most approved remedies so far tried; also to answer briefly some of the pertinent questions frequently asked by correspondents and others concerning it.

What is the San José Scale?—It is a very small (the largest specimens, not more than $\frac{1}{8}$-inch in diameter) round, flattened and inconspicuous scale-insect; that is, like the well known Oyster-shell Bark-louse and the Scurfy Bark-louse, a sucking insect covered by a waxy scale, which, as we find it on trees, is the only part visible, except in the early larval stage, when scale insects for a few days have the power of walking.

What it is not.—From the many different kinds of insects which have been sent in, it seems advisable to state that the San José Scale is not an easily seen insect resembling a beetle, a grub or a spider, nor has it well-developed wings and legs, but it is a minute creature which can only be detected by the closest examination, and even then requires some skill and experience to recognize it as an insect.

Among the objects which have been received under the supposition that they might be the San José Scale, were many things which in no way resembled scale-insects; but some, such as the small corky excrescences known as lenticels, which are found upon the young bark of some trees—apples, pears, birch, walnut, &c.—and certain minute fungi which are found on dead wood, do bear some resemblances to scale insects. Their different nature, however, may generally be easily detected by the fact that they cannot be detached from the bark without tearing the tissues, whereas all scale insects may be removed easily from the surface of plants by a gentle pressure.

How to know it.—The general appearance of the bark of infested trees is dirty, scurfy and grayish in colour, as though dusted with ashes. The scales usually are found in enormous numbers, frequently overlapping or occurring altogether on the top of other scales; they may be found throughout the summer of all sizes from the newly hatched mite-like larvæ to the fullgrown insects. In severe cases of infestation this massing of the scales produces a scurfy, dirty appearance of the bark, which when once seen is easily recognized. On young twigs, fruit and leaves, there is usually a well defined purplish ring surrounding each scale which is sometimes useful for detecting its presence when the scale itself might be overlooked; and although this purpling effect is produced by a few other scales, such as the Putnam Scale (*A. ancylus*, Put.) and the Forbes or Cherry Scale (*A. Forbesi*, Jnsn), it is particularly characteristic of the San José Scale, and even upon large branches, although invisible at the surface, may be found by cutting away some of the outer bark.

The scales of the males and females differ somewhat in shape.

Female:—Scale very thin, almost circular in outline, much flattened; size ranging from $\frac{1}{20}$ to $\frac{1}{8}$ of an inch in diameter; white at first, becoming grayish or blackish, particularly in the centre, and later much blackened by the fungus *Fumago salicina*, so common on trees attacked by many kinds of bark-lice and plant-lice. In the centre of the scale there is a small dark, or when the insect is dead or rubbed, yellow, nipple-like elevation surrounded by a distinct circular depression, which, as pointed out by Prof. Webster, is one of the best distinguishing marks between this scale and some closely allied species.

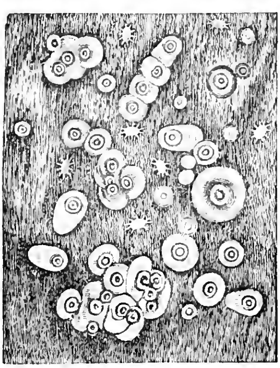


Fig. 16.—San José Scales, male and female—enlarged 6 diameters.

Male:—Scale about half the size of that of the female, rounded-oblong, with the nipple-like elevation plainly nearer to one end than the middle.

The drawing herewith shown was made by Dr. C. E. Saunders from a group of scales found upon a plum on 25th of July last. They are all, therefore, of the first brood of the season, although certainly some of them were born later than others. The first young of the year were reported from Niagara on 1st of July, so that the largest specimens would be about three weeks old. This was by Mr. Charles Thonger, a careful observer. Male insects almost ready to emerge from their scales, were found among the scales shown in the figure.

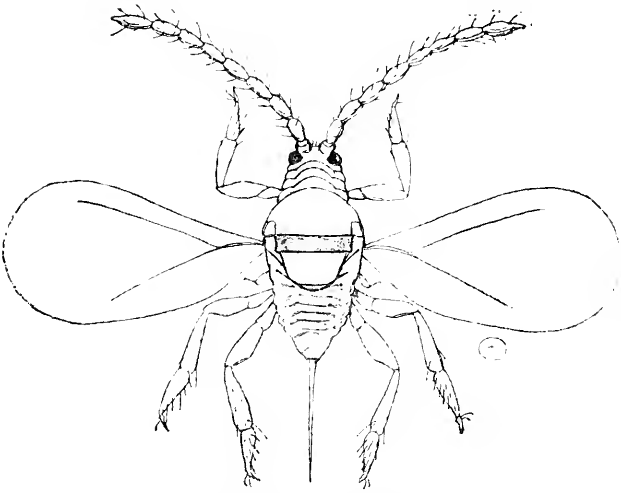


Fig. 17.—San José Scale, male—much enlarged. The natural size is shown by the line in the circle below the right wing.

Life History.—The winter is passed by the partially grown insects beneath their scales. With the return of warm weather the next spring, growth is resumed, and the males reach maturity a few days before the females. They are extremely small two-winged flies (Fig. 17) and when examined under a magnifying glass are found to have orange yellow bodies, iridescent dusky wings and black eyes. These minute creatures have no mouths, so can take no food; consequently after having fertilized the females they very soon die. The date when the females become full-grown and begin to produce young varies with locality and climate. In Arizona the young larvæ are recorded as appearing in March. At Washington it is by the middle of May; in New Jersey during the last days of May; in the state of New York, early in June. At Amherst, Mass., they were first noticed 12th June, and, as far as I can learn, in our Niagara district between the middle of June and 1st of July. Most careful observations have been made under direction of the United States Entomologist, by Mr. Theo. Pergande. The following condensed life-history is compiled chiefly from *United States Division of Entomology, Bulletin No. 3, N.S.*, in which Mr. Pergande's observations are recorded.

The adult female gives birth to living young, instead of laying eggs like most other scale insects. Ordinarily, as with the Oyster-shell Bark-louse, eggs laid beneath the scales, in the course of a longer or shorter time, hatch, and the young larvæ migrate to different parts of the plant; but in the case of the San José Scale living young are produced day and night for a period of nearly six weeks before the exhausted female perishes, and this at the rate of about nine or ten every twenty-four hours. After birth, the young larva remains motionless for a short time beneath the scale of the mother, it then forces its way out and runs over the plant, seeking a suitable place to settle. It is a microscopic creature, pale orange in colour with an oval body, six legs and two feelers. The long thread-like proboscis, with which it sucks the sap of the plant, is doubled on itself and lies in a groove of the body wall. After crawling about for a few hours, the larva settles down and works its bristle-like sucking tube through the bark and remains fixed, if it be a female, for life, and if a male, until fully developed, when it will have a few hours more active life, during which it can fly about.

The development of the scale begins even before the larva becomes fixed. The secretion of the scale starts in the form of very minute white waxy filaments, which spring from all parts of the body and rapidly become more numerous until, within two days, the insect is entirely concealed by a whitish shell or scale, which has a prominent central nipple. The scale is formed by the matting and melting together of the waxy filaments. As in the development of most insects, there are also with these scale-insects distinct periods of the larval life, divided by moults of the skin, and, in the case of the males, marked by important structural changes. The first moult takes place when the larva is twelve days old. Up to this time, the male and female scales are exactly similar in size, colour and shape; but after the moult the insects beneath the scales bear no resemblance to each other; the males are larger than the females and have large purple eyes; while the females have lost their eyes entirely. The legs and feelers have disappeared in both sexes. Eighteen days after birth the second moult occurs and the males change to the first pupal condition (pro-pupa). The male scales now assume an elongated shape. The legs and feelers have appeared again, and there are now prominent wing pads extending along the sides of the body. About twenty days after birth the male insect changes to the true pupa, in which all the parts shown in the pro-pupa are much more developed, and a slender organ at the end of the body called the style has appeared. From four to six days later, or from twenty-four to twenty-six days after birth, the males mature and emerge by backing out from the rear ends of their scales; this is chiefly by night or in the evening.

The changes which have gone on beneath the female scale are less striking than those described above. After the first moult the body of the female is practically an almost circular, flattened sac, with indistinct segmentation and without any visible organs, except the long sucking bristle with which it draws up continuously the sap of the tree it is infesting. The female moults a second time about 20 days after birth, and the last segment now shows the important characters of the mature female, which are of so much service in the exact identification of the species. The segmentation of the body at this stage is quite distinct.

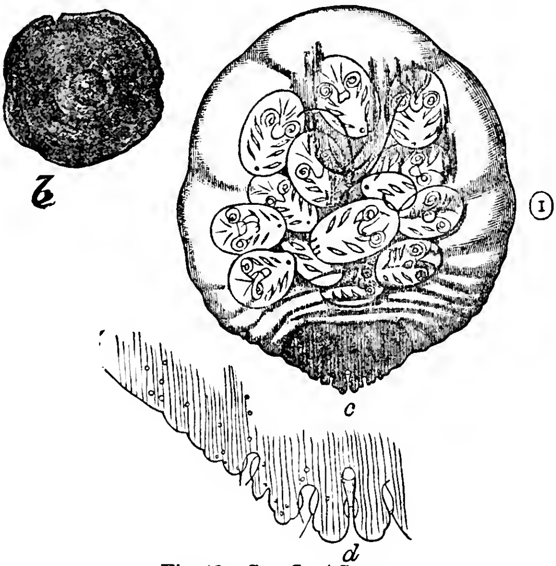


Fig. 18.—San José Scale.
(*b.*) Scale much enlarged. (*c.*) Female showing young, much enlarged. (*d.*) Anal lobes of female.

Thirty days from birth the females are full grown and the embryonic young may be seen within their bodies. The mature female, prior to the development of the young, is $\frac{1}{30}$ of an inch wide by $\frac{1}{25}$ of an inch long. The length of time necessary for the development of a generation varies somewhat; according to the Washington observations, it covers a period of from 33 to 40 days from the time a young larva appears until it develops into a mature female bearing young. The San José Scale is enormously prolific. It has been calculated that a single female may be the progenitor of 3,216 million descendants in a single season.

The exact identification of the species is of the greatest importance, for the San José Scale is now known to have many very bad characteristics not possessed by several other scales which resemble it very closely in appearance; and these make it a matter of public interest that no effort should be spared to control so dangerous a public enemy whenever it is detected in a new locality. The chief differences, in this connection, between the San José and some of these other scales are: (1) the fatal effects on the tree due to its greater rapidity of increase, and (2) certain minute but important structural characters which can be seen only with the help of a microscope.

The careful experiments at Washington, already alluded to, show that in one season from a single female an increase of 3,216 millions is possible. It is not, of course, to be expected that all of these would survive; but with the San José Scale there are many circumstances which make it less liable to diminution than many other insects. As a matter of fact, it is known that this scale does not spread from a new point of infestation with very great rapidity to contiguous trees, and also that, when once established upon a tree, it soon increases enormously in numbers—indeed, unless checked, usually spreading rapidly over the whole tree and destroying it. This rapid increase is characteristic of the species and is due, of course, to the great fecundity of the females. The fact that they bring forth their young alive throughout the season and that these are very quickly protected by a scale which is impervious to many liquids, affects very seriously the question of remedies, making it necessary to apply several successive treatments, if it is hoped to thoroughly free a plant infested by this enemy so difficult to conquer.

The mere fact of a scale-insect occurring, even in vast numbers, upon a given plant does not necessarily prove that the species is a dangerous enemy to that kind of plant; for, although it may possibly be so and should be regarded with suspicion, this habit of occurring in great numbers on isolated trees, but on no others surrounding these, has frequently been noticed with scale-insects, and is probably due to some lack of vigour in the individual tree. In the case of the San José Scale, on the other hand, if other trees are reasonably near, it is almost certain that they will soon become infested; and, when a severe case of infestation is found, one of the first things looked for when considering whether the pest is actually the San José Scale or one of the other species which superficially resemble it very closely, is, whether surrounding trees are also infested.

This important difference of habit in spreading and the much more fatal effects upon trees from the presence of the San José Scale, make much more stringent measures necessary to secure its eradication than with many other species, even frequently rendering it advisable or imperative to destroy many trees, if not whole orchards. This being the case, the very great advantage is obvious of being perfectly sure as to the identity of an infesting scale-insect before valuable trees are condemned to destruction.

Unfortunately, as stated, there are several species of scale-insects which bear a very close superficial resemblance to the much to be dreaded San José Scale. On this point, which has been referred to by many entomologists, Mr. T. D. A Cockerell, a high authority, may be cited: "It has been a matter for dispute whether the San José Scale can be certainly recognized in the field. Its effect on the tree, killing the branches, is characteristic, but hardly in any sense diagnostic, while the reddening of the tissues of the plant adjacent to the scale is sometimes well marked with *A. ancylus*, as well as with *perniciosus*. A little experience, however, enables one to recognize the ashy gray, generally thickly massed scales of *perniciosus*, with the dot and ring of the male scale, as against the dark scale and contrasting reddish orange exuviæ of *ancylus*, or the similar scales of *ostreæformis* and *Forbesi*. At the same time, it is to be recommended that the diagnosis made in the field be in every case confirmed by examination of the insect under the compound microscope if either locality or plant is new." (*Technical Series, Bull. 6, U. S. Div. of Ent., 1897.*)

The above is from a valuable pamphlet prepared under Dr. Howard's direction for the special purpose of helping students to distinguish between these different scale-insects. Prof. F. M. Webster says: "I know of no insect the detection of which has given expert entomologists more trouble than this one. Its extreme minuteness, its close resemblance to the other species less harmful, and the frequency with which it is found concealed in cavities and about the wrinkles of the bark or under buds, render its detection, when present in limited numbers, a matter of extreme difficulty." (*Ohio Bulletin 81*, p. 183.)

For the exact separation of these closely allied species it is necessary to take the females from beneath the scales and examine them under a microscope after special preparation. The differences are then readily seen, but these are beyond the power of ordinary pocket lenses or magnifying glasses, and require compound microscopes, which are expensive instruments not in the hands of ordinary fruit growers, and for the use of which special knowledge is needed.

As, therefore, there are several kinds of scale-insects resembling each other so closely at first sight as to make it necessary for even expert entomologists to examine them with a microscope before being positive as to the identity, and as one of these, to wit the San José Scale, is extremely injurious and the others not nearly so much so, we invite all fruit growers to send for examination and report specimens of any suspicious scale-insects which they may find upon their trees before they adopt extreme measures or even decide upon what measures they will take to free their orchards. Not only does the San José Scale spread more rapidly than many other species, but it has been found much more resistant than others, to the ordinary applications used for scale-insects.

Food Plants.—The list of plants upon which the San José Scale has been found as a serious enemy is a very large one and may almost be said to include all deciduous trees and shrubs, and it has also been found in Maryland by Prof. W. G. Johnson, upon such unlikely plants as milk-weed (*Asclepias*) and crabgrass (*Panicum*). It is particularly noted, however, that the San José Scale does not attack Conifers—pines, spruces, cedars, &c.—and has not so far infested injuriously any of the citrus fruits, such as oranges, lemons, &c., although it has been found on these trees, and in the case of one species *Citrus trifoliata* was found in large numbers in New Jersey by Prof. J. B. Smith.

The botanical order to which most of the food plants belong is the Rose family. So far, I have seen specimens of this scale in Canada, upon the following trees: pear, plum, peach, black currant, apricot, apple, Russian mulberry and Japanese walnut.

So far as we know, the Forbes Scale has similar food habits, but Prof. Cockerell says that *A. ancylus*, the Putnam Scale, differs somewhat. This last is especially a maple species but will flourish on poplar, oak, etc. It does not seem to take very kindly to fruit trees as a general rule. It also does well (probably best) in the Transition faunal zone, whereas the San José Scale belongs to the more southerly Upper Austral. In Canada both the Putnam Scale and the Forbes Scale have been found on plum, pear, apple and cherry trees.

"The manner of attack is different, more or less, in the various species under discussion. *A. ancylus*, on fruit trees, will be found upon the smaller branches, but in my experience more or less scattered, rarely in any great quantity. *A. perniciosus* is found largely upon the branches, becoming very abundant, covering and killing them. On the young shoots the reddening effect is very marked, though *ancylus* will also produce reddening. *A. Forbesi*, as seen on apple trees in Mesilla (N. Mex.), occurs largely under loose bark on the trunk, wintering there in numbers, and only invades the branches in limited quantity. Thus there may be quite a lot of *Forbesi* on a tree without its being noticed."—(T. D. A. Cockerell, *Technical Series, Bull. 6, U.S. Div. of Ent., 1897.)*

"At first glance it is not easy to distinguish this species (*A. Forbesi*, the Forbes Scale), popularly known as the Cherry Scale, from the San José Scale. The purplish tinge of the bark is also quite conspicuous on some varieties of apple and pear where the Cherry Scale has established itself. The general appearance of the last segment of the female very closely resembles that of the San José Scale; but it can readily be distinguished from that species by the presence of spinnerets."—(Willis G. Johnson, *Proc. 9th Ann. Meeting, Ass'n Econ. Ent., 1897.*)

Means of Distribution.—It is thought probable that most scale-insects are distributed while in the minute larval form, chiefly by means of larger insects and of birds. Since the San José Scale has been so critically studied, this has been actually proved to be the case with that species, the young larvæ having been frequently observed crawling upon lady-bird beetles of several kinds, ants, and other insects which resort to the trees during the breeding season. Isolated colonies of scale-insects in the tops of otherwise uninfested trees and in close vicinity to the nests of small birds have doubtless originated in this way. It is stated that the larvæ are also carried by the wind; this seems difficult to understand, but has been proved by Mr. W. G. Johnson in Maryland. This insect may also undoubtedly be distributed by means of farm implements, domestic animals and workmen attending to orchards.

Much has been said about the danger of distributing the San José Scale through the sale of infested fruit; but, after considering the matter very carefully, I must still differ in opinion from many good entomologists who think that there is great danger from this cause. Fruit badly infested by the scale is generally disfigured too much to be marketed, and upon fruit which is not sufficiently injured to be condemned for the market the chances of the scale-insects surviving a long journey after the fruit is removed from the tree, packed and shipped, and then of its being peeled and the peelings thrown out in an orchard or near enough to a tree for the young larvæ to infest it, are so slight that I cannot even see the necessity of considering this danger. Further, I have failed to hear of a single instance where infestation could be attributed to such a cause, but it would, of course, be well, should any one detect the scale upon imported fruit, to be careful to burn all peelings and not throw them out in a yard or garden where, in the event of any of the insects being alive and breeding, the young might be carried on to surrounding trees by flies or other insects attracted to the peelings during the short time that they were still moist.

Fatal effects of Infestation.—It has been noted by all observers that plants attacked by the San José Scale die with greater rapidity than from the attacks of other insects. "In the whole category of injurious insects we have not another one that is so difficult to detect, so pernicious in its effects and which breeds so rapidly as the San José Scale." —[F. M. Webster, Wooster, Ohio.]

"If the tree survives the attack, the infested wood becomes knotty and irregular, partly from the sapping of the juices by the insect and also without doubt largely from the poisoning of the sap of the cambium layer by the punctures of the insect, as indicated by the coloration. Young peach trees will ordinarily survive the scale only two of three years. Pears are sometimes killed outright, but generally maintain a feeble, sickly, existence, making little or no growth for a somewhat longer period."—(Howard & Marlatt, *Bull. 3.*)

Whether from the fact that the climate of Canada is not so well suited to the rapid increase of this scale as the warmer regions to the south of us, or from some other cause, it would appear to take a longer time in Canada for the San José Scale to produce fatal effects upon infested trees than stated above, and I only mention this as it has been several times referred to by correspondents when discussing whether or not the scale insect which has been found in Canadian orchards is really the San José Scale. Unfortunately, there is not the slightest doubt about this. and disastrous results have already attended its presence in Canadian orchards. To the credit of those fruit growers on whose grounds this scourge has been detected, it may be said that they have endeavoured to stamp out the occurrence promptly, sometimes at what seemed to those who did not understand the gravity of the case, to be a considerable and unnecessary sacrifice. The danger of heavy pecuniary losses in the various kinds of fruit trees, as well as in shade trees and ornamental shrubs, should the San José Scale be allowed to spread in Canada, must not be lost sight of, as there is hardly a deciduous shrub or tree which it will not infest. Now is the time to put forth great efforts to eradicate the pest wherever it may be found. The Federal Government and the Provincial Governments of Ontario and British Columbia are using every effort to learn of any occurrences in the country, and fruit growers will be suicidally foolish if they adopt the narrow-minded policy of trying to hide the fact if they have been so unfortunate as to accidentally introduce the pest into their orchards. A single tree neglected may be the means of infesting a whole orchard, from which the trees in every other orchard, garden, public park or cemetery in the neighbourhood may suffer irreparable injury.

Occurence in Canada.—The San José Scale is now known to occur in injurious numbers in a few Canadian orchards. These are situated in the fertile peach districts of the province of Ontario. The most western points in Ontario where infested orchards have been found are near Kingsville, Essex County, and Chatham, Kent County; others occur in the neighbourhood of Niagara and St. Catharines, probably the orchard worst infested being actually within the limits of the last named town.

In British Columbia there have been four distinct occurrences, all of which have been promptly eradicated through the energy of the active Inspector of Fruit Pests, Mr. R. M. Palmer, who saw that every infested tree and those immediately surrounding them were cut down and burnt as soon as the scale was detected. The localities where the San José Scale was found were at Kelowna, on the shore of Okanagan Lake, in 1894, at Victoria in 1896, and at Salt Spring Island and Nanaimo, on Vancouver Island, during the past summer.

The first occurrence of the San José Scale in Ontario, as far as I can learn, was on the grounds of Mr. John Van Horn, of Chatham, Ontario. This gentleman has made every effort to eradicate the pest and has kindly kept me posted during the season on the progress he was making against the scale. I have been similarly favoured with regard to the Niagara outbreaks by Mr. Charles Thonger, of Niagara, a practical and successful fruit grower and an accurate observer, moreover, possessed of the most remarkable eyesight for detecting San José Scale or any other injurious insect, also by

Mr. Martin Burrell, of St. Catharines, a trained observer and a practical fruit grower, who has studied injurious insects for many years, one, therefore, who was well calculated to observe and record any matters of value bearing upon the presence and increase of the San José Scale and the general condition of any orchards visited. All of these gentlemen, as well as Mr. M. G. Bruner, of Olinda, Essex Co., Ontario, who has observed carefully since its discovery the occurrence of the San José Scale in the orchard of Mr. John D. Wigle, at Kingsville, have favoured me with voluminous notes upon this important subject during the summer, and, as their experience and notes, both as to means by which orchards have become infested and the effect of measures adopted to control the spread of the San José Scale, are of general interest, I give herewith lengthy extracts from their letters.

Mr. Van Horn's letters :

"Chatham, Kent County, Ont., Jan. 12, 1897.—I have, unfortunately, got San José Scale on a lot of fine young plum trees. I am preparing to dose them with the California mixture mentioned in your report of 1894."

"Jan. 19.—I send you cuttings of Simoni plum and Lombard plum covered with what I think is San José Scale. Kindly give me all information at hand."

"Feb. 11.—Yours of the 9th received with thanks. Two years ago this spring I ordered a lot of plum trees from Parry's 'Pomona' Nurseries, New Jersey. Among the lot was one dozen Simoni plum trees—a fine lot of well grown and handsome trees. After putting out, they all grew finely ; all made vigorous growth in spite of a very dry summer. During the summer I received a circular from the nurserymen saying that San José Scale had got into their trees, imported from California, and stating that no further danger need be feared, as they were disinfecting all stock after discovering the pest. I paid no more attention to it, as my trees were doing so well. I did not notice anything wrong till this winter, and one day while going through them I noticed four of the Simoni looking sick, the bark looking as if dusted with ashes. As the disease was new to me I sent samples to them, as well as to you. They (Parry's) like yourself, answered that it was the dreaded scale all right, and recommended digging out and burning if badly affected, and if but slightly, to wash with whale-oil soap. I cut off two trees near the ground, intending to drench the stumps and let the trees sprout again from the roots. Those only slightly affected, I cut back severely and have sprayed with the salt, sulphur and lime mixture and will go over them again shortly with the same, and then later on will give them a dose of whale-oil soap suds.

"The trees were ordered direct from the nursery and not by agents, so there may be no more in this part of the country. I have examined a number of my neighbours' orchards, but can find no trace of the scale. I am very anxious to wipe it out, so that it may not spread to my neighbours' orchards, as well as the rest of my own. If I thought it necessary, I would dig up and burn all infested trees, but with your kind assistance by way of advice, I would be delighted to master it otherwise. I am very fond of fruit growing and dislike very much to be beaten by such things as San José Scale or any other pest and will conquer it if I can."

"April 8.—I got the trees from Parry's nurseries. I gave my son-in-law, who lives a few miles from me, a nice Simoni tree. I did not see the tree again till last week, when I was helping him trim his trees. On coming to his Simoni, which he was very proud of, as it had grown so much last summer, I said, 'You had better get your spade and dig it up at once,' for it was crusted all over with scale. I took my magnifying glass and let him see for himself. I did not loose sight of the tree till it was in the fire. I could see no signs of the scale on his other trees, and I hope they are not infested."—[J. Van Horn.]

At the end of the season Mr. Van Horn wrote to me that he believed his orchard was quite clear of the scale. During the month of December, 1897, I visited his orchard and examined the trees very carefully. I found the following state of affairs. Of the two trees which were badly infested, one had been dug up and destroyed entirely, the other was cut off last winter within a few inches from the ground and thoroughly drenched with the "lime, sulphur and salt" mixture and subsequently with the whale-oil soap solution. This stump had thrown up during the summer some vigorous young shoots upon which no trace of the scale could be found, although on the old stump many of the scales which had been killed by the treatment given them last winter were still discernible. Besides these two badly infested trees, those which were slightly affected and had been severely cut back last winter and then treated, had made vigorous growth. Upon some of these a very few living scales were found, showing that, although the treatment with whale-oil soap was extremely effective, rendering it possible to find the scales only by very close search, yet it was not absolutely so, as there were a few still alive. Mr. Van Horn had attended to this matter very carefully, being much interested in it and being also keenly solicitous for the welfare of his neighbours. Every tree in his orchard had been sprayed, and he intends to repeat the operation regularly during the coming season.

Mr. Thonger's letters :

" Niagara, May 10.—I have discovered San José Scale on several of my trees, but do not think it is in any other orchard in the neighbourhood as yet, as nobody seems to know anything about it. I have dug out several dwarf trees—the worst—and sprayed with whale-oil soap solution all those immediately surrounding the infested spot. That was on Thursday last, and I thought these looked cleaner a day or two after, and I almost regretted that I cut down the others ; but this may be fancy. I feel considerable responsibility in the matter and shall be glad of any information you can give me."

" May 11.—I send you to-day some infested twigs (pear tree). I have selected them with the object of showing the difficulty of detecting the scale when only a few are present, rather than the extreme stages, when, the whole trunk being covered with a mass of scales that hide the bark, it is obvious enough.

" I noticed only one tree last summer and was struck by its disgusting appearance. This tree was planted eight years this spring. Including this tree, I have taken out to burn seven trees as too badly infested to cure, and left about as many nearly as bad, to spray. The infested stock must have been from F. C. Young, Rochester, N.Y., and planted in May, 1894 ; or perhaps with a replace not later than 1895. This would indicate that the scale may spread one or two seasons without being observed, or even longer, or migrate from the infested stock and develop quicker in the new location. The infestation is evidently very slow in developing to such an extent as to attract attention, unless it happens to strike a pear tree or one as favourable to its growth and development. The scale appears to have started in the south-west corner of a plot and spread north and east to some 50 trees. I must spray the whole plot, and will try and keep you informed of my progress.

" My farm is well situated for isolating the attack. On the lake shore there is nothing to take the infestation to the north-east or west,—I think the wind has much to do with spreading it—and the infested area is well sheltered by woods from all quarters but south-west to south-east. I think it would be quite to the interest of the fruit growers of this country if the Department of Agriculture would send an expert here to examine into the matter on the spot, and decide what is the best thing to do and to assist in carrying it out.

" It is clearly of the utmost importance to prevent the scale from getting a foothold in the country. The Black Knot experience shows that the individual growers will not take the pains to eradicate a pest that does not kill the tree at once, but this sort of action will not do in this case. Rather than assume the responsibility, as well as the cost, of attempting to fight the pest myself, I would rather cut down and burn every infested tree ; but I do not think that course would be in the best interest of either the country or myself."

" May 27.—I have been making a tree-to-tree examination through the orchard, taking row by row and have found two peach trees much farther away from the pear trees than the dead tree of which I sent you samples. The nearer tree is one about ten years old. I think the confidence we have had in the precautions to keep the scale out of the country is largely to blame for the hold it has now among us. I cannot look at this tree without the conviction that, had I even glanced at it three years ago with scale in my eye, it must have been detected at once. Even last summer, when seen on the pear tree, I was quite unsuspicious, and only when two men who have been among fruit trees all their lives said they had never seen it before, did I think it must be the dreaded scale.

"The most remarkable thing I observe among the peach trees is the limited area to which this scale is confined. An infested tree will have one or two limbs affected, and the others, perhaps, quite free, with only a few scales scattered about the base of last year's laterals. On the trees immediately surrounding the infested one, perhaps only a scale or two can be found, or in some instances a few small groups of six or eight. I marked the spots with red lead as I came to each tree, and on trees considered centres of infestation I drew two rings round the trunk; the others with few scales, or even one only, I marked with red spots. There is no danger of losing them and I shall know just what spraying to give when I get the material. I recognize about three centres of infestation among the peach trees, and some 50 trees that should be thoroughly sprayed, over and above the pear trees."

"July 5.—I first noticed the young on Saturday, 3rd inst., and by Monday noon they were quite plentiful on the trunks of infested trees and even a few on the fruit of the pears. They are extremely minute, nearly globular in form and, as far as I could see with a magnifying glass, without any vestige of legs or head; the colour, a light yellow verging to white. The characteristic stain is quite marked on the fruit and makes the nature of the minute spot distinct. The scale is more abundant than might be expected, even on pear trees painted with a 2-pound to the gallon whale-oil soap solution."

"July 21.—The samples I send you are from a tree treated three times with soap spray (the last time of 1 pound of soap to 5 gallons of water), and once with kerosene emulsion strong enough to nearly strip some of my peach trees of leaves. The young scale comes out freely on to the new pear wood and fruit, but I have only seen one young scale on a new peach shoot; perhaps later in the season they may work out. Probably the fuzz on the peach would protect the fruit from the inroads of the scale, so that fruit from an infested peach tree would have little, if any, effect in spreading the pest.

"It looks as if painting the trees with a 2 pound to the gallon soap solution had but little effect on the old scale. In places where they are thick I can squeeze out quite large insects."

"November 27.—I have not myself seen any more cases of infestation than my own, but a man who has been cutting back in my infested trees the last month or so and who knows the appearance of the scale well, tells me that two or three days ago he had found numerous adult scales and young on trees in his village lot, and that his neighbours have several trees as badly covered with scale as any of mine, and also a considerable quantity on another adjoining orchard of several acres, the grower of which talks of cutting out 8 rows so as to reduce the area of infestation to dimensions which he thinks he might treat with some prospect of disinfecting them.

"From the time the first brood of lice came out till September 9, I sprayed my infested pear trees with the whale-oil soap solution (1 pound to 5 gallons of water) once a week. I think it had very little, if any, effect in checking the increase of the scale on those trees, for all those slightly infested in the spring were almost covered as badly as the few I had taken out at the beginning of the season. I have since taken out and burned all the pear trees, dwarf and standard, in the small orchard that you saw near the house. Some of the trees at the north end were not affected and were doing well, but blight as well having got hold of many I did not think it worth the risk and trouble of further treatment. I intend to concentrate all my efforts on the peach trees. I am cutting them back (especially those infested) as far as I think the tree will bear, not to kill it, and hope to do something to keep the scale in check. I have very little hope whatever of getting rid of it entirely. I find infested trees through an area quite eight times as large as was infested in the spring, chiefly on trees three and four years old. These are easier to examine than those larger, but it indicates that quite half of the orchard should be treated to have even a chance of not missing any. I am considering now either to spray the whole orchard next year with kerosene and water, say from the end of April till the leaves or blossoms come out, in hopes of keeping the infestation down and raising a crop; or with a scalding spray of either soap solution or pure water; but either course involves considerable outlay.

"I am really thoroughly disheartened in the matter, being convinced that we have either to destroy the infestation absolutely at once or be ruined by the expense of keeping it so far under control as not to destroy the trees or crop. It is just one of those things like a house on fire in a town, the whole force of those interested should at the beginning have been concentrated on the infested spots to smother it out.

"You ask, July 26, to note what distance young scales travel from the mother. In the summer I saw on pear shoots 18 or 20 inches long, young scales of the first brood only three or four leaves away from the extreme ends of the shoots. These were few in number, but the mother scale could not have been closer than the terminal bud of last year's growth, and most likely not as far out as that. This year, on Nov. 10, thermometer 55 degrees, cloudy day, I saw young lice crawling about. The first brood of the year did not come out till the first week of July, with a temperature of about 85 degrees in the shade.

"The man who told me he found scale three days ago said there were lots of young lice, and he thought he saw them move. The day was rather warm, south wind and about 60 in the shade."—[Chas. Thonger.]

Referring to Mr. Thonger's suggestion to spray with a scalding hot spray. I have found the application of hot spraying mixtures in the first place impossible, because the breaking up of the liquid into a spray causes it to cool before it has reached a distance of one or two feet from the nozzle, and, besides this, all hot water remedies are both extremely inconvenient to use and to make, and also very destructive to apparatus.

I have not had an opportunity of visiting this orchard myself this autumn; but I know Mr. Thonger to be a close observer, and he has reported to me from time to time on the progress made. Mr. Burrell has also visited this and some other infested orchards in the neighbourhood of St. Catharines, and his report appears herewith. I have been lately shown a letter published by Mr. Thonger in the *Rural New Yorker*, in which he speaks of treating his infested trees mechanically with a wire brush to free them of the scale. Although undoubtedly by this method a large number would be destroyed, still, this being an imperfect method, as many scales must necessarily escape the brush, I fear that it would be a dangerous practice to adopt, owing to the feeling of false security which would be created from the apparent cleanness of the trees. They might seem to be quite free from scale, but it would be impossible to treat the scales on the branches and small twigs with such a brush, and, judging from experience in other matters, I am confident that, although Mr. Thonger might follow up the brushing of the trunks with a thorough spraying of coal oil emulsion or of whale-oil soap solution, many others would not do so owing to the extra amount of labour and time necessary for two operations.

Mr. Martin Burrell's observations:

"St. Catharines, Ont., Oct. 11.—With reference to your inquiry as to the San José Scale, its spread, development, &c., I am very happy to give the results of my own observations in this district. In the two orchards where the scale is at work, there has certainly been an extension of the infested area since spring. The infestation of new trees has, however, not been nearly so marked as the extraordinary increase of the scale on trees that were only moderately attacked in the spring. In the latter case the scale has, in nearly every instance, spread over the whole tree, including leaves and fruit. On one three year old Japanese plum tree which was affected severely last year only on the trunk and the bases of the main limbs, the insects had spread to such an extent by the middle of July that out of 407 plums on one tree, 405 were attacked. One plum had on its surface upwards of 450 newly set scales, and in more than one case there were between 1,500 and 2,000 scales on a single leaf. When the breeding process is in full swing, the trees appear to have been dusted with a yellow powder. So minute and in such numbers are the insects, that on a raised piece of bark no bigger than a pea I have carefully estimated that there were more than 150 larvæ. It has been stated by some that the larvæ are not very active and move but an inch or so from the parent scale. The facts I have mentioned rather contradict this. It is true that, as far as my observations go, the larvæ do usually set within a short distance of the old scale, but, for such an extremely small insect, it can travel fairly fast. I have timed them, when nearly an inch per minute was covered. As a matter of fact, I have found newly set scales 13 inches from the mother insect, and I see no reason why in many cases the distance should not be much greater. One can readily see, therefore, how rapid would be the spread among nursery stock. In stating that the spread, as far as new trees were concerned, was not very marked, it must, of course, be borne in mind how difficult it is —indeed almost impossible—to detect a fresh case where a few isolated scales only are on the tree. Quite recently I saw an English Damson tree some eight years old with one of the upper branches slightly atttacked, the fruit also showing scale. This tree was not contiguous to any infested trees, nor were the scales present on the trunk or lower limbs. The scale had evidently been carried by birds or other insects. This sort of thing may exist undetected in many instances, and the following season witness the usual rapid spread of the pest on all such trees. In a favourable season it is probable that four broods would occur in this latitude. They probably commenced breeding here about the middle of June, and although the cold weather of the last day or two has checked any activity on the part of the larvæ, there are any quantity of them so recently hatched as not yet to have developed the waxy scale. Only this morning I took 15 young ones in various stages of development from the body of one female. Taking June 15 as the date of the first brood's appearance, and assuming 39 days as the time for one generation (in the breeding case here, the time occupied was from 36 to 39 days) the fourth brood would commence emerging on October 10 and under favourable autumn conditions doubtless many of this last brood would develop sufficiently to winter over as half-grown females. I have watched carefully for any sign of the little lady-bird *(Pentilia misella)* which has done such good work on the San José Scale in California and even in the Eastern States, but have failed to see a single specimen. The Twice-stabbed Lady-bird *(Chilocorus bivulnerus)* I have found on infested trees, both in the larval and adult forms, but not in sufficient numbers to render it of any economic importance this season. The food plants upon which I have seen scale in this district are: the pear, the peach, the plum (both of the domestic and Japanese types) and the red currant.

"In conclusion, I may express my belief that the scale is liable to be a serious menace to Canadian horticulture, unless the most stringent measures are adopted to stamp it out of the few orchards where it exists, and the strongest precautions taken to prevent the sale and the planting of infested nursery stock.

"November 20.—I send a few additional notes on the orchard infested by San José Scale near here :—

First saw the trees on July 3. Breeding had probably been going on for some time prior to this; scales of all ages were found and the larvæ were commencing to set on the young fruit.

July 10.—By this date some of the plums and many of the leaves were almost covered with scales.

July 26.—Some of the badly infested leaves dropping, and fruit and leaves showing marked red discoloration.

October 9.—Frost enough to shrivel a large proportion of the grape foliage.

October 13.—Warm and sunny. Breeding very active. Found from 20 to 30 *Pentilia misella* beetles on one badly infested tree, and over 30 on another. First time of observing these beetles. One *Pentilia* larva also apparently full grown.

Sprayed one badly infested tree with pure kerosene—a good soaking.

October 17.—Hard frost, quarter of an inch of ice.

October 18.—Breeding still active. Sprayed tree, apparently uninjured. Cut bark from four different parts of the tree, and a microscopic examination showed that every scale was dead.

October 28.—Breeding still going on. *Pentilia* beetles and *Chilocorus bivulnerus* both seen. (Have never found more than three or four of the latter on any one tree.)

November 19.—Cold and wet lately. No larvæ moving and no beetles.

"Now about the spread. These Abundance trees were planted in the spring of 1895. I should infer that at time of planting ten trees were infested, because there were just ten trees in July the trunks of which were covered with scale. There are 40 or 50 of these Abundance trees together, and next to them on one side is a row of young Beurré D'Anjou pears, and on the other Lombard plums. I have pretty carefully examined the rows of Abundance and these two adjacent rows, and this is what I find at this date, November 19:

60 infested trees (out of a total of 78 in the block) composed as follows :—

10 infested in 1895, now covered and very sickly ;

4 less severely, probably attacked last summer or early this spring ;

46 slightly, varying from a slight scattering over of the tree to a few scales on a single limb. Every one of the young pear trees is infested slightly, and nine out of the 13 trees in the row the other side of the Abundance block. I have not had time to examine all the trees in the orchard (some 300 or so), but a walk through and a hasty look round revealed one or two trees slightly infested, and I have no doubt a thorough examination would bring to light a good many more cases. The spread, therefore, has been very extensive this year."—[Martin Burrell.]

The Kingsville occurrence of the San José Scale was first reported to me by Mr. Milton G. Bruner, who also kindly showed me, in company with the owner, M. John D. Wigle, the infested spots in the orchards. Mr. Wigle has probably 6,000 trees and there are three centres of infestation, the scale occurring in different orchards, but all comparatively close together. As far as I could judge from a two hours' examination upon an extremely cold day, I should say that there were altogether about 300 trees infested more or less, most of them plum trees, the remainder being dwarf pears. Mr. Wigle is much exercised in this matter and has expressed himself as willing to do anything in his power to prevent the insect from spreading. My thanks are due to him and to Mr. Bruner for assistance in examining his orchards and also for facilities afforded for meeting the fruit growers of Essex County. While with these gentlemen, I had an opportunity of holding two meetings at Olinda and one at Kingsville. These meetings were well attended by leading fruit growers, and the matter of the San José Scale was thoroughly discussed. Mr. Bruner I found had made himself well acquainted with the subject and was able to recognize the species as well as was po sible from a superficial examination. He had given much valuable information to those with whom he had been brought in contract in his official capacity as Township Inspector of Black Knot and other orchard pests.

REMEDIES.—The remedies other than total destruction of the trees which have been most successfully used towards checking injury by the San José Scale are : (1) Spraying with kerosene emulsion or pure coal oil ; (2) washing with whale-oil soap ; (3) fumigating with hydrocyanic acid gas ; and (4) spraying with the lime-sulphur-and-salt mixture.

When a tree is found to be badly infested, save under very exceptional circumstances, the cheapest plan will be to cut it down at once and burn it. If, however, a tree is only slightly infested or there are special reasons for trying to save it, the tree should be pruned back as closely as it will stand and then washed thoroughly two or three times with whale-oil soap—two pounds of soap in one gallon of water. This is an expensive treatment, but on the whole is the most effective yet discovered.

1. *Kerosene.*—Prof. John B. Smith, of New Brunswick, N.J., Mr. C. L. Marlatt of Washington, D.C., and some other experimenters, have found that a light spraying of pure kerosene oil may be applied to trees without injury, if it be done sparingly, so as only just to cover the bark, and upon a bright day, when the oil will evaporate quickly. I must acknowledge that some limited experiments of my own have not been quite satisfactory. Professor Smith's experiments, however, have been very satisfactory to him, and on 1st of September last, he publicly recommended fruit growers to "spray thoroughly in September all infested bearing apple, pear, plum and peach trees with undiluted kerosene during the middle of a clear sunshiny day. By undiluted kerosene is meant the ordinary burning fluid used in lamps, in exactly the condition in which it is purchased. It should be applied in the finest possible spray, and every part of the plant should be thoroughly wet, but no more."

At the last meeting of the Association of Economic Entomologists held at Detroit, August 12-15, 1897, Mr. Marlatt read some "Notes on Insecticides," in which he speaks of some experiments in treating several kinds of trees early last spring with pure kerosene. His report is as follows: "Much to my astonishment, no ill effects of any moment resulted in the case of any of the trees sprayed with kerosene. In the case of all the trees, spraying was continued just long enough to moisten the plants thoroughly, but not to cause the oil to run down the trunks and collect about the base, and, with the young trees, the soil was carefully mounded up and pressed about the crown to avoid all danger of the oil collecting at that point." *(U. S. Div. of Ent., Bull. 9, N. S.)*

In view of these facts, it seems impossible to doubt but that if Prof. Smith's instructions are followed carefully we may have in kerosene (ordinary coal oil), a remedy of great value. At any rate, it is well worth the while of any one who has fruit trees infested with San José or other scale-insects to risk the losing of one or two trees if he can discover a remedy which will save his whole orchard. Care should be taken to mound up some loose soil around the base of the tree treated to catch any superfluous oil. This should be taken away again after the spraying, to prevent the oil from injuring the roots.

2. *Whale-oil soap* is the remedy which I have recommended to my correspondents to be applied, as advised by Dr. Howard, in the dilution of only one gallon of water to two pounds of the soap, the trees to be washed or sprayed with the mixture during the winter, some time after the leaves fall in the autumn, and again the following spring, before the buds open.

One of the chief difficulties with "whale-oil" or fish-oil soaps is the want of uniformity in their composition. It has been found after many experiments at Washington that what is required for spraying purposes is a caustic potash and fish-oil soap which does not contain more than 25 per cent or 30 per cent of water. Mr. Marlatt states that a brand of soap known as "Good's Caustic Potash Soap No. 3" is perhaps the best which has been recently put on the market. This is a soft soap, which is shown by analysis to be a true potash soap, containing about 27 or 28 per cent of water. Soaps made with caustic soda have been found unsuitable for spraying purposes. Mr. Marlatt concludes his account of the Washington experiments up to date as follows:—"Our examination of the soap question up to the present time seems to indicate that we shall have to insist on a potash soap made with a fair quality of fish or Menhadden oil, and that the water should be eliminated by boiling, so as not to exceed at the outside 25 per cent of the weight of soap. Such soap can be used at the rate of 2 or 2½ lbs. or more to the gallon of water, as a winter wash, without difficulty."

3. *Gas treatment*:—For thorough work in treating infested nursery stock, the fumigation with hydrocyanic acid gas seems in California to have given the best satisfaction. This method, however, is expensive and the materials used are intensely poisonous. However, for large nurseries where many young trees have to be disinfected before being sent out, this is the best method and is very generally adopted by the large American nurseries. * The plants are placed under a canvas tent made air-tight by painting it twice with linseed oil. The first coat must be quite dry before the second is applied. the size of the tent is immaterial, but it must cover the trees entirely, and its edges should be long enough to lie on the ground, so that the tent may be made perfectly air-tight by having earth thrown upon the edges to prevent the gas from escaping. The latest formula for generating the gas is as follows, for every 100 cubic feet of space to be fumigated:—

Cyanide of potassium (98 per cent)	1 ounce.
Sulphuric acid (66°)	1 "
Water	2 ounces.

Put the acid and water in an earthenware vessel, large enough to prevent spattering, then place the jar under the tent, add to it the cyanide of potassium and close the opening quickly. The trees should remain exposed to the gas for at least 45 minutes, when it will be found that insects of all kinds have been destroyed. For the fumigation of nursery stock before shipping, many of the large United States nurseries

*Full details cannot be given here, but will be supplied on application to any one requiring them.

have special buildings in which all trees and shrubs are treated whether known to be infested or not. To save time, these buildings are divided into two compartments, so that one may be emptied while the stock in the other compartment is being disinfected. For treatment of a small number of trees a box may be rendered air tight by pasting paper over all cracks and openings.

4. *Lime-Salt-and-Sulphur Wash* :—This wash is one of the favourite washes on the Pacific coast and has certainly given excellent results in British Columbia. Mr. R. M. Palmer has found it most satisfactory for some years and in his last report refers to it as follows :—" Another year's experience with the No. 1 spraying mixture (lime, salt and sulphur) has added further evidence of its value as a winter wash for all kinds of fruit trees and bushes. It is generally noted that so much improvement results from its use in the health and vigour of the trees to which it is applied, as alone to justify the cost of the work."

Mr. Marlatt, when in California, noticed the same good results there in the vicinity of Pomona, Cal., where " unsprayed orchards were badly infested with San José Scale, while in adjoining sprayed orchards the scale was entirely killed and the trees were rapidly recovering and showing vigorous and healthy new growth. In contiguous orchards also of the same kinds of trees which had been cultivated in a similar manner, those trees which had been sprayed yearly were at least one-third larger than the others."

The mixture which Mr. Palmer has found so valuable is as follows :—

"Lime, unslaked	30 pounds.
Sulphur, powdered	20 "
Salt, coarse	15 "
Water	60 gallons.

"Place 10 pounds of lime and 20 pounds of sulphur in a boiler with 20 gallons of water, and boil over a brisk fire for two hours, until the sulphur is thoroughly dissolved. It will then be amber-coloured. Next, place 20 pounds of lime in a cask and pour enough water over it to thoroughly slake it. Add the salt. When dissolved, add to the lime and sulphur, and boil half an hour longer. Add enough water to make 60 gallons. Apply lukewarm. Spray when the trees are dormant, or as soon as the leaves fall, and again in the spring before the buds swell. A good force pump should be used, and care must be taken to cover the infested trees thoroughly with the mixture, which should be constantly stirred when applying.

" To insure freedom from lumps, it is advisable to pass the mixture through a wire sieve or strainer."—[R. M. Palmer, ***Insect Pests and Plant Diseases***, Victoria, B.C., 1897.]

Prof. J. B. Smith also speaks of the good results obtained with this wash on the Pacific coast in his Annual Report for 1896, p. 487 :—" In Yuba and Sutter counties, the lime, sulphur and salt wash is the favourite. The testimony to its efficiency is universal. Few claim that a single spraying is absolutely effective; all contend that two sprayings will kill practically all the scales. Absolutely perfect work cannot be expected, and so there is always a small amount of scale in the orchard; but, as they have found that the use of this wash is beneficial to the trees by seeming to make them more vigorous, less liable to fungus attack and, in the case of peach trees, less susceptible to leaf curl, the spraying is continued every year, whether the scale is abundant or not. A man who does not spray is considered a very poor farmer."

The above quotations are given for the benefit of British Columbia fruit growers, all of whom are urged to take the fullest advantage of the excellent work which is being done by Mr. R. M. Palmer, Inspector of Fruit Pests. His Annual Reports to the Provincial Board of Horticulture are indispensible to the farmer, fruit grower and gardener, in all parts of the province.

This valuable remedy of the West, however, it must be acknowledged, has not given satisfactory results in the East, Mr. Marlatt even going so far as to say, while acknowledging its value in the West :—" Our experience with the wash in the East had thrown doubt on its real efficiency as an insecticide, and it has been clearly demonstrated that under the climatic conditions east of the Alleghanies it is almost valueless."

Whatever the reason may be for this great difference, the value of the remedy for the West is undoubted and well attested. Similarly, the gas treatment has given less satisfaction in the East than on the Pacific coast, but this is to some extent due to the difficulty of treating deciduous trees, such as are infested by the San José Scale, which have a more spreading, open growth than the close-growing, thick-foliaged trees of the Citrus family, upon which this method is chiefly used in California for other kinds of scale-insects. For the disinfection, however, of nursery stock, the gas treatment is certainly most convenient. Probably the remedies which will be found most available for Ontario fruit-growers will be the whale-oil soap wash and the kerosene emulsion. The latter should be applied as soon as the leaves drop or during the winter, made according to the Riley-Hubbard formula and diluted with only four parts of water, to be followed before the leaves expand in spring by the whale-oil soap wash, 2 pounds in 1 gallon of water.

Mention may be made of the fact that where trees are closely planted the scale has spread more quickly than where the trees are farther apart. This points to the advantage of having the trees planted as wide apart as possible without waste of land.

Since the San José Scale is already established in several centres in Ontario, it is now too late to prevent its introduction into the country; still, no effort should be relaxed which will prevent further importation from infested nurseries in the United States, and it should not be forgotten that nearly all of the Canadian outbreaks have been traced back to nurseries in the State of New Jersey. There are some precautions which common sense would seem to dictate to all fruit growers, such as : (1) Do not buy either from nurseries known to have been infested, or, as it is unnecessary, even from States where the scale is known to exist. The home-grown trees of all our Canadian nurseries are much safer to purchase than those coming from any of the usual sources in the United States. Up to the present not a single Canadian nursery has been found to be infested.

(2) Examine all trees upon your own grounds and upon your neighbours', particularly those which have been planted or grafted during the last five years.

(3) Plant no young trees without examining them carefully for any trace of the San José Scale. Should any case of infestation, or even suspected plants, be found, at once report the matter and send specimens for examination to the Government entomologists at Ottawa or Guelph for advice.

On account of the exceedingly inconspicuous nature of this enemy and its habit of hiding beneath scales of bark, buds, etc., as well as the extreme danger which attends its introduction, in those cases where it is considered necessary to purchase from American nurseries, it would be well for fruit growers not to trust to the certificates that the trees are free from scale, which are sometimes supplied by nurserymen, unless they are actually signed in writing by state entomologists of recognized standing, and also for the actual consignment of trees with which they are imported.

As an illustration of the difficulty of detecting the young scales when they are few in number, Prof. F. M. Webster has published an illustrated article in the current December number of *Entomological News*, showing a twig from a peach tree which had been submitted to him for inspection and of which he says : "The most diligent search with a lens failed to reveal any outward trace or indication of the presence of San José Scale. When one of the buds was removed it was found that there was behind it a half grown scale which had been completely covered and concealed by the bud." This showed that practically no one could be certain that a tree was absolutely free from scale without removing all the buds, which of course is out of the question.

THE APIARY.

The practical management of the Apiary, as heretofore, has been satisfactorily carried on by Mr. John Fixter, the Farm Foreman. The interest shown in the Apiary has been very encouraging; large numbers of visitors have examined it, who have been gratified by the attention shown them and by the explanations given in all matters connected with bee-keeping. One experiment was particularly observed, namely, what has been called the "House Apiary." This is treated of by Mr. Fixter in his report appended hereto. Many of the experiments begun in former seasons have been continued; but those on wax foundations were not taken up this year. In addition to the explanations given to visitors, two valuable addresses were delivered by Mr. Fixter to the students of the Ottawa Normal School upon the subject of bee-keeping, and he also attended two meetings of Farmers' Institutes, one at Russell Village, Russell County, Ont., and the other at Bell's Corners, Carleton County, Ont., at both of which the directors of the institutes requested that the subject of bee-keeping should be brought up.

The season at Ottawa, with reference to bee-keeping, has been a very remarkable one. Although in June there was a good amount of blossom on flowering plants, bee-keepers in the district were all surprised to find how little honey was stored by their bees.

Notes are being taken, with the dates, of the different kinds of flowers which are attractive to bees, and will be published at some future date. The Breaking Buckthorn, or, as it is more generally known, the Alder Buckthorn (*Rhamnus Frangula*), was noticed to be particularly visited and for a very long period by bees. A supply of the seed of this shrub was, therefore, collected and distributed to all bee-keepers who asked for it before the supply was exhausted.

The condition of the Apiary I consider quite satisfactory, and it is a branch of the Farm work which is growing in popularity from year to year (a fact, it must be stated, almost entirely due to Mr. Fixter's skill and good management).

Results of the Work of the Season.

On August 28th all the supers were removed from our hives, when 212 partly filled sections were found. This was all the surplus honey which had been made during the year, and the whole of this was returned to the bees for their winter sustenance. It should also be mentioned that not only has there been an entire lack of surplus honey, but the bees have also failed to swarm, so that the number of colonies was not increased. These results appear the more extraordinary when we consider the large quantities of honey made per colony during the past two years. In 1895 the average was 54 sections per colony, and in 1896 it was 50 sections, besides 16 lbs. ½ oz. of extracted honey per colony, all having been under the same management and care. There seems to have been an unusual deficiency of nectar in the flowers. The bees worked industriously, but were barely able to accumulate enough for their own subsistence. Indeed it was necessary to supplement their stores with considerable quantities of sugar in order to keep them supplied.

This discouraging condition of affairs prevailed all over the eastern parts of Ontario. In the western parts of that province better results are reported.

The following extracts from letters received will show the peculiarity of the season of 1897, in the Ottawa district:—

"Ottawa, January 7, 1898.—As you are probably aware last season was one of the most peculiar, if not the most peculiar, in the history of bee-keeping in this section of Canada.

"Soon after my bees were removed from winter quarters I noticed that although seemingly working hard every fine day, they were getting little if any honey, and were very rapidly using up the balance of their winter supply. I think I am safe in saying they got nothing from either maple, willow or fruit bloom, that is to say, early fruit bloom such as apple, plum, cherry, currant, &c. After my bees had been out about a week I began feeding systematically every evening, giving perhaps half a cupful to every hive, and by the beginning of May, even with this amount of feeding, they were still drawing heavily on the not very large amount left over from wintering, so much so that by the second week in May scarcely a colony in all my apiary had more than a very little unsealed honey and the hives were absolutely filled with brood, more so than I have ever seen them before, many of the frames having brood in the first row of cells from the top bar of the frame.

"I could not detect any honey being brought in until after the 24th of May, and then only in small quantities from the raspberry bloom. I fed steadily until the 23rd of May, and am quite satisfied that I realized handsomely by doing so. It is perhaps worth mentioning here that in the spring of 1896 all my strong colonies filled the two outside frames so full of honey that I removed them and put empty frames in the hives between the middle frames. The flow was from the willow. Swarming began on the 4th of June, and I have never had finer swarms than during the past season, the great trouble was there appeared to be no end to the swarming season, as I had several swarms in September, as late as the first week, when buckwheat honey was coming in freely.

"I took 45 hives out of winter quarters, having put away 46; the one lost was from dampness, it was touching the outside wall of the cellar. I sold two colonies just before swarming, and by the end of September I had 90 good colonies, most of them very heavy with honey, even the late swarms in September filled up well with buckwheat and goldenrod (Solidago) and required very little feeding to bring them up to the 55 pound limit. I sold 25 colonies this fall and have 65 in the cellar now. My total yield of comb honey was a little over 1,100 pounds, of which two-thirds was white clover, basswood and possibly some raspberry mixed, the balance was goldenrod and buckwheat mixed, making a quite agreeable honey.

"I have an idea that the reason of the excessive swarming was partly on account of the honey flow being very intermittent, perhaps two or three days of a heavy flow and then several days with little or none. During the idle days the working force would hang about the hives and amuse themselves building queen cells. Then in a few days out they would come. The total return for the past season by the sale of bees and honey was $325, less about $15 for honey fed in the spring."—[Percy H. Selwyn.]

"Almonte, Jan. 12, 1898.—This year I got no white honey. Last year I had between 2,500 and 3,000 pounds. This year's dark honey was about 20 per cent of last year's, and similarly, new swarms were about 20 per cent of last year's. As for feeding, I do not do much of that. Most of my colonies go into winter quarters, heavy with natural stores; but some of the old colonies had none too much, and two or three of the new ones this year did not actually gather enough to winter on."—[J. K. Darling.]

"Chard, Ont., Dec. 27.—I set out 105 colonies on April 23. I had a few colonies set out some days before that. The first pollen was seen coming in on April 22. By July 1, through robbing and starving my colonies were reduced to 70. At the end of the season these were increasod to 82. I got 500 lbs. comb honey and 1,500 lbs. extracted, all dark honey. Another bee-keeper here says he began the season with 40 colonies. He had no increase in swarms. He got 50 lbs. comb honey and 860 lbs. extracted, all dark honey."—[W. J. Brown.]

"Bearbrook, Jan. 8, 1898.—I never experienced such a hard spring and summer since I have kept bees. I carried out 22 hives. Four or five were weak, so I united four colonies into two. I ran 4 of my strongest hives for comb-honey and 16 for extracting. The spring was cold and dark, and the summer hot and dry. There was no clover until September, perhaps a little in August; but I never saw such a fall harvest. My bees never did better, even in June and July, than they did for me this year in September off the wild flowers, which grow on the low swampy land along streams. The honey was dark, but of a delicious flavour.—[A. R. McRae.]

REPORT OF MR. JOHN FIXTER.

SEASON OF 1897.

April 5.—Hives all taken out of their winter quarters and placed on their summer stands. The bees came out at once and flew well.
" 6.—Cloudy, but not cold; no flying.
" 7.—Fine but cool; flying well.
" 8.—Fine, cool toward evening; bees flying about three hours.
" 9.—Dull day; no flying.
" 10.—Warm; some flying.
" 11.—Warm; bees flying well, some bees attempting to rob; openings closed to one bee's space.
" 13.—Cold and wet; little flying.
" 16.—First pollen gathered from swamp willows.
" 17-20.—No flying.
" 21.—All bees flying and gathering pollen off different species of willows.
" 22.—All flying and working on the flowers of the Siberian squill.
" 22-May 11—Working well, gathering pollen.
May 11.—Plum trees and dandelion beginning to bloom. Bees very thick on both.
" 13.—Bees working well on wild cherry.
" 19.—Cherry and apple trees in bloom, very attractive to bees.
" 25.—Bees working on the Siberian pea tree (*Caragana*).
June 1.—Many dead drones and some worker bees were carried out to the entrance of several hives, a most unusual occurrence at this season of the year, a result probably occasioned in some instances by scarcity of new honey. A very close inspection being made, several hives were found to be short of stores and had to be fed, although there were many plants and shrubs at that time blooming.
" 9.—The Bush Honeysuckle (*Lonicera Tatarica grandiflora*) came into bloom.
" 13.—White clover coming into bloom; notwithstanding the abundance of bloom, no increase in honey was observed.
" 13-15 and later.—Bees working on white clover, alsike clover, Alder Buckthorn (*Rhamnus Frangula*), also raspberries and Mock Orange (*Philadelphus*). All hives fed on syrup, very little new honey having been gathered.
" 15-20.—Weather very fine. Bees flying well but no honey appeared to be gathered.
" 25.—All flying and working well on white clover and alsike, carrying in some pollen, no surplus honey being stored at this date. Several hives fed with syrup (made by dissolving two parts sugar in one part water, the sugar being added to the water while hot and stirred until dissolved). Bees beginning to improve, showing signs of greater vigour.
" 30.—Fine weather; bees flying freely. Some new honey was stored by the strongest colonies; it was, however, found necessary to feed some hives.
July 1-6.—Bees working well; all hives gained rapidly in weight during this period.
" 6.—Bees working well.
" 11.—Basswood just coming into bloom; flowers scarce, and, on account of the extreme heat of the weather there was but little gain in weight from this source.
" 18.—Bees working on basswood, buckthorn, Catalpa and also on asparagus.
" 24.—Bees working on horse beans. Buckwheat in bloom and bees working on it.
Aug. 1.—Buckwheat honey was gathered freely.
" 1-28.—The weather was very fine and bees were flying well, but very little surplus honey was stored. All supers were removed; 212 partly filled sections taken off, which were afterwards returned for winter stores.

Experiments in Wintering (1896-97).

Experiment No. 1.—Nov. 16, 1896.—Fifteen colonies were put into winter quarters in the cellar and placed on the shelves, beginning eighteen inches from the floor. Under the back end of each hive was placed a three inch block, by which means the back of each hive was raised so as to ensure free ventilation. Each hive was raised from its own bottom board three-eighths of an inch at the back. All front entrances were left wide open, the wooden covers all removed, leaving the propolis quilt on 12 hives and placing a chaff cushion four inches thick on each. On the remaining three hives no propolis quilt was used, but the chaff cushion was laid close to the frames. No difference could be seen between the colonies having on the propolis quilt and those which had none, that is, as to dampness, &c.

Temperature was taken once a week all through the winter:—

	Highest.	Lowest.
November 16 to 30	46	40
December	44	43
January	44	43
February	45	43
March	46	42
April	46	..

The bees were quiet throughout the winter, very slight hum being noticeable.

On April 5 all hives were removed to their summer stands. The temperature was kept regular in the cellar by means of a coal stove and careful watching. The stove was placed in an adjoining room, and was lit when the temperature was low or the cellar damp. The stove and ventilators require a great deal of watching, so as not to allow sudden draughts of warm or cold air, as either disturb the bees too much.

As the advantageous use of the coal stove requires experience, at present I would not recommend it to beginners.

Since the cement floor, shelving and complete ventilation have been put in the cellar, it has given entire satisfaction.

During the past winter every colony in this experiment was perfectly dry and clean and showed no uneasiness of any kind, and all came out in excellent condition.

Average weight of each hive when put into winter quarters was 51 pounds; when taken out on April 5, the average weight was 41 pounds 10 ounces per hive, showing that each hive had lost 9 pounds 6 ounces, which was rather less than the usual amount, owing to the comfortable cellar.

Experiment No. 2.—Colonies Nos. 14 and 20 were put into the cellar with tops and bottoms of hives left on, just as they were brought in from the bee-yard. These were to be watched for dampness. During November and December there was a slight hum in both hives, but they were quite dry.

Jan. 11.—Hive No. 14 was damp and noisy; hive No. 20 was dry.

Feb. 1.—Both quite dry, but there were many dead bees at the entrance of hive No. 14.

Feb. 8.—Colony No. 14 very noisy and hive damp; cover removed and ventilation given at bottom by raising the front entrance an additional two inches.

Feb. 22.—Both hives perfectly dry and quiet.

Mar. 1-29.—Hive No. 14 had some spots of fæces on the entrance, and when removed from the cellar on April 5 there was about one inch of dead bees and some mould on the bottom board, but the bees were in fair condition, as the colony was a large one.

April 5.—Hive No. 20 noisy, but dry; very few dead bees on bottom board. Total weight of the two hives when put in, 105 pounds; when taken out, 82 pounds. No. 14 weighed 13 pounds less, hive No. 20, 10 pounds less than when put into winter quarters.

May 24.—Hive No. 14 had 7 frames of bees and 5½ frames of brood; hive No. 20 had 8 frames of bees and 6½ frames of brood.

Experiment No. 3.—Hives stored in a root-house. Two colonies, Nos. 4 and 6, were kept in a large root-house, which is 100 feet long, 25 feet wide and 10 feet deep. The hives were placed on a shelf nailed up against the side wall, about 3 feet from the ceiling and projecting 2 feet. A curtain was hung from the wall over the top and down in front of the hives, so as to keep out all light. The propolis quilt of hive No. 4 was taken off and a chaff cushion put on in its place. The propolis quilt was left on hive No. 6 and a chaff cushion placed above it. The fronts of both hives were raised an additional half inch to give free ventilation.

Temperature was taken every Monday of each week.

Nov. 3-6.—Bees in both hives quite dry, but making considerable hum.

December.—Temperature of root-house, highest 38, lowest 36; both colonies noisy and quite damp, scarcely any dead bees on bottom of hives.

January.—Temperature of root-house, highest 39, lowest 37; both colonies very noisy, damp and mouldy.

February.—Temperature of root-house, highest 39, lowest 37; both hives quite damp and mouldy. Colony No. 4 showed signs of dysentery.

March.—Temperature, highest 43, lowest 35; both hives showed signs of dysentery; some few bees coming out of both hives; very few dead bees around either.

April 5.—Both hives removed to bee-yard. Both colonies showed signs of dysentery, dampness and mould, but both were very strong in numbers.

Another experiment was also carried on with these two hives; the propolis quilt was left on hive No. 6 between the chaff cushion and the frames. On hive No. 4 no propolis quilt was used, the chaff cushion being placed next to the frames; the object of this was to see if the propolis quilt was liable to hold the moisture in the hives.

After careful watching all the winter, no difference could be noticed.

Weight of hive No. 4 in the autumn of 1896, $60\frac{1}{2}$ pounds; in the spring of 1897, 45 pounds a loss of $15\frac{1}{2}$ pounds.

Weight of hive No. 6 in the autumn of 1896, 63 pounds; in the spring of 1897, $50\frac{1}{2}$ pounds, a loss of $12\frac{1}{2}$ pounds.

Another examination was made on May 24. Hive No. 4 had 5 frames of bees and 4 frames of brood.

Hive No. 6 had 7 frames of bees and 6 frames of brood, so that they were in excellent condition for a honey flow.

Experiment No. 4.—Nov. 16, 1896.—Colonies Nos. 1 and 3 were put into a pit dug in the side of a hill, 3 feet deep by 3 feet in width and 10 feet long, in such a way that the ventilators at both ends might not be immediately above the hives, which were in the middle of the pit. The hives rested on two cedar poles laid the full length of the pit. A third cedar pole of the same length was laid in front of the entrance of the hives, and insured the necessary circulation of the air from the two ventilators one at each end of the pit. These ventilators, which were 3 inches by 4 inches were made of boards, three of which reached down to the bottom of the pit, the fourth only to the top of the pit, and the ventilators rose three feet above the ground. In each hive half inch strips of wood were laid under both sides and under the back end, between the brood chambers and the bottom boards, so as to provide more space at the bottom of the hive in case a quantity of dead bees should accumulate there.

The pit was filled up with loose straw up to four inches from the top, which was made of cedar poles along the length of the pit, the middle ones higher than the others, covered with a layer of straw and one foot of soil. A small shaft was also arranged between the hives, down which a thermometer could be let by means of a string, so that the temperature of the pit could be ascertained. The thermometer was examined once a week. If the temperature rose too much, some of the covering might be removed; and if the contrary, some added. Temperature was taken once each week.

Temperature for November was 42 each time it was taken, and no sound was heard at any time through the shaft or ventilators.

Temperature for the first two weeks of December was 42; remainder of month, 39.

On December 21, one foot of horse manure was placed over the pit to try and raise the temperature, but no difference was appreciable.

The temperature for February and March was 39, and did not vary one degree during the two months.

The temperature of the pit on April 5, was 40; the day being very fine, both colonies were removed to the bee yard

Hive No. 3, was very damp and mouldy, and had half an inch of dead bees on the bottom board, but no evidence of dysentery.

Hive No. 1 was also very damp and mouldy and the entrance had some evidence of dysentery; on the bottom board there was about half an inch of dead bees.

Mice had found their way into the pit, but had not been there long enough to do any harm.

The weight of hive No. 1, in the autumn of 1896, was 50 pounds, and in the spring of 1897, 40 pounds, a loss of 10 pounds.

The weight of hive No. 3, in the autumn of 1896, was 52 pounds, and in the spring of 1897, 44 pounds, a loss of only 8 pounds.

May 24, another examination was made as to the strength of the colonies.

No. 1 had 7 frames of bees and 6 frames with brood.

No. 3 had 8 frames of bees and 6½ frames with brood.

This experiment, therefore, is very satisfactory, and the method is one which can be adopted at small expense by any one who wishes to keep bees. Care must be taken to choose a well drained spot for the location of the pit, and to cover the ventilators with wire netting to keep out mice.

Experiment No. 5.—Wintering in wood shed (house apiary).

Two colonies, Nos. 46 and 48 were left in the wood shed with some additional packing as stated in last year's report, page 270.

The wood shed has walls which are double boarded, with an air space of four inches. The floor, which is about one foot from the ground is also double boarded and there is no draught under it. The hives were moved one foot from the wall, and placed on a double thickness of sacks laid on the floor; the wooden covers were removed and replaced by cushions. In addition to this, the hives were covered above and all round with a double thickness of the same packing. No ventilation was provided for one hive (No. 46); for the other, (No. 48), a small shaft half an inch square extended from the opening of the hive to the outside of the shed, and half-inch strips of wood were placed under both sides and under the back, and between the bottom boards and the brood chamber, so as to give more space at the bottom of the hive in case a quantity of dead bees should accumulate.

No flying took place from the time they were packed until they were opened in the spring.

No difference could be noticed as to strength of colonies.

April 5, both hives had two inches of dead bees on the bottom boards and were damp and mouldy, and both colonies were in a very weak condition.

Another examination was made on April 22, when both hives were found to be deserted.

Hive No. 46 weighed in the autumn of 1896, 63 pounds, and in the following spring it weighed 48 pounds, showing a loss of 15 pounds.

Hive No. 48 weighed in the autumn of 1896, 53 pounds, and in the following spring it weighed 37 pounds, a loss of 16 pounds.

Conclusions.—The mode of wintering that has given most satisfaction is No. 1.

No. 2. Hives put in the cellar as they came from the bee-yard had not sufficient ventilation. This result agrees with that of last year. During the winter of 1897-98 this experiment is being repeated and also two hives have been stored in the same way except that the wooden covers have been removed, leaving nothing but the propolis quilt.

No. 3. Wintering in a root-house. This experiment was fairly satisfactory, but the hives were too damp. An effort is being made this year to keep the hives drier, by having more ventilation at the bottom.

No. 4. Wintering in a pit out of doors. This experiment was satisfactory, but is being tried this year without filling up the pit with loose straw as was done last year, and two inches of space have been left both at the back and in the front of the hives for better ventilation.

No. 5. Wintering in a closed shed, the hives being merely protected with a double thickness of sacks above and all round them. This experiment was a failure. The cold of winter destroyed most of the bees, very few being alive in spring. The experiment is tried again this winter with the hives placed farther from the outside wall and with more protection against frost.

House Apiary.

An experiment was carried on in a wood-shed, a part of which was partitioned off for that purpose and is now called the House Apiary.

This house apiary opens into a yard that is 30 by 60 feet, surrounded by a close board fence 6 feet high, which gives an excellent shelter from prevailing winds. Both the south and east sides of the shed are covered with grape vines, which seem to keep the building cool during the very hot weather, and the vines are trained so as to leave the entrances perfectly clear. One part of the space in the shed devoted to this purpose faced the south-east and was 7 feet high, 6 feet long and 4 feet wide.

In this portion were placed two tiers of hives; the bottom tier was set on the floor, which is one foot from the ground and double-boarded. The second tier was set on a shelf 3 feet 6 inches from the floor.

Another portion of the shed facing the south-west 7 feet high, 4 feet wide and 32 feet long. There were here 12 hives in one row upon the floor.

From the experience of the past year gained with the part first mentioned, I would recommend two tiers on the south-west side, so that the vacant space might be profitably occupied. The entrances to the hives were 3 feet apart and were cut through the wall of the shed; they were 6 inches by 6 inches, with an alighting board projecting 7 inches by 12 inches wide and sloping so as to throw off rain. The hives are set close to the wall, so as to confine the bees to their own hives.

Conclusions.—During the past two summers the colonies in the house apiary, which is surrounded by an inclosed yard, having more shelter from the cold winds of both spring and autumn, were frequently observed to be flying, while the colonies in the exposed open apiary remained in their hives.

Another advantage of this arrangement is that there is less danger of robbing. When the hives are being inspected the examination is obviously more convenient in wet weather, being under shelter; further, if the apartment were made 6 feet wide, instead of 4 feet, and a shelf placed on the wall to hold bee appliances, this would add greatly to its convenience. The alighting board might be made to project only 6 inches and be 10 inches wide.

GRASSES.

AWNLESS BROME GRASS

(*Bromus inermis*, Leyss).

One of the most valuable pieces of work which has been accomplished by the Experimental Farms is the successful introduction into Canadian Agriculture of the Awnless Brome Grass, which, on the whole, has done better than any other introduced grass we have sent out for trial, both for hay and for pasture. The seed of this grass was imported from Russia during the first year of the institution of the Experimental Farms, and it has been grown ever since, with remarkable success. Every year small packages of the seed have been distributed free, in every province of the Dominion to such farmers as have asked for samples, and the reports received from them have been most satisfactory. On the prairies of the West, where, on account of the rapid settlement of the country and of the increase in the numbers of stock, the native grasses are now failing, the Awnless Brome grass is found to be a most useful substitute.

The seed germinates readily and the young plants soon become established. It is a perennial grass with running root-stocks, and is conspicuous for its free leafy growth and tall stems (3 to 5 feet high), which bear an abundance of seed. It flowers at Ottawa in the last week of June or the first week of July. It is very hardy and early, and produces a large crop of hay, which, although rather coarse-looking, is soft, sweet-smelling and palatable to all stock; chemical analysis also shows that it possesses great food value.

Not only does Awnless Brome grass thrive in the rich, moist soil of the eastern provinces, but its growth and productiveness are so wonderful, even it the dry plains of the West, that its cultivation, together with that of the Western Rye-grass (*Agropyrum tenerum*, Vasey),—another most valuable grass, a native of North-western America, which indeed is the well known "Bunch Grass" of the West,—may be said without exaggeration to have solved the problem of fodder production on a large scale in the arid western sections. Under irrigation on the farm of Mr. Wm. Hull, of Calgary, Brome grass has given on 200 acres of land the enormous yield of 4½ tons of grass per acre. It seems to stand a little more water than Timothy when irrigated. On good lands in the east it produces without irrigation from 1½ to 2½ tons of hay per acre.

One notable feature which distinguishes this grass, is that, while most grasses after the flowering period deteriorate rapidly while the seeds ripen, Awnless Brome grass can be left standing till the seeds are fully ripe, and yet the hay crop will be heavier, without being poorer, than if it had been cut when in flower, as should be done generally for all hay grasses in order to get the best value. This remarkable characteristic of Brome grass is due to the fact that after the seed-bearing stem has grown up, a great number of leafy sterile shoots spring up from its base. It is owing to this supplementary growth that the straw, after threshing, still makes hay of excellent quality.

A special value for this grass has lately been discovered, namely, its adaptability for alkaline soil. Mr. Mackay, having tried some experiments, reports as follows:—
"Indian Head, Assa., Nov. 12.—The Brome grass on alkaline land, which I referred to in speaking to the Committee on Agriculture while in Ottawa, was grown on two low spots in a field of about 15 acres. The spots are not very large (¾ acre in both), but, before sowing, the bottoms were white with alkali, though not so bad as low places in other districts. A good many crops had been grown on the field prior to the grass being sown, and no doubt have had some effect on the alkali. It seems to me as if alkali washes out of the soil into low spots, for we find it in varying quantities in places where water stands for a few days and then settles into the soil. Last June we had a deluge of rain, leaving us a 5-acre plot in one of the grain fields covered with water

until September. That spot is covered with alkali now, and so far as I know there has been no alkali there before.

"The crop of hay on the $\frac{3}{4}$ acre was very heavy, but the land being moist would cause a good crop in any case. Part of this year's crop of Brome hay was grown on low places, upon which alkali is observed every year we plough them; and in these places the crop was very heavy. As no record was taken of the yield on the alkaline spots, I cannot give any exact quantity per acre, but there was at least one-third more hay on them than on the ordinary land."—[Angus Mckay.]

"Urquhart, Alta., Nov.—The 1-pound bag of seed received was sown June 11, on 330 square yards of a field which had been sown with grain for the two previous years; but in this particular position little or nothing had grown, the soil being alkaline clay, which is always baked hard in summer. The ground was ploughed in May and well harrowed, and again harrowed previous to the grass being sown, in order to destroy the weeds. The grass grew to a height of 16 inches, but not vigorously over all the ground, some patches being quite bare. It was green and fresh when all the surrounding grass on field and prairie was withered and dead from the early frost. It was not cut. I feel satisfied that it will be a capital grass for hay or pasture, and I intend to sow the whole field (7 acres) with this grass."—[P. McDonald.]

The above quotations suggest a special value in this most excellent grass which was not thought of at the time it was introduced.

In certain parts of British Columbia, the two native species *Bromus Pumpellianus*, Scrib., which closely resembles *B. inermis*, and a large succulent species, *B. brevi-aristatus* Buckl., have been preferred by some growers and further experiments with these species are now being carried on.

REPORT OF THE POULTRY MANAGER.

(A. G. Gilbert.)

To Dr. William Saunders,
Director Dominion Experimental Farms,
Ottawa.

I have the honour to submit herewith the tenth annual report of the Poultry Department. The work of the year has been principally in the line of feeding reduced rations, and noting—

1. Effect in increased, or, decreased output of eggs.
2. On the general health of the laying stock.

The results were most gratifying and are given in the following pages, with full particulars of the change in quantity and value of the rations. The experience gained cannot fail to be of interest and value to all those desirous of obtaining eggs from their laying stock, in winter, at the least possible cost.

Details are also given of the experimental managing and feeding of 50 hens, as requested by the members of the Committee on Agriculture, of the House of Commons of 1896.

There is a marked increase in the correspondence of the year and no little part of it is devoted to inquiries as to the best means of artificially hatching and rearing of early chickens, ducks, &c.

Addresses on the care and management of poultry, markets for eggs and kindred subjects were delivered at the following points during the year, viz.:—

Ontario—Lanark, Kingston, Guelph, Monklands, Moose Creek, Maxville, Quigley, Summerstown and Smith's Falls.

Quebec—Montreal.

Nova Scotia—Grand Pre and Cornwallis (2).

New Brunswick—Fredericton, Upper Maugersville, Hampstead, Long Reach, Riverside, St. Joseph's College, Pointe de Butte and Sackville.

Prince Edward Island—Charlottetown, Alberton, Summerside and Georgetown.

A new feature at the Smith's Falls meeting was the exhibition of poultry, killed and dressed, to suit the requirements of the British market. The poultry was killed and dressed on the Experimental Farm by an expert. The exhibition consisted of turkeys, geese, ducks and chickens and was closely examined by a large number of farmers and their wives. As an interesting and instructive object lesson it was much appreciated.

I have the pleasure of again testifying to the zeal and energy of Mr. George Deavey to whose faithful carrying out of instructions given and inteiest taken in the work much of the success attained is due.

I have the honour to be, Sir,

Your obedient servant,

A. G. GILBERT.

REPORT OF THE POULTRY MANAGER.

The work of the past year has been unusually important and successful. Important, because it embraced the experimental feeding, to the laying stock, of a less quantity of cheaper rations than formerly. Successful, for the reason that a greater number of eggs was obtained, during the winter period of high prices, at a lessened cost of production. It will be interesting then to the farmers and poultry breeders of the country to learn how such results were brought about.

WHAT CLOSE OBSERVATION LED TO.

The experience of former years led first to the suspicion and finally to the conviction that the great drawback to successful winter laying was the hens becoming overfat—particulary those of the Asiatic and American breeds—from overfeeding and consequent disinclination to exertion. This was more noticeable when the soft mash morning ration was fed, as was thought, in too great quantity. It was also noticed that the overfat condition was more general and disastrous about the end of February, or beginning of March. The indications of an overfat condition were :—

1. The laying of eggs with thin or soft shells.
2. Eggs laid of abnormal size and unusual shape.
3. The sickness of several of the laying fowls from an ailment at first thought to be acute indigestion, but later supposed to be enteritis or inflammation of the intestines, and which in the majority of cases resulted in death.
4. The sudden death of several two and three year old hens, of the large breeds, from apoplexy.

SIMILAR CASES ELSEWHERE.

Investigation received incentive by the reception of several letters, from persons in different parts of the country, describing an ailment which affected their fowls, and similar to that noted in the farm fowls. The following letter may be taken as a specimen of those received, and describes the symptoms :—

"DEAR SIR,—My hens are suffering from some disease. They have been laying well up to this time (end of February and early March). They seem to lose the use of their legs and lie on their sides. They seem feverish and distressed. Some get over it, others die. We give them mash in the morning and grain at other times. They have water to drink and old mortar for lime."

In the case of the farm fowls, castor oil in small doses was given with a ration of soft food, and the correspondents were advised to try the same.

The ailment was a new experience and experts consulted thought it a form of acute indigestion.

SOME LIGHT ON THE MATTER.

What was the ailment ? It seemed an outcome of the overfeeding, over stimulating (and consequent overfat condition) of the laying fowls, in the attempt to procure eggs in winter. Some light was thrown on the subject by the publication, by Dr. W. Sanborn, of a book on poultry diseases, in which he describes "Enteritis," the symptoms of which so closely resembled those of the sick fowls of correspondents and farm, as to make conjecture almost a certainty. Dr. Sanborn thus writes :—"Enteritis, an inflammation of one or more of the intestines, has received much attention and investigation of late."

CAUSE OF DISEASE.—Feeding too stimulating or irritating foods ; long continued feeding of one ration ; eating of poisonous vegetable or mineral matter ; worms or anything that tends to inflame or irritate the bowels.

SYMPTOMS.—Great general weakness. Bird gets into a corner, or lies down in a listless manner with feathers ruffled. Eyes are nearly closed. The bird is hot, in fact there is general fever. It seems to shiver and is restless. Discharges are watery with mucous, stringy matter, sometimes tinged with bile or blood. It is quite common for fatal cases to show stupor, or wildness when well advanced with the disease.

TREATMENT.—Remove cause. Give teaspoonful of castor oil. Stop feeding hard food or grit for some days. Give mash of stale bread and milk with rice water or boiled milk for drink.

The foregoing description of the ailment is given at length for the benefit of numerous inquirers and others, who are feeding for eggs in winter.

A TRYING MONTH.

The month of March seemed to be the most trying to all the laying stock. It was at that time that the Spanish breeds seemed more predisposed to egg eating and feather picking. This was attributed to the long period of artificial life and treatment, in comparatively limited quarters, and it was so stated in the annual report of 1893. But later observation, the results of which are given in this report, showed that the main cause was not such as was supposed at that time.

It was also noticed that, when the ground was free of snow in spring and the fowls had outside run, all trouble ceased.

CONCLUSIONS ARRIVED AT FROM THE FOREGOING.

The conclusions arrived at from the foregoing experience and that of correspondents are :—

1. That there had been too many and not variety enough in the rations fed during winter.
2. That the warm morning mash had been fed in too liberal quantity, if not too frequently.
3. That more exercise and more green stuff were necessary.
4. That lime for shell should be conveyed, if possible, in the form of a ration, as well as being before the layers in the shape of crushed oyster shells.
5. That it is of paramount importance to have the winter layers over moult early; of the proper age and into winter quarters neither too fat nor too lean.
6. That the handling of the winter layers, so as to have them over their moult early and into winter quarters in proper condition, must begin in summer.

THE REMEDY APPLIED AND WHEN AND HOW.

In the summer and fall of the past three years the handling of the laying stock, so as to procure an early moult, was successfully carried out, as described in the reports of those years. But it was not until the fall of 1896 that it was decided to reduce the number of rations. Accordingly, when the laying stock went into winter quarters in November, 1896, the noon ration was dropped and the morning ration slightly reduced. The rations were then two in number, viz., morning and afternoon, instead of three, a reduction of nearly one-third. The result was nearly one-third more eggs. Details are given further on.

The year is dated from the 1st of November of each year named; as winter laying usually begins in that month.

THE MODIFIED RATIONS.—HOW MADE UP.—HOW FED.

The number of layers in the fall of 1896, and to which the modified rations were fed, was 204, composed of 151 hens and 53 pullets. The reduced rations were as follows.

MORNING RATION.

Three mornings of the week, cut green bones; the other three mornings, a warm mash. The green bones were got from the butcher shops and were cut up by a bone cutting machine, run by power. The mash was composed of shorts, ground oats, ground barley, ground rye, wheat bran, steamed lawn clippings, or steamed clover hay, the latter cut into short lengths. The lawn clippings and clover hay were prepared by placing the quantity thought sufficient, into a pot, containing boiling water, the night previous and allowing it to steam all night. The mash was mixed with boiling water. Sometimes for a change boiled turnips, or small potatoes were mixed into the mash.

On Sunday morning whole grain was usually fed.

NO NOON RATION.

No noon ration was given, but mangels, turnips and cabbage were before the fowls, all the time.

AFTERNOON RATION.

Whole grain, wheat or buckwheat, principally the latter while it lasted. Sometimes oats were mixed with the buckwheat, more frequently so in late spring and early summer.

QUANTITY FED.

The cut green bones were fed in the proportion of one pound to every fifteen hens. The mash in quantities of one quart to every twenty, or twenty-five hens. This may seem a small ration, but reasons for it are given further on. The afternoon meal was 20 pounds of wheat, or buckwheat, to 204 fowls.

WHAT WAS AIMED AT.

The aim in feeding the above rations was :—

1. To avoid an overfat condition.
2. To incite the layers to greater activity.
3. To convey lime for shell in form of cut green bone ration.
4. To furnish a greater quantity of green stuff.
5. To have as much variety in rations as possible.
6. To avoid many of the ills and vicious propensities noted in former years.

HOW OVERFEEDING WAS AVOIDED.

There was no hard and fast rule, as to the frequency with which the cut green bone was fed. When the hens were laying well a little would be fed, perhaps, every morning On such times no mash was used. Immediately after the morning ration a few handsfull of grain were thrown in the litter on the floor of the pens, so as to start the hens busily searching for it. Great care was taken in feeding the mash. Experience has proved that the overfeeding of the morning mash is the rock on which many farmers and poultry keepers are wrecked, in their eagerness to obtain eggs in winter. Experience has proved that disastrous results will surely follow the overfeeding of the morning ration of whatever kind. Particular mention is made of the mash, because it is so generally fed. It must not be inferred that objection is taken to the mash. It is useful and convenient in utilizing the waste of table, kitchen and barn, but it must not be overfed. The object in reducing and limiting the quantity of the soft mash, is to prevent the possibility of gorging the laying stock, at the early meal and so have them disinclined for the exercise, so requisite.

EXERCISE AND HOW BROUGHT ABOUT.

Having had a light morning meal the layers were ready for exercise and this was incited by throwing two or three handsfull of grain—as already stated—in the straw, cut hay, dry leaves or chaff composing the all essential dry litter, to be found on the floor of all well equipped poultry houses. The aim was to keep the layers, for the remainder of the day, so busy searching for the scattered grain, that their crops would be gradually filled by the time they went to roost. Certainly, a more natural way than by rapidly filling their crops with grain thrown on a bare floor, or into a trough. The afternoon grain ration was always fed early, so as to permit of the search being kept up. Too much importance cannot be placed on the exercise part of the winter management.

A POINT TO REMEMBER.

The reason for feeding the morning ration will be at once apparent, from the above. Had the hens been gorged, at the morning ration, they would certainly not have been inclined for exertion.

VARIETY.

Variety in composition of rations and time of feeding them was found beneficial. To have such variety, the cut bones were sometimes given for afternoon ration.

Again, the mash would occasionally be fed at that time. When fed at the latter period, it was followed by a light grain ration, which was scattered in the litter on the floor, to secure the desired exercise.

ONE CONSPICUOUS RESULT.

An early and conspicuous result of the dropping of the noon and reduction of the morning ration was the greatly increased quantity of vegetables and grit eaten. As already stated, vegetables were always before the layers, as were mica chrystal grit and crushed oyster shells.

APPARENT RESULT IN INCREASED EARLY EGG YIELD.

Another apparent beneficial result from the reduced rations, coupled with the early moulting of the layers, was noted in an increased egg yield in the comparatively early winter months of November and December, as shown by the following figures :—

——	1894.	1895.	1896.
November	114	160	568
December	538	943	1,466

The number of hens in each year were :—

1894	185
1895	218
1896	204

It will be noticed that the number of fowls was less in 1894, than in the other two years, but not so great as to make the difference in the number of eggs.

The early and increased results were gratifying because new laid eggs were in great demand, as they usually are in November and December, particularly so at the Christmas season.

COMPARATIVE EGG YIELDS.

The egg yield of the whole year, as compared with that of the three previous years, will best show any beneficial results from the decrease in quantity of food. The year is dated from the beginning of November of one year to the end of October of the year fullowing, for the reason that winter laying has usually begun in November. The figures are as follows :—

November (1893)	90	114	160	568
December (1893)	250	538	943	1,466
January	777	819	1,469	1,540
February	791	1,080	1,411	1,351
March	1,644	1,387	1,569	1,668
April	1,939	1,823	1,934	2,139
May	1,650	1,603	1,699	1,846
June	1,066	1,134	897	1,190
July	941	456	682	859
August	386	438	395	736
September	236	246	143	655
October	161	23	150	339
	8,931	9,661	11,452	14,357

The figures for the months of November and December of 1893 are estimated, as the record book could not be found, but they are not much out of the way.

The table shows a large increase in the output of eggs in the past year as compared with the three previous years. It is also an object lesson to the farmers as showing :—

1. Eggs were most in supply during the period of high prices.
2. During the spring months, of comparatively low prices, there were eggs enough to sell and hatch early chickens from.
3. The male chicks would be valuable as early birds for market. The pullets would be valuable as early layers.
4. That with proper care and feeding fowls will lay well during the winter season.

EGGS LAID PER DAY IN WINTER MONTHS.

The following is the production of eggs per day in the winter months named and the price of eggs during that time :—

DECEMBER, 1896.—38, 36, 31, 39, 43, 29, 40, 41, 45, 42, 42, 42, 42, 48, 47, 46, 50, 47, 52, 54, 57, 45, 54, 55, 55, 45, 64, 60, 52, 68, 55=1466.

JANUARY, 1897.—52, 61, 53, 53, 52, 54, 45, 57, 42, 51, 48, 46, 44, 50, 46, 53, 43, 49, 50, 42, 54, 50, 53, 47, 50, 54, 44, 54, 52, 40, 51=1540.

FEBRUARY.—45, 57, 51, 42, 46, 51, 40, 52. 48, 46, 50, 43, 47, 48, 44, 44, 49, 58, 48, 45, 52, 51, 45, 52, 46, 43, 51, 56=1351.

MARCH.—45, 60, 44, 59, 47, 54, 55, 54, 58, 51, 48, 57, 64, 47, 56, 44, 50, 50, 61, 43, 59, 51, 61, 53, 59, 50, 52, 55, 65, 57, 60=1668.

WHAT THE EGGS WERE SOLD FOR.

Eggs were sold, in Ottawa, from 1st to 15th of December, at 30 cts. per dozen ; during the latter half of that month at 35 cts. per doz. In January at 35 cts. per doz. in Ottawa. A shipment of eggs to Montreal during January brought 40 cts. per doz. The express charge for the case of 18 doz. eggs was 36 cts.

During February continued mild weather brought the price down to 25 cents. March, the prevailing price was 20 cts. per doz., declining to 18 cts. per doz.

COST OF DAILY RATIONS.

The cost of the daily rations fed to the laying stock, numbering 204, was estimated at 41 cts., as follows:—

18 lbs. of cut green bone at 1 ct. per lb.	18
20 " wheat, buckwheat, &c., at 1 ct. per lb.	20
Grit and vegetables	3
	41 cts.

To this should be added the time of the man in cutting up the bones by the machine, sometimes half or three quarters of an hour. It should also be stated that buckwheat was mostly used for cut rations during the winter months. To offset this is to be considered the worth of the manure, which a bulletin from the Raleigh, North Carolina, Experimental Station values at half the cost of the feed of the hen for the year, but which we allow to go for the trouble of the farmer in looking after and feeding his fowls.

When mash was fed it was composed of ground grains, in such quantity as not to exceed the value of 18 cts.

The allowance of 1 cent per lb. for the whole grain is liberal, for buckwheat sold in the fall and early part of the winter at 22 and 25 cts. per bushel.

EGGS SOLD AT THE HIGHEST PRICES.

Having obtained the new-laid eggs in the season of highest prices, the aim was to dispose of them to the best possible advantage. With a little effort the best results were obtained. The following is an instance:—

On the 30th of December, as shown in the above table, the greatest number of eggs laid on any day, in that month, was collected, viz.: five dozen and eight (68). These eggs were disposed of at the following prices:—

5 doz. and 8 eggs at 35 cts. per doz	$1 97
Deduct cost of rations	0 41
Proceeds of that day	$1 56

But as that was the day of the greatest production, it is but fair to give the average of the month, which was 48, or four dozen per day.

4 doz. eggs at average price of 33 cts. per doz.	$1 32
Deduct cost of rations	0 41
	$0 91

The eggs were strictly fresh and were sold in the city of Ottawa. In the same month eggs of the same description were worth in Montreal from ten to fifteen cents more per dozen. Had the eggs been sent to a leading grocer of that city they would probably have made the larger figure, less express charges.

LESSONS FROM THE ABOVE.

The lesson to the farmer is to obtain the new laid eggs in the winter season of high prices and having got the eggs to sell them—while they are strictly new laid—to leading grocers, dairymen, &c., or choice customers, who will always pay the high price for a reliable article. It may be said that the high figures named are not received by the majority of farmers. Perhaps not by farmers, who, are a distance from a high price market and who have to sell to a middleman. Certainly not by those who do not bring in a strictly new laid article. But the high figures are certainly received by farmers who cater to the requirements of a high price market, with strictly fresh eggs and a superior quality of poultry.

SUMMARY OF RESULTS NOTED.

The following is a summary of beneficial results noted, as following the reduction of the rations, with the care and handling of the laying stock, as described:—

1. Better health of the laying stock.
2. Greater output of eggs.
3. No development of vicious habits of previous years.
4. Comparatively few eggs laid with thin shells and none with soft shells.
5. Much greater activity of the layers in searching for the grain scattered in litter on the floor.
6. Much better condition of the fowls, of all breeds, in February and March as compared with previous years.

EXPERIENCE REQUIRED.

The question may be asked, "Why was the disastrous results of overfeeding not discovered before?" The reply is that it requires several years of experience and careful observation before reliable data can be obtained. There were many statements made and read during the past few years but none had received confirmation by experiment. The management and feeding of his hens by the farmer, so as to obtain eggs in paying quantity from them in winter, is comparatively new and much is yet to be learned. The report of the poultry department for any year gives the experience of that year, which that of the following year may confirm or modify, and so the work goes on and all in the way of finding out cheaper and more effective rations.

BREEDING PENS MADE UP.

At the beginning of March the breeding pens were made up as follows:—

Date.	Breed.	How Mated.	Remarks.
March 2...	Barred Plymouth Rocks....	1 cock 9 hens....	
" 2...	White "	1 " 8 "	
" 2...	Silver Laced Wyandottes....	1 cockerel 9 "	
" 2...	Light Brahmas	1 cock 7 "	
" 2...	Black Minorcas....	1 " 9 "	
" 2...	White "	1 " 8 "	
" 2...	Andalusians	1 " 9 "	
" 2...	Coloured Dorkings....	1 " 8 "	
" 2...	Houdans	1 " 3 "	
" 2...	Black Minorcas....	1 cockerel 4 "	Second pen.
" 11...	White Leghorns....	1 " 11 "	
" 11...	White Wyandottes....	1 " 7 "	
" 11...	White Plymouth Rocks....	1 cock 3 pullets..	Second pen.
" 13...	Langshans....	1 cockerel 9 hens....	

The eggs most in demand for setting were those of Barred and White Plymouth Rocks, Black Minorcas, Silver Laced Wyandottes and White Javas, in the order named. There was a greater demand for eggs of the Barred Plymouth Rocks than could be filled. It is gratifying to note that the popularity of this breed is steadily increasing. It is certainly good for both egg production and flesh development. Of equal merit is the Wyandotte family with its varieties of Silver Laced, White, Black, Golden and Buff. As prolific layers of large white eggs the Black Minorcas have taken a front place, and deservedly so.

HOW THE EGGS WERE SET.

The eggs were set in specially prepared nests, placed in a portion of the poultry house set apart for the purpose. In close proximity to the sitters was their food, composed of mixed grains, grit, water and dust bath. The mixed grains were contained in a narrow trough. For early sitters Wyandottes were preferred, as being docile, easily handled and not clumsy. Some of the cross bred hens were found to make excellent sitters and mothers. On being made, the nest was dusted with carbolic disinfecting powder, and so was the body of the sitter, before being placed on the nest.

AN EARLY HATCH.

At the beginning of February a vigorous male of the same breed, which had been kept in a separate compartment, was mated with a certain number of Barred Plymouth Rock hens. The object was to test the fertility of the eggs from hens which had been laying all winter. On the 20th of the month named, 13 eggs were given to a hen which had become broody. Three weeks after 11 lively chicks hatched out. The twelfth egg contained a dead chick, fully developed. The thirteenth egg was unfertile. Such a result from Plymouth Rock hens which had laid from the previous November was most gratifying. It went to show that it was quite possible to have hens lay all winter and to have early fertile eggs from them. The subsequent care and trouble experienced in rearing the chicks, went to show that it would not be profitable for a farmer to hatch out and rear chickens at that early period, unless he had a brooder or brooding room.

That the farmers in the neighbourhood of city markets, or within easy reach, by rail, of the same, are giving greater attention to the artificial rearing and hatching of chickens, is shown by the numerous inquiries by correspondents for information on the subject. Early chickens command a high price, and the demand for them increases year by year.

Further experiments in the way of testing the early fertility of eggs, from hens which have laid steadily all winter, will be important and interesting.

Certain poultrymen keep hens to lay eggs in the latter part of December, January, February and March, for incubator use only. These men live where climatic conditions make it comparatively easy so to do. But where the laying stock are confined to limited quarters from November to the following April, artificially housed and treated meanwhile, skill and experience are necessary to ensure early fertile eggs.

EGGS SET AND CHICKENS HATCHED.

When Set.	Description of Eggs.	When Hatched.	Chickens Hatched.
Feb. 20	13 B. P. Rock	Mar. 11	11
April 12	11 Light Brahma	May 3	3
" 12	11 Andalusian	" 3	4
" 14	13 B. P. Rock (from a farmer)	" 3	10
" 14	13 Langshan	" 5	2
" 14	13 White Minorca	" 5	9
" 14	13 R. C. B. Minorca (from Nova Scotia)	" 5	5
" 14	13 W. Wyandotte	" 5	5
" 14	13 W. P. Rock (from Hazeldean)	" 5	5
" 15	13 R. C. B. Minorca (from Nova Scotia)	" 6	3
" 17	13 B. P. Rock (from a farmer)	" 8	9
" 21	13 "	" 12	13
" 23	13 Brown Leghorn	" 14	10
" 30	13 Coloured Dorking	" 21	7
" 30	13 White Leghorn	" 21	4
" 30	13 White Java	" 21	4
May 5	12 Andalusian	" 26	4
" 5	12 W. Leghorn	" 26	7
" 7	13 Light Brahma	" 28	6
" 8	13 Andalusian	" 28	2
" 10	13 B. P. Rock	" 31	10
" 12	13 Andalusian	June 2	8
" 13	13 Coloured Dorking	" 3	5
" 13	13 White Java	" 3	8
" 22	13 Buff Leghorn (from Toronto)	" 12	1
" 23	13 S. L. Wyandotte	" 13	10
" 23	13 Coloured Dorking	" 13	2
" 27	13 W. Leghorn	" 17	9
" 27	13 "	" 17	11
June 3	13 B. Minorcas	" 24	9
			196

Many of the small hatches were the result of bad sitters. The experience with sitting hens, from year to year, is a varied and not altogether a happy one. During the early part of the season the Langshan cock, a very fine bird, sickened and notwithstanding treatment died. Later in the season the Andalusian cock also died. The latter was replaced by a younger bird. In both cases the want of fertility of the Langshan and Andalusian eggs may be attributed to the lack of condition, on the part of the male birds, prior to apparent symptoms of sickness. In the case of the Andalusian death was comparatively sudden. The Dorking cock was an old, but very fine bird. Some of his progeny are of more than ordinary worth. It will be seen from the above that the eggs which gave the best hatching results were from the Barred Plymouth Rocks, Silver Wyandottes and White Leghorns, notwithstanding that the hens of these breeds were the earliest and steadiest layers. The chickens hatched were strong and vigorous.

GROWTH OF THE CHICKENS.

The progress of the chicks was most satisfactory. After remaining in their nests until thoroughly ripe, with the mother hen they were placed in coops arranged in a field of short grass and clover. Their first food was stale bread, soaked in milk and squeezed dry. A little at a time was fed. Granulated oatmeal, or rolled oats was added on the second or third day. The food was placed on clean boards and none was allowed to remain to sour. Care was taken that the chickens were not overfed, which bad practice leads to much disaster. Grain was not fed until the twelfth or fourteenth day. Milk, at times, and pure water always, furnished all the drink required. As soon as the chicks were firmly on their legs, a mash made of cornmeal, shorts, oatmeal, &c., with a small quantity of blood meal added and the whole mixed with boiling water, or milk, or both was fed in moderate quantity and much relished. As in previous years the most rapid flesh development was made by Barred Plymouth Rock, Wyandotte, Java and Brahma cockerels. Without any forcing, other than regular feeding of wholesome food, in proper quantity and constant supply of pure water, there has never been any difficulty in having chickens of the breeds named weigh 4 pounds each, or 8 pounds per pair, at end of four months. In all cases such results were not attained, but would doubtless have been secured had the chicks been penned and fattened.

For instance a Barred Plymouth Rock cockerel was caught and sent away to a purchaser on the 26th October. It was hatched on the 11th March and when shipped weighed 7 pounds 5 ounces.

A Light Brahma Cockerel, hatched on 3rd May, weighed on 2nd November when it was shipped, 6 lbs 12 ozs.

A Barred Plymouth Rock cockerel, killed on the 17th of November, weighed after being bled and plucked 6 pounds 4 ounces. A pair of such chickens would have made weight of 12 pounds 8 ounces and would have been quickly bought by any leading dealer in Montreal, at 10 cents per pound, or $1.20 per pair. The farmer should aim to breed such chickens and he can easily do so, by keeping one of the breeds which make flesh development as mentioned above. A superior quality of poultry is in great demand in our leading cities, for home consumption, and export to the British market.

BEGINNING OF WINTER LAYING.

The fowls went into winter quarters in the second week of November. Winter laying may be said to have commenced about the 20th of the month. The first hens to resume laying were Plymouth Rocks, White Leghorns, Andalusians.

WHEN THE PULLETS BEGAN TO LAY.

The Plymouth Rock pullets hatched on the 11th March, three in number, matured early. The first egg laid, by one of their number, was on 20th September. The others laid soon after and continued to do so, up to time of writing, 26th November. The moral is obvious. The early pullets begin to lay when the price of new laid eggs is becoming high. It is therefore an object to have early hatched pullets. The White Leghorn pullets, hatched at end of May, began to lay in the beginning of November.

WILD AND TAME GEESE.

In the spring a tame gander was mated with one of the wild geese and a wild gander with a tame goose. The object was to obtain progeny from the cross. The limited quarters were evidently not suitable, for no results followed. The wild goose laid her usual quota of six eggs but hatched no offspring. The wild goose, mated with the tame gander died during the early part of the summer. At the end of the season the second wild goose died. Both birds were twelve years of age, but were apparently in fair condition prior to death. It is evident that the wild fowl of this breed must have range and congenial surroundings to ensure fertile eggs. The cross of wild and tame geese is not uncommon, but in all cases the birds have had free range. While at Summerside, P.E.I., in September last, the writer was shown a large flock of geese, crosses of the wild and tame. The wild ganders did not attempt to leave the others, although all had unlimited range. The cross birds were large and plump and were sold at $2 each, when killed and sent to the Boston market.

STOCK ON HAND.

The stock in the poultry houses at present are :—

——	Cocks.	Hens.	Cockerels.	Pullets.
Barred Plymouth Rocks	1	12	2	28
White do	1	9	......	4
Silver Laced Wyandottes	2	13	4	5
White Wyandottes	1	11	......	3
Light Brahmas	1	9	3	3
Langshans	......	7	......	......
White Javas	1	8	7	4
Coloured Dorkings	......	7	3	4
White Leghorns	2	20	7	17
Brown do	......	......	1	3
Black Minorcas	1	7	11	4
White do	1	3	5	2
Andalusians	......	9	4	......
Golden Polands	2	2	......	......
Mixed hens	......	26	......	......
	13	143	47	77

DISEASES OF POULTRY.

During the year several letters were received describing symptoms of different diseases. Two of the communications came from a distance and described symptoms of diseases unknown in this country. Where diseases were recognized, the best known treament was recommended.

THE PROFITS MADE BY FIFTY HENS.

The following experiment was conducted at the request of the House of Commons Agricultural and Colonization Committee. It will no doubt be interesting to farmers who cannot keep more than fifty hens. It shows the profit made by the number of fowls named and the manner in which they were managed and fed. The experiment began on the 1st of April, 1896, and continued for one year. The hens selected were :—

Silver Laced Wyandottes	9
White Javas	7
Mixed, or common hens	34
	50

None of the fowls selected were over two years. The object in making the above selection was to have :—

1. Stock of the age to make good winter layers.

2. To have a certain number of thoroughbreds so as to permit comparison with the mixed hens.

3. A certain number of thoroughbreds, from which male birds could be raised to sell for market or breeding purposes, the pullets being retained for layers.

EGGS LAID.

The eggs laid by the fifty hens during the year were as follows :—

April	571
May	540
June	317
July	242
August	155
September	61
October	77
November	344
December	587
January	693
February	600
March	586
Total	4,773

As stated in foregoing part of report, the object was to get the eggs when they were worth most and to sell them at the best price obtainable. Receipts and expenses were as follows :—

RECEIPTS.

Eggs sold for eating purposes at prices of from 13 to 35 cents per dozen	$ 78 69
Sold for hatching purposes	41 50
11 Cockerels sold at $1 each, viz.: 9 Silver Laced Wyandottes and 2 White Javas	11 00
8 Silver Laced Wyandotte pullets on hand in the fall, at $1 each	8 00
Total	139 19

EXPENDITURE.

Deduct cost of food for the year	$ 40 26
do rearing 19 chickens	5 00
	45 26
Profit	$ 93 93

The cost of rearing the 19 chickens is put at the highest figure. It is based on the calculation that the food of the hen costs 75 cents per annum. In this way, 75 × 8 give $6. The half of $6 = $3, for raising 6 pullets to six months of age. $2 are allowed to raise 11 Cockerels to marketable age, viz., four months.

THE PRICES OBTAINED FOR EGGS.

April, May, June, July, 95 doz. at 12 to 15 cents a doz....	$	11 46
August, 13 doz. at 13 cents....		1 69
September, 5 doz. at 20 cents....		1 00
October, 6½ doz. at 20 cents....		1 30
November, 29 doz. at 25 cents....		7 25
December, 49 doz. at 32 cents, average price....		15 68
January, 58 doz. at 33 cents....		19 14
February, 50 doz. at 25 cents....		12 50
March, 48 doz. and 2 eggs at 18 cents....		8 67
41½ settings sold for hatching at $1 each....		41 50
11 Cockerels, viz.: 9 Silver Laced Wyandottes, and 2 White Javas, at $1 each....		11 00
8 Silver Laced Wyandotte pullets, at $1 each....		8 00
	$	139 19

DEDUCT.

Feed for the year....	$40 26	
Cost of raising 11 Cockerels to marketable age, and pullets to laying age....	5 00	
		45 26
Net profit....		$93 93

DETAILS OF FEED BILL.

The cost of feed was made up as follows:—

Wheat, 1,882 lbs. at 1c per pound....	$	18 82
Oats, 244 lbs. at 1c. per lb....		2 44
Buckwheat, 281 lbs. at 1c. per lb....		2 81
Barley, 10 lbs. at 1c. per lb....		0 10
Mash (ground grains), 440 lbs. at 1c. per lb....		4 40
Cut green bone, 244 lbs. at 1c. per lb....		2 44
Cooked refuse meat, 394 lbs. at 1½c. per lb....		5 91
Blood meal, 8 lbs. 7 ozs. at 4c. per lb....		0 34
Vegetables and grit....		3 00
Total....		$40 26

The allowance of one cent per pound for all the whole grain food was a liberal one. Indeed more than it was worth to a farmer.

THE PROFIT MADE.

The calculation given in a preceding page shows the profit made as $93.93, but reducing the cost of rearing the chickens and the value of the grain to farmers figure, the profit is very nearly, if not fully, $2 per head.

COST OF DAILY RATION.

The daily ration and cost were as follows :—

3½ lbs. cut bone at 1c.	3½
5 lbs. wheat or buckwheat, at 1c.	5
Grit and vegetables, say.	1½
Total..	10

PRODUCTION PER DIEM AND PRICES OBTAINED.

The following figures show the output of eggs per day by the 50 hens for December, January, February and March, period of high prices :—

December.—18, 16, 14, 18, 21, 13, 17, 16, 19, 18, 17, 14, 18, 20, 18, 19, 16, 18, 15, 19, 17, 22, 20, 23, 24, 18, 20, 27, 21, 28, 23 = 587. In this month eggs retailed at 30 and 35 cents per dozen in Ottawa.

January.—21, 27, 25, 18, 25, 23, 18, 26, 21, 23, 24, 21, 20, 23, 23, 25, 21, 25, 23, 20, 22, 20, 22, 22, 21, 22, 21, 26, 24, 19, 22 = 693. Eggs sold at 30 and 35 cents. Eighteen dozen sent to Montreal fetched 40 cents per dozen.

February.—22, 27, 23, 20, 24, 23, 19, 23, 19, 22, 20, 15, 23, 19, 18, 15, 25, 25, 20, 22, 23, 21, 20, 25, 17, 23, 23, 24 = 600. Eggs sold at 25 cents per dozen.

March.—20, 24, 18, 25, 18, 25, 23, 21, 23, 22, 19, 26, 19, 20, 14, 18, 11, 20, 15, 13, 12, 15, 14, 18, 18, 17, 17, 20, 20, 19, 22 = 586. Eggs sold at 18 cents.

From the above it will be seen how much profit was made during the winter months named, with cost of production at no more than ten cents per diem.

EGGS LAID BY THE DIFFERENT BREEDS.

The following will show the number of eggs laid by the different breeds :—

	April.	May.	June.	November.	December.	January	February.	March.	Total.
9 Silver Laced Wyandotte hens.	87	78	63	48	172	169	154	121	892
7 White Java hens.	122	112	59	14	19	(replaced on 22nd December by 11 Silver Laced Wyandotte pullets.)			326
11 Silver Laced Wyandotte pullets.	....	......	.....	....	51	160	134	114	459
Mixed hens.	233	209	142	52	191	198	169	206	1,400
11 Plymouth Rock and Dorking Cross hens.	129	141	53	59	154	166	143	145	990
(Eggs laid by all hens when running at large during months of July, August, September and October)									706
Total.									4,773

COST OF PRODUCTION IN SUMMER.

Exception may be taken to the high figures obtained for the eggs sold in the winter months. The following statement made to the committee will show that fifty hens, running at large, in the summer season of low prices, should not cost the farmer more than four cents per day :—

"Not many days ago a farmer visited me, and I put the case to him in this way. I said: We reduced the cost of rations of fifty hens, during last winter, to ten cents per day. On these rations they laid well and were in perfect health. My opinion is that with the laying stock running at large—as they do in most cases—the cost of the fifty hens per day to a farmer could be reduced to five cents, if not to four cents. I calculated, that as prices go, four cents would buy five pounds of sound grain, say buckwheat and oats mixed, or wheat and oats. I would give half of the quantity in the morning, and the remainder for evening ration. Meanwhile the hens have had opportunity to find insect life, grit and green stuff, and would return with their crops well filled, and the $2\frac{1}{2}$ pounds of grain would be quite enough for them. He said that under the circumstances he did not think the cost would be any more. I further explained that my object was to show that the production of a dozen eggs, in such a case, should not cost more than four cents, and that a greater number would likely be laid by the fifty hens, during the day. Speaking on the subject to a friend who lives in the neighbourhood of the city limits, and who successfully manages a flock of Barred Plymouth Rocks, he remarked that he thought he was doing something very like what I stated. I asked him to give me his figures, and he did so in the following letter which I submit to you :—

OTTAWA, June 8, 1897.

Mr. A. G. GILBERT,
Experimental Farm.

DEAR SIR,—My answer to your question, "How much does it cost me per dozen to produce eggs in the summer months?" is—two and a half cents. I find that twenty of my hens (Barred Plymouth Rocks) will lay an average of one dozen a day from 1st of March until 1st of September, on the following rations :—

$1\frac{1}{2}$ pounds of shorts, mixed with cooked vegetables, in the morning, $1\frac{1}{2}$ cents ;

2 pounds of buckwheat in the evening, at 25 cents per bushel, 1 cent.

Making together $2\frac{1}{2}$ cents.

The vegetables used are culls, of no market value, and when not available, skimmed milk is used to moisten the meal. My hens are at liberty to forage about the pastures and yards, and the abundant supply of worms, grubs and insects make up any deficiency that I do not supply.

Yours sincerely,
S. SHORT.

I would not use skim-milk as Mr. Short does, because skim-milk with us is, to a certain extent, costly. I consider such a letter important. It goes to confirm my point and to show farmers that no matter how low prices of eggs have been, there yet remained a margin of profit.

REPORT OF THE FOREMAN OF FORESTRY.

(W. T. Macoun.)

Dr. Wm. Saunders,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I beg to submit, herewith, my fourth annual report as Foreman of Forestry in which will be found information relating to the forest belts at the Central Experimental Farm; the arboretum and progress of the work there; the planting of ornamental trees and shrubs with a list of one hundred of the hardiest and most ornamental species and varieties; information relating to the growing of perennials, with a list of one hundred of the best species and varieties; hints on hedge planting with a list of the hedges growing at the farm; and notes on the condition of, and work in connection with, the ornamental grounds.

I have the honour to be, sir,
Your obedient servant,

W. T. MACOUN.

It is not often that two such trying winters as the past have been, follow one another so closely. Both were characterized by lack of snow, very severe frosts, with intervals of mild weather, and generally unfavourable conditions for the wintering of trees, shrubs, and plants. It was feared that many losses would be discovered in the spring of 1897, especially when it was remembered what a rigorous winter the trees and shrubs had experienced, but, when growth commenced, it was found that the proportion of deaths was little above the average, and in many cases, partly tender species were not killed back so much as in former years. The early part of April was mild, but during the third week of that month the weather became quite cold, the temperature falling on the 19th and 20th to seventeen and nineteen degrees below freezing, which checked the swelling buds for a time. Very cool weather, with frost at nights during the third week of May, no doubt injured the buds on some of the earlier flowering shrubs which did not make as fine a show as in some seasons. The summer was dry and the trees and shrubs did not all have that robust appearance, nor make as vigorous a growth, as in other years. The last week of July, however, was very wet, the almost continuous downpour of warm rain causing many of the trees to make a second growth. September and October were two of the driest months recorded in Ottawa for many years. The drought coming at a time when growth had ceased, no apparent harm was done the trees and shrubs, and it is hoped that the wood of tender sorts, having had such favourable conditions for ripening, will be enabled to withstand the winter better.

TREE PLANTING

Some of the farmers in the more thickly settled parts of Ontario are beginning to feel the need of convenient forests from which they may obtain wood for their constant needs. The timbered land remaining on their own farms has, in many cases, become so depleted through careless management that the supply available does not now meet the demands made upon it. As a result of this the farmer is often obliged to go some distance to get the material he desires. The time has now come when it behooves the owner of a farm to consider the value of the wood crop as well as that of his grain or other crops.

Where timber lands still remain on the farm they should be properly cared for so that they may continue to yield supplies of fuel. It is the custom with many farmers when grass has become scarce during the summer months to let their cattle pasture in the woods; the result is that the young seedling trees are destroyed, which, if protected, would grow up to replace those which are cut down. This practice should be avoided, if possible. Furthermore, in cutting his trees for fuel the farmer frequently takes those which are in their prime and leaves the largest and partly decayed, which are more difficult to handle. It would be wiser to fell the oldest and most matured trees first and follow with those remaining in the order of their size and age. Judicious cutting is very essential to permanency of the wood supply. Too much care cannot be taken, also, in felling the trees, for if this is done carelessly many young trees will be destroyed. A forest cover, more or less perfect, should also be encouraged, and those favourable conditions of moisture maintained which trees require to produce the most vigorous growth.

Where there is no woodland on the farm, such portions as are too poor to yield good crops, or hillsides that may be inconvenient to cultivate, may be turned with good advantage into a forest if proper measures are promptly taken to plant these areas with trees. Where all the soil is good and there are no hillsides, a belt of trees could be planted along the northern and western sides of the farm, which, while they would serve the purpose of windbreaks, would also become in time valuable for fuel or timber.

FOREST BELTS AT THE CENTRAL EXPERIMENTAL FARM.

The forest belts at the Central Experimental Farm extend along its northern and western boundaries; the belt on the western boundary is 165 feet wide, and that on the northern boundary, 65 feet; their total length being nearly 1¾ miles. The number of trees growing in these belts, including those in an evergreen clump, is about 20,500. The objects, for which these forest belts were planted, are well expressed in the report of the director for 1893 as follows:—

"There were several objects in view in planting the belts of forest trees which line the west and north sides of the farm. One was to test by actual experiment with a number of different species the comparative results in growth and development to be had by planting at different distances apart. Five feet by five, five feet by ten and ten feet by ten were the distances chosen for these tests. Another question on which information was desired was the relative growth to which trees would attain when planted in blocks of single species as compared with those planted in mixed clumps where they are associated with a number of other sorts. Further information was sought as to how far the crops on the farm located near these tree belts will be influenced by the shelter they would afford as growth progressed. In the planting, the grouping was also designed with the object of producing pleasing effects on the landscape by the intermingling and blending of varieties. The main purpose, however, was to get all the useful data possible with regard to the more important timber trees of economic value so that object lessons in tree growth might be available to any who in future might desire to study this subject or to engage in the enterprise of timber growing."

Although it is but nine years since the first trees were planted in the belts referred to, the growth already made is a useful object lesson and should encourage the more

View in Forest Belt at Central Experimental Farm, Ottawa, July, 1897, showing Black Walnut planted in spring of 1889, five by five feet apart, when two years old.

View in Forest Belt at Central Experimental Farm, Ottawa, July, 1897, showing White Pine planted in spring of 1889, when eight to ten inches high, five by five feet apart.

extensive planting of timber trees. The soil in which the trees were planted was in many instances poor, and while a number of species appear to succeed almost as well on poor as on good land, yet some kinds require good soil in order to grow them successfully. As to the distance apart at which it is desirable that trees should be planted, those which were put five by five feet apart are making, in most cases, the best trees for timber purposes, as the lower limbs are dying, leaving the trunks clean which will make the wood freer from knots than where planted ten by ten, or ten by five feet apart as at those distances there are, as yet, few instances where the lower limbs have died. The trees planted five by five feet apart, also make make more growth in height than where wider planting was adopted, but the diameter of the trunk is not so great, The closely planted trees are more protected from storms and there are fewer broken tops and crooked stems. The desirability of close planting is also very apparent in the condition of the surface of the ground where the trees are ten feet apart, which, in a number of cases, still requires cultivation although the trees have been planted for eight years, which is necessary in order to keep sod from forming and checking the growth of the trees, whereas, in most instances where the trees are planted five by five feet apart the surface soil is kept shaded and moist, and sod does not form. As the conditions of soil are different in the belts where the trees are planted in clumps of a single species and where the several kinds are mixed together, a fair comparison of these two methods of planting cannot yet be made, but the advantages derived from mixing the leafier sorts of trees with those which are not very leafy, are already apparent. Where thin foliaged trees have been planted five by five feet apart and have had eight years' growth, the sod still forms very readily unless the soil is kept cultivated, thus showing that sufficient shade is not afforded to prevent the growth of grass and weeds.

The black walnut (*Juglans nigra*) does not succeed well on all kinds of soils. Unfortunately most of that in the forest belts at the Central Experimental Farm is not very suitable for this tree, although in some places they are doing well. Those which were planted in a cold, compact, light sandy loam are almost at a standstill; in a warmer light sandy loam with gravel they are doing much better, but not making thoroughly satisfactory growth, while in the mixed belt, where the soil is a rather stiff clay loam, they are doing best. By consulting the table the growth of this tree in these different kinds of soil will be found.

The white pine (*Pinus Strobus*) has made very satisfactory growth in the belts. This is due, undoubtedly, in a large measure, to the fact that the soil chosen for this test proved suitable for them, being a warm, light, sandy, loam. On gravelly soil they have also done well. This pine makes a very rapid growth, and young trees planted in the spring of 1889, when 8 to 10 inches high, now average about 15 feet in height, with a diameter one foot from the ground of from 3 to 4 inches.

The European larch (*Larix europaea*) is also a very rapid growing tree, and seems to do equally as well on a warm sandy loam; a cold, compact, light, sandy loam, and a clay loam. The trees, in the plantation in the forest belt growing in a cold compact sandy loam, are now from 19 to 22 feet in height, with a diameter, one foot from the ground, of from 4 to 5 inches.

The white ash (*Fraxinus americana*) planted in 1889 and growing in a black loam have made very rapid growth and are now about 20 feet in height, with a diameter one foot from the ground of 3 inches. The black, green, and red ash, in the same soil, have made slower growth.

The Scotch pine (*Pinus sylvestris*) does well on a clay loam, a gravelly soil, a warm sandy loam, and a cold compact sandy loam. Planted in 1888 on a cold sandy loam when 18 inches high, they are now 16 feet in height, with a diameter one foot from the ground of 4 to 5 inches.

The canoe birch (*Betula papyrifera*) planted in 1889 in a light sandy loam soil have made rapid growth and are now from 23 to 26 feet in height and 3 to 5 inches in diameter. The branches of this tree have already died, where the trees are planted five by five feet apart, to a height of 8 feet.

GROWTH of Trees in the Forest Belts

Name of Species.	Character of Soil.	When Planted.	Distance Apart.	Age or Height when Planted.
			feet.	
Black Walnut—Juglans nigra	Low sandy loam	1888	5 x 5	1 year
do do	do	1888	10 x 10	1 do
do do	Sandy loam with small stones.	1889	5 x 5	2 do
do do	do do	1889	10 x 10	2 do
do do	Clay loam	1888	10 x 5	1 do
Butternut—Juglans cinerea	Low sandy loam	1888	5 x 5	1 do
do do	do	1888	10 x 10	1 do
Silver-leaved Maple—Acer dasycarpum.	Light sandy loam	1889	5 x 5	3 do
do do	do	1889	10 x 10	3 do
European White Birch—Betula alba	do	1889	5 x 5	3 do
do do	do	1889	10 x 10	3 do
Canoe Birch—Betula papyrifera	do	1889	5 x 5	3 do
do do	do	1889	10 x 10	3 do
Yellow Birch—Betula lutea	do	1889	5 x 5	3 do
do do	do	1889	10 x 10	3 do
White Elm—Ulmus americana	Sandy loam	1889	5 x 5	3 do
do do	do	1889	10 x 10	3 do
Black Ash—Fraxinus sambucifolia	Black muck	1889	5 x 5	2 do
do do	Low sandy loam	1889	10 x 10	2 do
Green Ash—Fraxinus viridis	Black muck	1889	5 x 5	3 do
do do	Low sandy loam	1889	10 x 10	3 do
Red Ash—Fraxinus pubescens	Black muck	1889	5 x 5	2 do
do do	Light sandy loam	1889	10 x 10	2 do
White Ash—Fraxinus americana	Black muck.	1889	5 x 5	3 do
do do	Light sandy loam	1889	10 x 10	3 do
Black Cherry—Prunus serotina	Light sandy loam and gravel.	1889	5 x 5	3 do
do do	do do	1889	10 x 10	3 do
Box Elder—Negundo aceroides	Light sandy loam	1889	5 x 5	2 do
Bolle's Poplar—Populus alba Bolleana	do	1890	5 x 5	1 do
do do	do	1890	10 x 10	1 do
Scotch Pine—Pinus sylvestris	Sandy loam with gravel	1888	5 x 5	18 inches.
do do	do do	1888	10 x 10	18 do
do do	Low sandy loam with gravel.	1888	5 x 5	18 do
do do	Low sandy loam	1888	10 x 10	18 do
do do	Light sandy loam	1888	10 x 5	18 do
do do	Clay loam	1888	10 x 5	18 do
do do	Light sandy loam and gravel.	1888	10 x 5	18 do
do do	do do	1887	3 x 3	9 do
Austrian Pine—Pinus austriaca	Light sandy loam	1889	5 x 5	18 do
do do	do	1889	10 x 10	18 do
do do	do	1888	10 x 5	15 do
do do	Clay loam	1888	10 x 5	15 do
do do	Light sandy loam and gravel.	1888	10 x 5	15 do
do do	do do	1887	3 x 3	15 do
White Spruce—Picea alba	Light sandy loam	1889	5 x 5	15 do
do do	do	1889	10 x 10	15 do
Norway Spruce—Picea excelsa	do	1889	5 x 5	18 do
do do	do	1889	10 x 10	18 do
do do	do	1888	10 x 5	15 do
do do	Clay loam	1888	10 x 5	15 do
American Arbor-vitæ—Thuya occidentalis	Low sandy loam and black muck.	1889	5 x 5	18 do
do do	Low sandy loam	1889	10 x 10	18 do
European Larch—Larix europæa	do	1888	5 x 5	2 feet
do do	do	1888	10 x 10	2 do
White Pine—Pinus Strobus	Light sandy loam with gravel.	1889	5 x 5	8 to 10 in.
do do	do do	1889	10 x 10	8 to 10 in.

In the above table the average growth is given of most of the important timber trees growing in the measurement of average trees, and give a fairly accurate idea of the growth these make each year. Until spread so much that it was difficult to determine the leader, hence the total height is now taken. This are very divergent, or the extremities pendulous, the total height is given as less than that of the year at the Central Experimental Farm.

Average Height, Autumn of						Average Growth in						Average Circumference 1 Foot from Ground.			
1895.		1896.		1897.		1892.	1893.	1894.	1895.	1896.	1897.	1893.	1895.	1896.	1897.
ft.	in.	ft.	in.	ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
9	11½	10	6	10	9	26	23	21	18	6	3	5⅓	7⅔	8 7/24	8½
5	5	5	8½	5	10½	12	17½	11	9	3½	2	3	5	5½	5 17/24
12	8	13	9	14	5	37½	28	36	19	13	8	.....	8½	9 13/24	9 19/24
8	4½	8	7½	8	12½	15	25	28	15	3	5	......	7¾	8⅙	8¾
12	5	13	2	13	5	31	31	31	15½	9	3	.....	10¾	11 11/12	12 23/48
9	11	10	7	10	10	19	24	18	10½	8	3	.....	6½	7 1/24	7½
6	2½	6	9	7	4	18	15	15	16	7	7	....	4⅔	6⅙	6⅝
23	2	24	4	25	3	37	40	33	29	14	11	......	9¼	9½	9⅔
22	6	23	1	23	7	53	38	33	20½	7	6	......	13	13⅔	14⅓
23	1	25	4	28	8	58	18	17	14	27	40	.....	10⅓	11 17/24	12⅝
24	11	26	7	31	1	36	32	30	30	20	54	. ..	15⅚	17 5/36	19 4/9
21	9	23	7	25	10	46	36	22	14	22	27	......	9⅔	10	10 5/12
21	2	23	5	25	7	34	24	33	28	27	26	..	13	14¼	15 1/12
16	6	17	1	18	6	47	30	35½	21	7	17	6¾	8¼	9⅛	9⅝
16	1	16	7	18	1	41	33	26	21	6	18	8	11½	12⅔	13 11/24
14	5	14	4	15	1	33	38	27½	23	0	9	5½	6⅔	7⅓	7⅔
13	9	14		14	9	44	31	25	18	3	9	6	9	9⅚	10 7/12
12		12	11	13	11	38	26	32	8	11	12	5	6¼	6 19/24	7 13/24
8	4	9	3	9	1	20	23	19	8	11	0	3½	5	5 11/24	5⅔
15		15	11	17	7	30	31	29	20	11	20	6¼	7⅔	8⅚	9 5/12
14	3	15	5	15	7	28	24	21½	21	14	3	7¼	8½	9⅓	9¾
15	5	16	11	18	4	31	34	39	33	18	17	5	7	8 7/24	8 23/24
12	5	13	8	14	5⅓	26	32	27½	21	15	9	4⅓	6¼	7⅓	7 17/24
18	5	20	8	22	3	32	41	58	36	27	19	5¼	7	8 1/24	8 11/24
15	9	17	9	19	7	38	38	37	25	24	22	5¾	8⅔	9 23/24	10 13/24
16	7	17	4	18	4	29	21	22	19	9	12	.....	8½	9¼	9 15/24
18	2	19	4	21	2	40	39	32	26	17	20	.....	11⅔	11⅙	11 11/12
19	1	20	6	22	2	38	38	39	29	14	22	8¼	10¼	12⅚	13⅝
24	2	26	4	27	11	46	68	63	70	26	19	.....	11¼	12¼	12⅔
22	11	25	4	27	11	40	55	70	74	29	31	.....	12½	15⅜	17⅙
14	4	16	9	18	11	29	28	35½	31	29	26	7⅚	10	11	11⅞
11		13	3	15	7	15	22	28½	29	27	28	9 1/12	12	15⅙	16½
13	4	15	4	17	6	26	29	32½	29	24	26	7⅛	9½	10⅔	11 5/24
11	6	13	8	15	8	20	23	29	29	26	24	8¾	13¼	15⅝	17 11/24
14	10	17	2	19	2	25	31	35	34	28	24	......	15½	18	20⅓
11	11	14	2	16	3½	20	23	32	31	27	25½	.....	12¼	14 7/12	16 7/24
14	11	17	1	18	8	29	30	36	33	26	19	..	15	17 7/24	18 7/12
14	3	16	6	18	9	22	23	26	28	27	27	5½	8¼	9 5/24	9 11/12
8	1	10	2	12		12½	18	23	22½	25	22	...	9	11¼	12 11/12
7	9½	9	10½	11	11	12	16	22	24	25	24½	....	10⅓	13¼	15⅜
8	11	10	11	12	5	18	21	24	24	24	18	......	9¼	10⅘	12¾
9	2½	10	11⅓	12	4½	17	19	24½	22	21	17	......	9½	11⅙	12 19/24
10	5	12	3	13	11	22	22	26	25	22	20	......	10¾	13 5/24	14 11/12
10	6	12	1	13	4	21	19	22	21	19	15	.. ..	8½	9⅔	10 13/24
8	5	9	10	10	9	12	21	21½	21	17	11	....	6¼	6⅚	7 5/24
7	8	8	11	9	11	10	18	22	19	15	12	......	6½	7⅝	8⅚
10	8	11	10	13		19	29	29	18	14	14	6	8¼	9¾	10⅔
10	1	12	2	14	5	16	23	25	27	25	27	5	8¼	10 13/24	11 13/24
10	10	13	1	15	9	19	25	23	28	27	32	......	8	9 5/12	10 5/12
11	4	13	9	16	2	18	20	31	32	29	29	....	8⅓	9 13/20	11 11/40
9	1	10	2	11	6	21	23	15	15	13	16	.....	7¾	9½	10 11/12
8		8	10	9	10	20	18	15	15	10	12	....	7¾	9⅛	10 13/24
19	3	20	3	21	9	35	41	45	31	12	18	8	11	11 11/12	12 19/24
17	9	19	3	20	5	33	37	42	40	18	14	7½	12	13⅝	14⅚
10	11	13	4	15	8	19½	27½	27½	27½	29	28	4½	8	10	10 23/24
10	1⅓	12	7	15	2	16	24½	24	27	29	31	5	9¼	11 7/12	13 5/12

forest belts at the Central Experimental Farm. The figures published are the average results from the last year the annual growth was taken in measuring the trees, but the crowns of many of them began to change has lessened the apparent annual growth for the year, and in some cases, where the main branches previous.

ARBORETUM.

The arboretum at the Central Experimental Farm is yearly becoming better known and a much larger proportion of the visitors now see this part of the farm. The trees and shrubs are, many of them, becoming very prominent, the evergreens being especially attractive. Nearly all the genera which are hardy are now represented, some of them by a large number of species. The perennial border which is over half a mile long is almost filled with plants, and these from early spring until late autumn produce a succession of lovely and interesting flowers. Each year valuable data on the hardiness and time of blooming of the trees, shrubs and plants is secured, and it is hoped that in the near future a list will be published of all that have been tested in the arboretum in which these notes will appear.

PROGRESS OF THE WORK.

It was feared that, on account of the unfavourable winter, the number of deaths, among the trees and shrubs would be large, but on examination it was found that there were not many killed of those which had already wintered at Ottawa, with the exception of a large collection of named varieties of lilacs grafted on the Californian privet (*Ligustrum ovalifolium*), which were almost all destroyed. These had been growing here for three years but never made satisfactory growth. Lilacs grafted on privet are very unsuitable for this part of the country and should on no account be planted. Many new species and varieties of trees and shrubs were procured during the spring and autumn and a large area of additional land which had been broken up last year was utilized for them. The surface soil in the circles about the trees and shrubs, in the parts of the arboretum seeded down, was hoed several times during the summer, and weeds destroyed.

When the mulch of manure was removed from the perennial border it was found that most of the plants had come through the winter in good condition. Large additions were made during the spring, summer, and autumn, to the number grown in 1896 and nearly all the border prepared last autumn was utilized. Throughout the summer, the surface soil was kept loose and free from weeds, with the result that strong growth was made and the plants bloomed well. Stakes were driven down beside the taller growing perennials to prevent their breaking and these proved very effective.

The grass was cut with the pony lawn mower for the first time on the 14th of May and afterwards at intervals until the 15th of September, which kept the lawns at all times in good condition. About eight acres which had been kept cultivated since 1896 were seeded down with lawn grass during the summer and by autumn a very good sod was formed.

The new road machine did splendid work in making up the roads in the arboretum and several, which had previously been only staked out, were opened for the first time. Coal ashes are now being used, spread on the surface, on several of the roads, and when this is rolled in the spring it is hoped that a good firm road-bed will be formed.

Boys proved very mischievous on Sundays in the arboretum this year, plucking flowers, disturbing labels, and destroying valuable fruits and seeds. Notices were of no avail and nothing short of a police patrol is likely to stop the annoyance in future.

DONATIONS.

We again acknowledge, with gratitude, the donations of seeds which have been kindly furnished us by the Royal Gardens, Kew; the Arnold Arboretum; the Missouri Botanic Garden; the Massachusetts Botanic Garden; and the Royal Botanic Gardens, Sapporo, Japan. Acknowledgments are also due to Prof. John Macoun and Mr. J. M. Macoun, of the Geological Survey of Canada, for very useful contributions. A large and valuable collection of seeds of trees and shrubs was received from Mr. J. Niemetz, of Winnitza, Russia, who kindly had many of these collected, especially for the Canadian

Experimental Farms, in one of the coldest districts in Northern Russia. Several private individuals have also kindly contributed useful and acceptable material towards the collection.

ORNAMENTAL TREES AND SHRUBS.

In travelling through Canada, especially in the rural districts, one is often struck by the little effort made by the inhabitants to beautify their homes. With the wealth of native trees and shrubs growing all around, it is surprising that so few people take the trouble to use them for this purpose; and when to these are added other lovely flowering shrubs from foreign countries, easily procured, one fails to understand why the farm house and surroundings, remain bare and uninviting. Lack of time is often given as the cause of this neglect, but one or two trees and shrubs planted in the spring and autumn of each year take but little time, and would soon grow up to be attractive objects around the dwelling.

To get the best results in planting ornamental trees and shrubs, it is important to give them good soil to begin with, and if that in which they are to be planted is not of this quality, it will repay the planter to procure some, but no manure should be used about the roots in any case. Trees and shrubs from one to two feet in height are the best size for planting, as at that height they transplant easier and make more shapely specimens than when larger. The holes should be made somewhat larger than the roots actually require, and the tree or shrub planted a little lower in the ground than where it had been growing in the nursery or woods, and the hole then filled with good soil, pressed firmly about the roots. Great care should be taken that the roots do not become dry from the time they are dug until they are re-planted in their permanent position. This is especially applicable to evergreens. Planting may be done either in spring or autumn, but spring is the preferable time. The surface soil about the tree should be kept loose with the hoe throughout the summer, which will ensure a more rapid growth than if weeds or grass are allowed to grow about them. By keeping the soil loose each year in this manner, the tree or shrub will soon reach a good size. A mulch of manure applied late in the autumn on the surface of the soil about the tree, will protect the roots from severe frost during winter, and enrich the soil.

The following list of one hundred species and varieties of trees and shrubs, hardy at Ottawa, is given so that the intending planter may ascertain the best kinds to plant. The names in the list are selected from nearly 2,500 species and varieties, growing in the arboretum at the Central Experimental Farm, and are all of exceptional merit. Notes are given on each species so that the reader may know whether the tree or shrub is noted for its flowers, fruit, or foliage; when it blooms, where it is native; and the height it grows. For the information of those who have not room for a large collection the best twenty-five are distinguished by a star preceding the name.

LIST OF ONE HUNDRED HARDY ORNAMENTAL TREES AND SHRUBS.

1. *Acer dasycarpum laciniatum.*—Wier's cut-leaved maple (Canada), height, 40 to 50 feet. This is a cut-leaved variety of the native silver-leaved maple, which originated in Europe, and is a very quick growing, robust tree, with large, deeply cut leaves, and pendulous branches. It requires plenty of space to appear to the best advantage.

2. *Acer platanoides.*—Norway maple (Europe). Height, 30 to 50 feet. The Norway maple is one of the hardiest of ornamental trees. The dark green leaves appear before those of our native hard maple and fall from two to three weeks later in the autumn, but do not assume such a brilliant colour, the leaves having different shades of yellow.

* 3. *Acer platanoides Schwedleri.*—Schwedler's Norway maple. One of the best ornamental trees. The leaves are large and in the early part of the summer are of a bright, purplish red becoming duller as the season advances.

4. *Acer saccharinum.*—Hard, or sugar maple (Canada). Height, 50 to 70 feet. The hard maple needs no description. Its clean, clear green leaves, almost free from insect pests, handsome form, delicately and highly tinted leaves in autumn, recommend it as one of the best of hardy trees.

5. *Acer tataricum Ginnala.*—Ginnalian maple (Amurland). Height, 10 to 20 feet. The deeply cut, pretty leaves, of this little maple, make it ornamental throughout the summer, and in the autumn it rivals all other maples in the variety and brilliancy of its colouring.

6. *Æsculus (Pavia) flava.*—Sweet buckeye (United States). Height, 20 to 25 feet. In bloom, third week of May. Flowers, pale yellow. This is the tallest growing species of buckeye and forms a very shapely little tree.

7. *Æsculus Hippocastanum.*—Horse chestnut (Mountains of South-eastern Europe). The horse chestnut is well known. At Ottawa, all specimens have not proven hardy, but if procured from northern grown stock they should do well. This tree is very ornamental when in full leaf and flower.

8. *Alnus glutinosa imperialis.*—Imperial cut-leaved alder (Europe). Height, 20 to 30 feet. The cut-leaved alder is a very distinct and graceful tree with deeply cut fern-like leaves and pendulous branches.

9. *Ampelopsis quinquefolia hirsuta.*—Self fastening Virginian creeper (Ontario). It is unfortunate that this very valuable climber is not more widely distributed. The leaves are smaller than those of the ordinary form and quite downy, but the most marked distinction is its power of clinging to brick, wood, or stone, almost as tightly as Japanese ivy. In the autumn, the leaves are highly coloured and very effective when growing on a wall, house or fence.

10. *Berberis Aquifolium.*—Oregon grape (British Columbia). Height, 1 to 2 feet. In bloom, third week of May. Flowers, bright yellow. Leaves evergreen, smooth and shiny.

*11. *Berberis Thunbergii.*—Thunberg's barberry (Japan). Height, 2 to 4 feet. The best barberry for ornamental purposes. It is a dwarf, compact shrub, with bright, green leaves in summer, changing in autumn to deep red. The scarlet fruit is borne very profusely and makes this barberry quite ornamental throughout the winter.

12. *Berberis vulgaris purpurea.*—Purple-leaved barberry (Europe). Height, 4 to 6 feet. In bloom, fourth week of May. The yellowish flowers in pendulous clusters make a fine contrast with the leaves which are bright purple, when young, becoming duller later in the autumn.

*13. *Betula alba laciniata pendula.*—European cut-leaved birch (Europe). Height, 30 to 50 feet. One of the most graceful and hardy of all ornamental trees. The pendulous branches, finely cut foliage, and elegant form of this birch make it very desirable.

14. *Caragana arborescens.*—Siberian pea-tree (Siberia). Height, 10 to 15 feet. In bloom, third week of May. Flowers, bright yellow and pea shaped. The delicate green leaves of this shrub open very early and are quite attractive throughout the summer. This is one of the hardiest shrubs grown.

*15. *Caragana frutescens.*—Woody caragana (South Russia to Japan). Height, 3 to 4 feet. In bloom, third week of May. The flowers of this species are larger than those of *Caragana arborescens*, the leaves are formed differently, and its branches are pendulous. It is a smaller shrub than the Siberian pea tree but quite as desirable.

16. *Carya alba.*—Shell bark hickory (Canada). Height, 30 to 50 feet. The hickory is a slow growing tree but in time it becomes a very handsome object on the ornamental grounds.

17. *Catalpa Kæmpferi.*—Japanese catalpa (Japan). Height, 30 feet. In bloom, second week of July. Flowers, yellow, spotted with purple and smaller than those of the hardy catalpa. The leaves are purple veined. This is the hardiest catalpa grown here.

18. *Catalpa speciosa.*—Hardy catalpa (United States.) Height, 30 to 40 feet. In bloom, fourth week of June. Flowers, large, white, spotted with purple and yellow. This tree is very handsome when the flowers are in bloom. The leaves are large and heart-shaped. The seed pods which form during the latter part of the summer become more than one foot in length. The whole tree is very tropical looking. To ensure hardiness, trees should be obtained from northern grown stock as but few specimens have proved hardy at Ottawa.

19. *Celastrus articulatus.*—Japanese climbing bitter-sweet (China and Japan). This is very distinct from *Celastrus scandens*, the native climbing bitter-sweet, with smaller and more abundant berries, which are yellow and orange in colour, in that respect especially differing from the native species. It is perfectly hardy and makes a fine climber.

20. *Celastrus scandens.*—Climbing bitter-sweet (Canada). This pretty climber, with its bright green leaves and showy scarlet and orange berries, is very desirable. It may be grown in a low compact mass by keeping the stems well cut back. Treated in this way it makes a very attractive object when covered with fruit, which remains throughout the winter.

21. *Cercidiphyllum japonicum.*—Katsura tree (Japan). Height, 30 to 50 feet. The pyramidal shape and delicate heart-shaped leaves of this tree make it very attractive and ornamental. It is closely related to the magnolia family but is quite hardy at Ottawa.

22. *Cornus alba sibirica variegata.*—Variegated Siberian dogwood. Height, 4 to 6 feet. A handsome shrub with silvery variegated leaves. Quite hardy.

23. *Cratægus coccinea.*—Scarlet fruited hawthorn (Canada). Tree. Height, 10 to 20 feet. In bloom, fourth week of May. Flowers, white, borne in great profusion. This valuable native tree is ornamental in spring, summer, and autumn. The flowers are pretty, the leaves dark and shiny, and the fruit bright red and very showy.

24. *Cratægus Crus-galli.*—Cockspur thorn (Ontario). Tree. Height, 15 to 25 feet. In bloom second week of June. Flowers, white tinged with pink. The leaves of this tree are very ornamental, being thick, smooth, and very shiny.

25. *Daphne Cneorum.*—Garland flower (Eastern Europe). Height, 1 to 1½ feet. In bloom, second week of May. Flowers, bright pink and sweet scented. A very pretty little evergreen quite suitable for flower borders. It blooms a second time in autumn.

26. *Diervilla candida.*—White flowered weigelia (China). Height, 4 feet. In bloom, first week of June. Flowers, pure white, making a charming contrast with the pink-flowered varieties.

27. *Diervilla rosea.*—Pink-flowered weigelia (China). Height, 4 to 5 feet. In bloom first week of June. Flowers, pink. The weigelias are very well known and much admired flowering shrubs. Of this species there are a number of fine varieties.

*28. *Diervilla rosea Sieboldii variegata.*—Siebold's variegated weigelia (China). Height, 4 feet. In bloom, first week of June. Flowers, pink and white. Leaves beautifully variegated with white and pale green. This is the hardiest variety of weigelia tested here.

29. *Elæagnus angustifolia.*—Russian olive (South Europe, Orient). Height, 15 to 20 feet. In bloom, third week of June. Flowers, small, yellow, very sweet scented. This is a very ornamental tree with narrow silvery leaves and is perfectly hardy.

30. *Elæagnus argentea.*—Wolf willow (Canada.) Height, 8 to 12 feet. Blooms in 4th week in May. Flowers, small, yellow, and very sweet scented. The leaves which make this shrub ornamental are large and silvery. As it suckers considerably this should be taken into account when planting.

31. *Genista tinctoria.*—Dyer's greenweed (Europe). Height, 1 to 2 feet. In bloom fourth week of June. Flowers, bright yellow, pea-shaped. A very beautiful little shrub continuing in bloom for some time.

32. *Ginkgo biloba.*—Maiden-hair tree (China). Height, 20 to 60 feet. This pretty, graceful tree is a deciduous conifer with peculiar fan-shaped leaves. It is rather a slow grower but eventually reaches a good size.

*33. *Hydrangea paniculata grandiflora.*—Large flowered Hydrangea (Japan). Height, 5 to 10 feet. In bloom, fourth week of July. Flowers, white, gradually becoming pink, in very large panicles. This is one of the finest of hardy flowering shrubs.

34. *Hypericum kalmianum.*—Kalm's St. John's wort (Ontario). Height, 2 to 4 feet. In bloom, second week of July. Flowers, large, bright yellow. A very ornamental late flowering shrub.

35. *Ilex verticillata.*—Black alder, winterberry (Ontario). Height 6 feet. This shrub is most ornamental in autumn when it is covered with bright scarlet berries.

*36. *Larix europæa.*—European larch (Europe). Height, 60 to 80 feet. This tree is more graceful than our native tamarac and will succeed on a greater diversity of soils.

37. *Ligustrum amurense.*—Amur privet (China and Japan). Shrub. Height, 4 to 6 feet. This is the only privet tested here which has proved perfectly hardy. It is a pretty little shrub.

*38. *Lonicera Alberti.*—Albert Regel's honeysuckle (Turkestan). Height, 2 to 4 feet. In bloom, fourth week of May. Flowers, bright pink. This beautiful little honeysuckle with its sweet scented flowers, pendulous branches, and narrow leaves, is one of the most hardy and desirable shrubs.

*39. *Lonicera sempervirens.*—Scarlet trumpet honeysuckle (United States). This very attractive climbing honeysuckle blooms almost continuously from the first week of June until late autumn. The profusion of bright, scarlet, trumpet-shaped flowers produce a fine effect where trained against a house or wall.

*40. *Lonicera tatarica.*—Tartarian honeysuckle, bush honeysuckle (Siberia, Tartary). Height, 5 to 10 feet. In bloom third week of May. Flowers, bright pink. This is an old favourite and one of the hardiest shrubs grown. A variety called *grandiflora* is an improvement on the ordinary type with larger flowers striped with white. There are also white flowered and yellow fruited varieties.

*41. *Neillia (spiræa) opulifolia aurea.*—Golden leaved spiræa (Canada). Height, 6 to 10 feet. A very vigorous growing, hardy shrub, with yellow leaves. Fine for contrasts on the lawn.

42. *Populus deltoidea aurea.*—Golden leaved poplar (Canada.) A very pretty, graceful, golden leaved tree, retaining its colour throughout the season. This is also known as *Populus monilifera aurea* and *Populus canadensis Van Geertii.*

*43. *Philadelphus coronarius*—Mock orange or Syringa (South Europe). Height, 5 to 10 feet. In bloom second week of June. Flowers, white, with a strong, sweet odour. A well known, popular shrub. There are several varieties, two of the most ornamental being the golden leaved and double flowered forms.

*44. *Philadelphus grandiflorus speciosissimus.*—This is a great improvement on *Philadelphus grandiflorus*, with larger, whiter, and more abundant flowers. It blooms in the third week of June. It is a smaller shrub than *P. grandiflorus.*

45. *Platanus occidentalis.*—Button-wood (Ontario). Height, 50 to 60 feet. A very handsome and striking native tree, with large, deeply cut foliage.

46. *Potentilla fruticosa.*—Shrubby cinque-foil (Canada). Height, 2 to 4 feet. In bloom, second week of June. Flowers, large, bright yellow. A very pretty shrub when in bloom.

47. *Pyrus Aucuparia*—European mountain ash, rowan tree (Europe). Height, 20 to 30 feet. In bloom, fourth week of May. Flowers, white, borne in large clusters. This is a very graceful lawn tree, remaining ornamental throughout the winter when it

is covered with its scarlet fruit. The American species is also very good. It is a smaller, more compact tree, flowering about one week later than the European.

48. *Pyrus baccata.*—Siberian crab (Siberia). Height, 15 to 20 feet. In bloom, third week of May. Flowers, white, tinged with bright pink. This compact little tree bears such a profusion of flowers in spring that it is one of the most ornamental at that time, and later in the summer, when the highly-coloured fruit hangs thickly among the leaves, it is again very handsome. This is one of the hardiest trees grown here.

49. *Pyrus* (*Cydonia*) *Maulei.*—Maule's Japanese quince (Japan). Height, 1 to 3 feet. In bloom, second week of May. Flowers, bright red. The flowers of this little shrub are very ornamental, and in the autumn, when the golden coloured, highly perfumed quinces are ripe, it makes a very interesting object. It is much hardier than *Pyrus japonica*, of which some authorities call it a variety.

50. *Quercus rubra*—Red oak (Canada). A large, handsome tree, with very glossy leaves which turn red in autumn and at that time render it very ornamental.

51. *Ribes aureum.*—Missouri currant (United States). Height, 6 to 8 feet. In bloom, fourth week of May. Flowers, yellow and very sweet scented. This currant is quite ornamental, especially when in bloom, and again in summer the fruit, which is very palatable, makes it attractive at that time.

52. *Rosa rubrifolia.*—Red-leaved rose (Europe). Height, 6 feet. In bloom, second week of June. The bright pink flowers of this species are rather small, but the purplish red leaves are very ornamental. This rose does not sucker.

53. *Rosa rugosa.*—Japanese rose (Japan). Height, 4 to 5 feet. In bloom, second week of June. Flowers, very large and deep pink. This is a beautiful rose with fine flowers and very ornamental leaves which are large, thick and shiny. There is a white-flowered variety which is also good.

54. *Robinia hispida.*—Moss or rose locust (United States). Height, 8 feet. In bloom, fourth week of June. Flowers, deep pink. The experience with this tree is yet very limited here, but it proved hardy last winter which was a severe test for all trees and shrubs. It is very beautiful and if it continues hardy will be desirable.

55. *Spiræa arguta.*—(Europe). Height, 2 to 4 feet. In bloom, third week of May. Flowers, pure white, produced very profusely in compact clusters. This is the earliest flowering spiræa grown here, and is one of the best hardy shrubs of recent introduction. It is a graceful little spiræa with pendulous branches but its chief beauty lies in the abundance of its flowers.

56. *Spiræa japonica* (*callosa*).—Japanese spiræa (Japan). Height, 2 to 4 feet. In bloom, fourth week of June. Flowers, bright rosy red. This is a very pretty spiræa which continues to bloom throughout the greater part of the summer. A variety called *Bumalda* is more dwarf and very ornamental. An improvement on *Bumalda* is one called Anthony Waterer which has crimson flowers.

57. *Spiræa bracteata.*—Round leaved spiræa (Japan). Shrub. Height, 3 to 4 feet. In bloom, second week of June. Flowers, pure white borne profusely in compact clusters. Very ornamental when in full bloom. This shrub is also known as *Spiræa rotundifolia alba.*

58. *Spiræa salicifolia.*—Willow-leaved spiræa (Canada). Height, 4 to 5 feet. In bloom, first week of July. Flowers pink or white, in large panicles. This is a late bloomer and is valuable on that account. It is known among some nurserymen as *Spiræa Billardii.*

59. *Spiræa sorbifolia.*—Sorbus-leaved spiræa (Himalaya to Japan). Height, 4 to 5 feet. In bloom, fourth week in June. Flowers, white, borne in very large panicles. This is a strong growing species but suckers considerably.

*60. *Spiræa Van Houttei.*—Van Houtte's spiræa (Europe). Height, 3 to 5 feet. In bloom, first week of June. Flowers, pure white, borne very profusely in small, compact clusters, on pendulous branches. This graceful shrub is very beautiful when in full bloom.

*61. *Sambucus nigra foliis aureis.*—Golden-leaved elder (Europe). Height, 5 to 10 feet. The leaves of this variety are bright golden yellow which make it an attractive shrub on the ornamental grounds.

62. *Symphoricarpus racemosus.*—Snowberry (Canada). Height, 3 to 4 feet. This shrub has small rose-coloured flowers but its chief beauty lies in the large pu:e white berries which render it very ornamental in autumn.

63. *Syringa chinensis (rothomagensis).*—Rouen lilac. Garden origin. Height, 5 to 10 feet. This a hybrid between *s. persica* and *s. vulgaris*. In bloom, fourth week of May. Flowers, bright violet purple. A very profuse bloomer with much the habit of *Syringa persica* but bearing more highly coloured flowers.

64. *Syringa japonica*—Japanese lilac (Japan). Height, 15 to 20 feet. In bloom, fourth week of June. Flowers, creamy white, without perfume, borne in very large panicles. This is the latest blooming lilac tested here being more than one month later than the common species.

65. *Syringa Josikæa.*—Josika's lilac (Hungary). Height, 5 to 10 feet. In bloom first week of June. Flowers, bluish purple without perfume. This lilac blooms about two weeks later than the common species. The leaves are deep green and shiny which make it quite ornamental throughout the summer.

66. *Syringa oblata.*—Heart-leaved lilac (China). Height, 10 to 15 feet. In bloom, fourth week of May. Flowers bright purple. This is a very ornamental species with heart-shaped, shiny leaves. It blooms a little later than the common species.

67. *Syringa villosa.*—Rough-leaved lilac (North China). Height, 4 to 6 feet. In bloom, first week of June. Flowers, pale purple. This is a very handsome species blooming about a week later than the common lilac.

*68. *Syringa vulgaris alba grandiflora.*—Large-flowered white lilac (Europe). This is an improvement on the common white lilac with larger flowers and panicles. It blooms during the third week of May.

*69. *Syringa vulgaris, Charles X.*—Charles X lilac (Europe). Height, 8 to 12 feet. In bloom, fourth week of May. Flowers, deep purplish lilac, very sweet scented. A profuse bloomer and one of the finest lilacs grown.

70. *Salix rosmarinifolia*—Rosemary-leaved willow (Europe). Height, 6 to 10 feet. This is a very ornamental willow with long narrow rosemary-like leaves.

71. *Salix Laurifolia.*—Laurel-leaved willow (Europe). Height, 20 to 30 feet. The leaves of this willow are deep green and very shiny. When given room to develop symmetrically, it makes a very handsome specimen on the ornamental grounds.

*72. *Viburnum Lantana.*—Way-faring tree (Europe). Height, 8 to 12 feet. In bloom, third week of May Flowers, white in compact flat heads. The fruit is very ornamental, being scarlet, turning to dark purple when ripe.

73. *Viburnum Opulus.*—Guelder rose, high bush cranberry (Canada). Height, 6 to 8 feet. In bloom, second week of June. Flowers, white, in large clusters. This is, at all seasons of the year, an ornamental shrub, as the abundant bright scarlet fruit remains on the bush all winter.

*74. *Viburnum Opulus sterile.*—Snowball. Height, 8 to 10 feet. In bloom, second week of June. The almost round clusters of pure white flowers of this shrub are well known. This is one of the most ornamental flowering shrubs grown here.

75. *Viburnum prunifolium*.—Plum-leaved viburnum (Canada). Height, 10 to 15 feet. In bloom second week of June. Flowers, white, in compact, flat heads. The leaves of this species are very ornamental, being smooth and glossy.

EVERGREENS.

76. *Abies concolor.*—White fir (Colorado). Height, 30 to 60 feet. This is a very beautiful species with large, flat, glaucous, green leaves. Young trees of this species should be obtained from northern-grown stock, as it seems to be at its limit of hardiness here.

77. *Cupressus ericoides.*—Heath-like retinospora (Japan). Height, 2 feet. This is a very pretty dwarf evergreen, with fine, soft, delicate green foliage, which becomes of an attractive purplish tinge in winter.

78. *Cupressus pisifera (Retinospora pisifera).*—(Japan.) The retinosporas are all ornamental, and this is one of the best. It is of pendulous form with bright green leaves and a very graceful habit.

79. *Cupressus pisifera filifera.*—(Japan). This is a very distinct and beautiful variety with drooping branches and slender thread-like pendulous branchlets.

*80. *Cupressus pisifera plumosa.*—(Japan). A more compact tree than *Cupressus pisifera*, but very ornamental. Its branchlets are somewhat feathery in form.

81. *Cupressus pisifera plumosa aurea.*—(Japan). One of the most beautiful golden leaved, evergreen shrubs in cultivation. It is of compact form and holds its colour well.

82. *Juniperus communis fastigiata.*—Irish juniper (Europe). Height, 4 to 8 feet. The Irish juniper is an erect, compact form of *Juniperus communis* with light green foliage, silvery beneath. It makes a very attractive shrub on the lawn.

83. *Juniperus Sabina tamariscifolia.*—Tamarisk-leaved savin (Europe). Height, 1 to 2 feet. This is a low growing variety with widely spread trailing branches and attractive foliage.

84. *Pinus austriaca.*—Austrian pine (Austria). Height, 30 to 60 feet. A very handsome pine with dark green rigid leaves and upright branches. This is a very compact growing species and one of the most beautiful.

*85. *Pinus montana Mughus.*—Dwarf mountain pine (Mountains of Central Europe). Height, 2 to 10 feet. This is a very ornamental, dwarf, compact pine. Its height varies considerably, some specimens being quite dwarf and others attaining a height of about 10 feet.

86. *Pinus ponderosa.*—Heavy wooded or bull pine (British Columbia). Height, 50 to 80 feet. The bull pine is one of the most handsome species. The long glaucous green leaves, sometimes twisted into peculiar forms, and its upright branches, give it a very majestic appearance.

87. *Pinus resinosa.*—Red pine (Canada). Height, 40 to 60 feet. Not unlike the Austrian pine when young, but becoming less stift in form as it becomes larger. The leaves are also much softer than those of the Austrian pine.

88. *Pinus Sylvestris.*—Scotch pine (Europe). Height, 40 to 60 feet .A very rapid growing pine with bluish green leaves. It is not so shapely as some of the other species, but grows well in nearly all kinds of thoroughly drained soils.

89. *Pinus Strobus.*—White pine (Canada). Height, 50 to 75 feet. The white pine is better known as a timber tree in Canada than as an ornamental tree, but when it branches from near the ground, and has sufficient space to develop symmetrically, it becomes one of the most graceful evergreens grown. The leaves which preserve their colour well in winter are a very lively green.

90. *Picea alba.*—White spruce (Canada). Height, 30 to 50 feet. A very beautiful native species with glaucous green leaves and rather rigid branches but making a fine ornamental tree.

*91. *Picea alcockiana.*—Alcock's spruce (Japan). Height, 40 to 60 feet. This is a very ornamental Japanese species, and quite distinct from all others. The dark green of the upper part of the leaves, and the bluish silvery green of the lower surface, make it very attractive.

*92. *Picea excelsa.*—Norway spruce (Europe). Height, 50 to 75 feet. The Norway spruce is one of the most popular evergreens planted, being a very rapid grower, of graceful form, and doing well on a great variety of soils.

*93. *Picea pungens glauca.*—Rocky mountain blue spruce (Western United States). Height, 40 to 60 feet. A very beautiful species with steely blue coloured leaves. One of the most ornamental trees. It is a slow grower and takes some years before it attains much height. As this tree varies in colour from green to blue, in procuring young trees, the blue variety should be ordered.

94. *Pseudotsuga Douglasii.*—Douglas fir (British Columbia). Height, 50 to 75 feet. The Douglas fir is a very majestic and handsome tree, with foliage dark green above and silvery beneath. The seed or young trees should be obtained from as far north as possible, or high up on the mountains, as otherwise it is not likely to prove hardy.

*95. *Thuya occidentalis aurea Douglasii.*—Douglas' golden arbor-vitæ (United States). This is a very beautiful form with bright golden coloured foliage and upright habit.

96. *Thuya occidentalis compacta.*—Compact arbor-vitæ (United States). A dwarf compact variety with bright green foliage.

97. *Thuya occidentalis Ellwangeriana.*—Ellwanger's arbor-vitæ (United States). This is a fine, compact, dwarf, vigorous variety, with slender leaves and branches.

*98. *Thuya occidentalis Hoveyi.*—Hovey's arbor-vitæ (United States). This is one of the finest and most desirable varieties. The leaves are bright green and the branches flat and parallel, giving the shrub a very remarkable and attractive appearance.

99. *Thuya occidentalis pyramidalis.*—Pyramidal arbor-vitæ (United States). The pyramidal arbor-vitæ is a very compact upright grower, and its columnar form makes it one of the most conspicuous objects on the grounds.

100. *Thuya occidentalis wareana* (*Sibirica*).—Siberian arbor-vitæ (Europe). The Siberian arbor-vitæ is a well known compact form with deep green, blunt leaves, which keep their colour well in winter.

PERENNIALS.

No flower garden is complete without perennials. Even though the plot of ground be small, some of the precious space should be allotted to a few of the finest examples of this large and varied class of plants. Few flowers require as little care as perennials if given the proper conditions to start with. The soil should be a good loam, well drained, for thorough draining is very essential. When planted, they should be left undisturbed as long as possible, hence the soil must be well prepared by trenching, with a liberal supply of well rotted cow manure, dug under. Most perennials thrive best in full sunshine, and, where it is possible, they should be planted where they will get the most favourable conditions. A southern aspect is the most suitable, and where there is protection from the cold winds the plants do best. Planting may be done either in spring or fall but September is probably the best time to plant perennials. Throughout the growing season the surface soil should be kept loose and free from weeds. During the summer, the taller growing sorts will need staking, as fine specimens are liable to be broken by storms if this is neglected. When the flowers have ceased blooming, the old stalks should be cut off near the ground. Just before permanent frost sets in, the border or bed should be given a liberal dressing of strawy manure. This will form a fine mulch for the protection of the plants and at the same time enrich the soil. The mulch ought not to be removed too soon in the spring, as often most of the damage done to perennials is at that season when so much thawing and freezing takes place.

The following list of one hundred of the best hardy perennials growing at the Central Experimental Farm, selected from over 1,000 species and varieties, is published for the purpose of assisting any who may desire to obtain a choice collection of these plants. In this list will be found the scientific and common name of each; its native home; when it begins to bloom; how tall it grows; the colour, size and other characteristics of the flower; also any other notes deemed advisable. For the information of those who have no room for a large collection, the best twenty-five are distinguished by **a star** preceding the name.

LIST OF ONE HUNDRED OF THE BEST HARDY PERENNIALS.

*1. *Achillea Ptarmica flore pleno.*—Double sneezewort (Northern Hemisphere). Height, 1 foot. In bloom fourth week of June. Flowers small, pure white, double, and borne in clusters. A fine perennial, blooming freely throughout the summer.

2. *Aconitum autumnale.*—Autumn flowering monk's hood (Europe). Height, 3 to 4 feet. Blooms in September. Flowers, bluish purple, borne in loose panicles. Valuable as a late bloomer.

3. *Aconitum Napellus.*—Common monk's hood or helmet flower (Northern Hemisphere). Height, 3 to 4 feet. Blooms in July. Flowers, deep blue, borne on a large terminal spike. A fine species, desirable for the rear of the border.

4. *Adonis vernalis.*—Ox-eye (Europe). Height, 6 to 9 inches. In bloom first week of May. Flowers, large, lemon yellow, borne singly from the ends of the stems. A very beautiful early flowering perennial.

5. *Agrostemma coronaria atropurpurea.*—Mullein pink (South Europe). Height, 1 to 2 feet. In bloom fourth week of June. Flowers, medium size, bright crimson, borne singly from the sides and ends of the stems. A very showy flower with silvery foliage, and continues to bloom throughout the summer.

6. *Anemone patens.*—Spreading pasque flower (North America). Height, 6 to 9 inches. In bloom fourth week of April. Flowers, large and deep purple. Very early. A beautiful flower.

*7. *Anthemis tinctoria Kelwayi.*—Kelway's hardy golden Marguerite (Europe). Height, 1 to 2 feet. In bloom fourth week of June. Flowers, large, deep yellow, borne singly on long stems. It continues to bloom profusely throughout the summer; is very showy and valuable for cutting.

8. *Aquilegia canadensis.*—Wild columbine (Canada). Height, 1 to 1½ feet. In bloom third week of May. Flowers, medium size, red and yellow. One of our prettiest wild flowers.

*9. *Aquilegia chrysantha.*—Golden spurred columbine (New Mexico). Height, 3 to 4 feet. In bloom fourth week of June. Flowers, large, bright lemon yellow, with long slender spurs. A very handsome perennial and much later than other columbines.

*10. *Aquilegia coerulea.*—Rocky Mountain columbine (Rocky Mountains). Height, 1 to 1½ feet. In bloom fourth week of May. Flowers, large deep blue with white centre and long spurs. A very beautiful species, of which there are some charming varieties in cultivation.

11. *Aquilegia glandulosa.*—Altaian columbine (Siberia). Height, 1 foot. In bloom third week of May. Flowers, large, deep blue, with white centre and short spurs.

12. *Aquilegia oxysepala.*—Russian columbine (Northern Asia). Height, 1 foot. In bloom second week in May. Flowers, large, deep purplish blue with blue and yellow centres, a very desirable early species, one of the best.

13. *Aquilegia Stuarti.*—Stuart's columbine (Europe). Height, 9 to 12 inches. In bloom third week of May. Flowers, large, deep blue with white centre, one of the best.

14. *Arabis alpina.*—White alyssum (Europe, North America). Height, 6 inches. In bloom first week in May. Flowers, small, pure white, in clusters. One of the earliest bloomers.

15. *Arnebia echioides.*—Prophet flower (Armenia). Height, 9 inches. In bloom third week of May. Flowers, yellow, borne in clusters, with petals spotted with purple. One of the most charming of early flowering plants.

16. *Asclepias tuberosa.*—Pleurisy root (Ontario). Height, 1½ to 2 feet. In bloom third week of July. Flowers, bright orange, borne in clusters. Very showy.

17. *Aster alpinus.*—Alpine aster (Canada, Europe). Height, 9 inches. In bloom first week of June. Flowers, large, bright purple, borne on long stems from the base of the plant. The earliest flowering of all the asters.

*18. *Aster Amellus bessarabicus.*—Bessarabian aster (Russia). Height, 1 to 1½ feet. Blooms from July to September. Flowers, large, deep purple, borne singly on long stems. Very fine. Splendid as cut flowers.

19. *Aster Novae Angliae roseus.*—Pink flowered New England aster (Ontario). Height, 5 to 7 feet. In bloom fourth week of August. Flowers, bright pink, borne profusely in large terminal clusters. Very showy. A strong growing variety.

20. *Boltonia asteroides.*—False chamomile (Canada). Height, 4 to 5 feet. Blooms in September. Flowers, smaller than the next, pale pink, borne very profusely in large panicles. Much later than the next species. Valuable as a showy, late flowering perennial.

21. *Boltonia latisquama.*—(Canada). Height, 4 feet. In bloom first week of August. Flowers, large, white, somewhat resembling asters, and borne very profusely in large panicles. A very fine perennial.

22. *Campanula carpatica*—Carpathian bellflower (Eastern Europe). Height, 6 to 9 inches. In bloom first week of July. Flowers, medium size, deep blue, borne profusely in loose panicles. It continues in bloom throughout the summer. Flowers, fine for cutting. A white variety of this is also good.

23. *Campanula Grossekii.*—Grosseck's bellflower (Eastern Europe). Height, 3 feet. In bloom first week of July. Flowers, large, deep blue borne on a long spike. A comparatively new but very handsome species.

24. *Campanula persicifolia.*—Peach-leaved bellflower (Europe). Height, 3 feet. Flowers, large, blue, borne in a raceme with long flower stems. A very desirable species. There are also white and double varieties which are good.

25. *Clematis recta.*—Erect virgin's bower (South Europe). Height, 4 feet. In bloom fourth week of June. Flowers, small, pure white, borne profusely in dense clusters. This is a very compact bushy species and desirable for the rear of the border. *Clematis Jackmanni* with large deep purple flowers and *Clematis Vitalba* with small white flowers, are excellent climbing sorts.

26. *Convallaria majalis.*—Lily of the Valley (Europe). Height, 6 to 9 inches. Blooms in the latter part of May. This charming, delicately perfumed flower, needs no description.

27. *Coreopsis delphinifolia.*—Larkspur-leaved tick-seed (Japan). Height, 2 to 3 feet. In bloom first week of July. Flowers, large, yellow with dark centres and borne singly with long stems.

28. *Coreopsis grandiflora.*—Large flowered tick-seed (Southern United States). Height, 2 to 3 feet. In bloom fourth week of June. Flowers, large, deep yellow, borne singly on long stems. It continues blooming profusely throughout the summer. Fine for cutting.

*29. *Coreopsis lanceolata.*—Lance-leaved tick-seed (Canada). Height, 2 feet. In bloom fourth week of June. Flowers, large though slightly smaller than the last, and borne on long stems. It continues blooming throughout the season, and is a very desirable perennial.

*30. *Delphinium cashmirianum.*—Cashmerian larkspur (Himalayas). Height, 1½ feet. In bloom first week of July. Flowers, pale to bright blue, in large open heads. A very beautiful low growing species.

31. *Dianthus plumarius flore pleno.*—Double-flowered garden pink (Eastern Europe). Height, 9 inches. In bloom second week of June. Flowers, large, white or pink, very sweet scented, and two or three borne on a stem. A variety called Mrs. Simkins is especially desirable being very double, white and deliciously perfumed, almost equalling a carnation. It blooms during the fourth week of June.

32. *Dicentra spectabilis.*—Bleeding heart (Japan). Height, 3 feet. In bloom second week of May. Flowers, heart-shaped, red and white and borne in pendulous racemes. An old favourite.

33. *Dictamnus albus.*—Gas plant (Europe). Height, 1½ to 2 feet. In bloom second week of June. Flowers, white with an aromatic fragrance, and borne in large terminal racemes. A well known variety, has purple flowers with darker markings. A very striking plant and well worthy of cultivation. It is generally known as *Dictamnus Fraxinella.*

34. *Doronicum caucasicum.*—Caucasian leopard's bane (Europe). Height, 1 foot. In bloom second week of May. Flowers, large, yellow, and borne singly. A fine strong growing early perennial.

*35. *Doronicum plantagineum excelsum.*—Tall plantain-like leopard's bane (Britain). Height, 2 feet. In bloom third week of May. Flowers, large and deep yellow. A fine plant with large flowers.

36. *Epimedium rubrum.*—Red barren-wort (Japan). Height, 1 foot. In bloom second week of May. Flowers, small, bright crimson and white, borne in a loose panicle. A very dainty and beautiful little flower.

37. *Erigeron speciosus.*—Showy fleabane (Western North America). Height, 1½ feet. In bloom second week of July. Flowers, large, violet-blue, with yellow centres, and borne in large clusters on long stems. Very desirable.

38. *Funkia subcordata (grandiflora).*—Large flowered plaintain lily (Japan). Height, 1½ feet. Blooms in August. Flowers, large and white, borne in racemes. The best funkia grown here. Both leaves and flowers are handsome.

*39. *Gaillardia aristata grandiflora.*—Large flowered Gaillardia or blanket flower (Western North America). Height, 1½ feet. In bloom third week of June. Flowers, large, yellow, with deep orange centres, and borne singly on long stems. The named varieties, Superba and Perfection, are more highly coloured and are of great merit. These all continue blooming profusely until late in the autumn.

40. *Gypsophila paniculata.*—Infant's breath (Europe). Height, 2 feet. In bloom second week of July. Flowers, small, white, borne profusely in large open panicles. A very graceful plant.

41. *Helenium autumnale.*—Autumn flowering sneezewort (Canada). Height, 6 to 7 feet. In bloom second week of July. Flowers, large, deep yellow, borne in large heads. Very ornamental in late summer.

42. *Helianthus doronicoides.*—(Canada). Height, 6 to 7 feet. In bloom second week of August. Flowers, large, bright yellow, and borne singly. Very fine; continues blooming for several weeks.

43. *Helianthus multiflorus.*—Soleil d'Or (United States). Height, 4 feet. Blooms in August. Flowers, large, double, bright yellow, and borne singly. A very striking late flowering perennial.

44. *Heuchera sanguinea.*—Blood-coloured alum-root (Northern Mexico). Height, 1 to 1½ feet. In bloom first week of June. Flowers, small, bright, scarlet, borne in open panicles. Continues blooming throughout the summer. Very desirable.

*45. *Hemerocallis Dumortierii.*—Dumortier's day lily (Japan). Height, 1½ feet. In bloom second week of June. Flowers, large, orange yellow, with a brownish tinge on the outside, and three or four on a stem. Very fine.

*46. *Hemerocallis flava.*—Yellow day lily (South Europe). Height, 2 to 3 feet. Blooms in the latter part of June. Flowers, bright orange yellow and fragrant. One of the best.

47. *Hemerocallis minor.*—Lesser day lily (North China and Japan). Height, 1 to 1½ feet. In bloom second week of July. Flowers, medium size and yellow. Blooms later than the two preceding species and has a smaller flower and narrower foliage.

48. *Hibiscus Moscheutos.*—Swamp rose mallow (Ontario). Height, 5 feet. In bloom third week of August. Flowers, very large, varying in colour from white to deep pink. A variety called "Crimson eye" is very good. This plant makes a fine show during late summer.

49. *Hypericum pyramidatum.*—Pyramidal St. John's Wort (Ontario). Height, 3 feet. In bloom fourth week of July. Flowers, large, yellow, and borne singly. A good late flowering perennial.

*50 *Iberis sempervirens.*—Evergreen candytuft (Candia). Height, 6 to 12 inches. In bloom third week of May. Flowers, pure white, fragrant, and borne in dense flat clusters. A fine perennial for cutting.

51. *Iris Chamaeiris.*—(South Europe). Height, 6 inches. In bloom fourth week of May. Flowers, bright yellow with brown markings. A very pretty dwarf species.

52. *Iris flavescens.*—(Eastern Europe and Western Asia). Height, 1½ to 2 feet. In bloom first week of June. Flowers, lemon yellow with brown markings. This species makes a fine contrast with *Iris sibirica*, blooming about the same time.

*53. *Iris florentina.*—Oris root (Central and Southern Europe). Height, 2 feet. In bloom first week of June. Flowers, very large, pale blue or lavender, sweet scented. A splendid Iris,

*54. *Iris germanica.*—German iris (Europe). Height, 2 to 3 feet. In bloom first week of June. Flowers, very large, of elegant form; colour, deep lilac and bright purple, sweet scented. Cannot be too highly recommended. There are a large number of choice varieties of this iris.

*55. *Iris lævigata* (*Kaempferi*).—Japanese iris (Japan and Siberia). Height, 1½ to 2 feet. In bloom first week of July. Flowers, very large and distinct in colour and shape. The flowers of the type are bright purple, and purple with yellow blotches in the throat, but there are a great many exquisite varieties of this charming plant.

56. *Iris pumila.*—Dwarf iris (Europe, Asia Minor). Height, 4 to 6 inches. In bloom third week of May. Flowers, deep purple. An old favourite. There are several varieties of this pretty little iris but none that excel it.

57. *Iris sibirica.*—Siberian iris (Europe to Siberia). Height, 3 to 4 feet. In bloom fourth week of May. Flowers, deep blue, borne on long stems in clusters of two or three. This species has many varieties.

58. *Iris variegata.*—(Eastern Europe). Height 1 to 1½ feet. In bloom first week of June. Flowers, yellow and brown, veined with various shades of brown.

*59. *Lilium auratum.*—Golden rayed lily of Japan (Japan). Height, 3 to 5 feet, Blooms in July. Flowers, very large, white, with a yellow central band on each petal, and thickly spotted with purple and red. The most showy of all lilies and a splendid flower. This has proven hardy at the Central Experimental Farm, although it has been reported tender in some localities. There are many choice varieties of this lily.

60. *Lilium canadense.*—Canadian lily (Canada). Height, 2 to 3 feet. Blooms in the latter part of May. Flowers, yellow to pale red with reddish spots, pendulous. A very desirable early native species.

61. *Lilium elegans.*—Elegant lily (Japan). Height, 6 inches. In bloom first week of July. Flowers, pale red. A very pretty dwarf lily with several varieties which are better than the type.

*62. *Lilium speciosum.*—Showy japanese lily (Japan). Height, 2 to 3 feet. Blooms in July. Flowers, large, white, tinged and spotted with deep pink and red. A very desirable lily. Hardier than *Lilium auratum* and almost as fine. There are several fine varieties of this flower.

*63. *Lilium superbum.*—Superb lily (Ontario). Height, 4 to 6 feet. In bloom first week of July. Flowers, very numerous, orange red, thickly spotted with dark brown. One of the most robust lilies grown. When in bloom it is a perfect blaze of colour. An admirable lily for the rear of the border.

64. *Lilium tenuifolium.*—Narrow leaved lily (Siberia). Height, 1½ to 2 feet. In bloom third week of June. Flowers, pendulous and bright scarlet. One of the most graceful of all lilies.

65. *Lilium tigrinum.*—Common tiger lily (China). Height, 2 to 4 feet. Flowers, large, deep orange, spotted thickly with purplish black. A very popular old sort.

66. *Linum perenne.*—Perennial flax (Canada). Height, 1½ feet. In bloom first week of June. Flowers, large, deep blue, borne in loose panicles. A very profuse bloomer continuing in flower throughout the summer.

67. *Lobelia cardinalis.*—Cardinal flower (Canada). Height, 2 to 3 feet. Blooms in August. Flowers, bright scarlet, borne in terminal racemes. A very showy and desirable native plant.

68. *Lychnis chalcedonica flore pleno.*—Double flowering, London pride (Russia). Height, 2 to 3 feet. In bloom first week of July. Flowers, bright crimson, double, and borne in terminal racemes. An old favourite.

69. *Lysimachia clethroides.*—Clethra-like loose-strife (Japan). Height, 3 feet. In bloom fourth week of July. Flowers, white, borne in long spikes. A very striking late flowering perennial.

70. *Myosotis alpestris.*—Alpine forget-me-not (Mountains of Europe). Height, 6 inches. In bloom third week of May. Flowers, small, bright blue with a yellowish eye A very profuse bloomer and always popular.

71. *Œnothera missouriensis.*—Missouri evening primrose (United States). Height, 1 foot. In bloom fourth week of June. Flowers, very large, rich yellow, and borne singly. Very beautiful. Continues to bloom throughout the summer.

*72. *Paeonia officinalis.*—Common paeony (Europe). Height, 2 to 4 feet. Blooms in the early part of July. This old favourite needs no description. The double flowered varieties are the best, and can be obtained in several colours and shades.

*73. *Papaver nudicaule.*—Iceland poppy (Mountains of Northern Hemisphere). Height, 1 foot. In bloom second week of May. Flowers, medium size, orange, white, or yellow. This is a very valuable and pretty poppy, blooming almost continuously until late in the autumn.

74. *Papaver orientale.*—Oriental poppy (Asia Minor). Height, 2 to 3 feet. In bloom first week of June. Flowers, very large, scarlet, and variously marked, according to variety, there being many forms of this beautiful poppy.

75. *Pentstemon barbatus Torreyi.*—Torrey's beard tongue (Texas). Height, 2 to 3 feet. In bloom first week of July. Flowers, deep red, borne in long spikes, very ornamental.

76. *Phlox amoena.*—Lovely phlox (Virginia). Height, 6 inches. In bloom second week of May. Flowers, medium size, bright pink, in compact clusters. A fine early species.

*77. *Phlox decussata.*—Hybrid perennial phlox (United States). Height, 1 to 3 feet. In bloom third week of July. Flowers, of many beautiful shades and colours are found in the large number of named varieties of this phlox, which continues to bloom until late in the autumn.

78 *Phlox reptans.*—Creeping phlox (North America). Height, 4 inches. In bloom fourth week of May. Flowers, medium size, purple, and borne in small clusters.

79. *Phlox subulata (setacea).*—Moss pink (North America). Height, 6 inches. In bloom third week of May. Flowers, medium size, deep pink, and borne in small clusters. An old favourite for early effects in the garden.

*80. *Platycodon grandiflorum.*—Large flowered Chinese bellflower (China and Japan). Height, 1½ to 2 feet. In bloom second week of July. Flowers, very large, deep blue, borne singly or in twos. A very profuse bloomer, flowering continuously until autumn. Cannot be too highly praised.

81. *Platycodon grandiflorum album.*—This is a white flowered variety of the last and makes a fine contrast to it when they are grown together. It blooms a few days earlier than the species.

82. *Platycodon grandiflorum* Mariesii (China). Height, 1 foot. In bloom second week of July. Flowers, large and deep blue, a lower growing form of the species but equally as good.

83. *Polemonium coeruleum.*—Jacob's ladder (Northern Temperate Regions). Height, 2 feet. In bloom second week of June. Flowers, deep blue, borne in terminal spikes, very attractive.

84. *Polemonium reptans.*—Creeping Jacob's ladder (North America). Height, 6 inches. In bloom third week of May. Flowers, medium in size, blue, and borne profusely in loose clusters.

85. *Polemonium Richardsoni.*—Richardson's Jacob's ladder (Rocky Mountains). Height, 6 inches. In bloom third week of May. Flowers, medium in size, blue, borne profusely in pendulous panicles.

86. *Potentilla hybrida versicolor.*—(Europe). Height, 1 foot. In bloom fourth week of June. Flowers, large, deep orange and yellow, semi-double. Very fine and quite hardy. A hybrid variety.

87. *Primula cortusoides.*—Cortusa-like primrose (Siberia). Height, 9 inches. In bloom third week of May. Flowers, small, deep rose, in compact heads. A charming little early flowering perennial.

88. *Pyrethrum uliginosum.*—Great ox-eye (Russia). Height, 4 feet. Blooms in September. Flowers, large, white with yellow centres, and borne singly on long stems. A very profuse bloomer. Splendid for cutting.

*89. *Rudbeckia laciniata* Golden Glow (United States). Height, 5 to 6 feet. Blooms in August. Flowers, large, lemon yellow, double, and borne on long stems. Very fine. One of the best of lately introduced perennials, being a very profuse bloomer and vigorous grower.

90. *Rudbeckia maxima.*—Great cone flower (United States). Height, 5 to 6 feet. Blooms in July and August. Flowers, large with a long cone shaped centre, and bright yellow rays, and borne singly. Leaves are large and glaucous. The whole plant is very striking.

91. *Scabiosa caucasica.*—Caucasian scabious (Caucasus). Height. 1½ feet. In bloom first week of July. Flowers, large, light blue, and borne singly on long stems. Blooms very freely throughout the remainder of the summer.

92. *Solidago canadensis.*—Golden rod (Canada). Height, 3 to 5 feet. In bloom first week of August. Flowers, small, golden yellow, and borne in dense panicles. This common native perennial is well worthy of a place in any border.

93. *Spiræa astilboides.*—Astilbe-like Spiraea (Japan). Height, 2 feet. In bloom fourth week of June. Flowers, small, white, very numerous, and borne in many branched panicles. Both foliage and flowers of this species are ornamental.

*94. *Spiræa Filipendula.*—Dropwort (Europe). Height, 2 to 3 feet. In bloom third week of June. Flowers, pure white, borne profusely in loose panicles. The foliage of this species is also very fine. There is a double flowered variety which is very effective.

95. *Spiræa palmata elegans.*—(Japan). Height, 2 to 3 feet. In bloom first week of July. Flowers, whitish with crimson anthers, borne very profusely in panicles. A fine species.

96. *Spiræa Ulmaria.*—Meadow sweet (Europe). Height 3 to 4 feet. In bloom second week of July. Flowers, very numerous, dull white, borne in large compound heads, having a soft, feathery appearance. A vigorous grower and a very striking species.

*97. *Spiræa venusta.*—Queen of the prairie. Native country unknown. Height, 4 feet. In bloom second week of July. Flowers, small, bright pink, borne profusely in large panicles. A very pretty pink flowered spiraea.

98. *Statice latifolia.*—Broad-leaved sea lavender (Bulgaria). Height, 1½ feet. In bloom first week of July. Flowers, small, blue, borne very profusely in loose panicles. Very effective in the border.

99. *Thalictrum aquilegifolium.*—Columbine rue (Europe). Height, 4 to 5 feet. In bloom fourth week of June. Flowers, small, white to purplish, very numerous and borne in large panicles. Very ornamental.

100. *Trollius europæus.*—Common globe flower (Europe). Height, 1½ to 2 feet. In bloom fourth week of May. Flowers, large, bright yellow. A very pretty plant, somewhat resembling a buttercup and continuing in bloom for a long time.

ORNAMENTAL GROUNDS.

The laying out and planting of the ornamental grounds is now almost complete. The work has covered a period of ten years, during which interval all the time available both in spring and autumn has been utilized to bring about the present results. The road from the main entrance to the office building which, when the work was begun in 1889, had nothing along its margins to vary the landscape save the fields of grain, is now at all seasons of the year brightened by the clumps of trees and shrubs which are grouped and scattered along its borders. The roads leading to the other buildings have also been planted in like manner, while the intervening areas are broken by lawns, flower borders, and flower beds. Some parts of the lawns now look quite park-like where such trees as pine, spruce, birch, larch, and other quick-growing sorts have been distributed singly over the grassy sward. Many of these are now more than twenty feet in height, and are excellent examples of the rapidity with which such trees grow when properly cared for.

FLOWER BORDERS AND FLOWER BEDS.

The roses which in June are always attractive were better in 1897 than last year, being less injured by the winter. The flower borders and beds were well stocked as usual and there was a splendid display of bloom throughout the season. A new feature this year was the hydrangea bed, where 58 specimens of this beautiful shrub were planted, and produced during the latter part of July and August a fine mass of bloom.

VISITORS.

This year the number of notable visitors to the farm was much greater than at any time during the past, among them being many representatives of both the British Association for the Advancement of Science and the British Medical Association. All seemed pleased with the general appearance of the ornamental grounds, and many expressed their surprise at the growth the trees and shrubs had made in so short a time. Many farmers and farmers' wives, who came on the special excursions which were arranged for from time to time throughout the summer, expressed much interest in the trees, shrubs, and flowers, and it is hoped that some of them will, from seeing the effects of the judicious planting near the houses, spend more time in the beautifying of their own homes. The ladies were especially interested in the flowers and the names of those they admired most were often taken with the intention of procuring some of the desirable sorts for themselves.

The splendid example which the ornamental grounds now affords to all who can visit them, will, it is hoped, bear abundant fruit by inciting a greater desire to make the homes of our people more attractive.

CARE OF THE ORNAMENTAL GROUNDS.

The work in connection with the care of the ornamental grounds is now very considerable as the trees, shrubs, hedges, flower borders, flower beds, lawns and roads must all be kept in good order. Throughout the summer the grounds at all times looked well. The first work was done with the pony lawn mower on the 10th of May and the grass was kept cut at intervals with it until the 18th of September. The weeds in the flower borders and beds were also kept well in subjection. The surface soil about the trees and shrubs was stirred at intervals throughout the summer both to kill weeds and keep the soil from baking. Some thinning of the original planting of trees and shrubs along the main avenue, was done this year as a number of them were already crowding each other. During the summer many trees and shrubs were sprayed to prevent the depredations of insects and fungous diseases. Aphides were especially troublesome.

ADDITIONS TO TREES, SHRUBS AND LAWNS.

Very little planting of trees and shrubs was required on the ornamental grounds this year. In some places, however, clumps were widened by the addition of new specimens and those replaced which had died during the winter. The piece of ground north of the poultry building which was planted last year, was seeded down this summer also that on both sides of the avenue leading from the northern entrance to the farm foreman's house.

HEDGES.

Visitors to the Central Experimental Farm are often surprised at the number and variety of the trees and shrubs used for hedge purposes, and they manifest much interest in them by asking questions regarding the best varieties to plant and the methods of growing them. Examples of 88 species and varieties are now growing side by side in hedges 50 feet in length and 10 feet apart, which present a very fine appearance in summer when in full leaf.

The methods to be adopted in growing a hedge successfully are simple, but should be followed if a compact and regular hedge is to be obtained. The young trees or shrubs should be planted in good soil, and if it is not good it should be removed and better earth brought in its place. Young stock from one to two feet in height should be planted and all cut back to a regular height of from ten to twelve inches. Evergreens should be procured as compact as possible at the base, for if they are loose and the foliage wanting it takes them a long time to thicken. The roots should not become dry from the time the shrubs are dug until they are re-planted in the hedge-row. Planting is done by opening a trench about a foot wide and placing the hedge plants 15 inches apart in a single row. The trench should be filled with good soil pressed firmly against the roots. Afterwards the surface soil should be kept loose for about two feet on each side of the hedge throughout the summer, and every following season. If the trees or shrubs are cut back when planted they will need no further clipping the first season, but after that, hedges of most deciduous trees and shrubs require to be clipped twice a year, in the latter part of June and again in August. Regular pruning from the beginning is very essential to successful hedge growing.

The following thirteen trees and shrubs, after several years' test, have proven the most satisfactory for hedge purposes of all those yet tested at the Central Experimental Farm :—

1. *Berberis Thunbergii.*—Thunberg's barberry. This makes a beautiful dwarf compact hedge with bright green leaves in summer becoming in autumn very highly coloured with red. The scarlet fruit which is produced abundantly makes it quite ornamental throughout the winter. It is a very satisfactory shrub where a low growing hedge is desired. Planted in 1890, this hedge is now 3 feet 4 inches in height and 4 feet 3 inches in width.

2. *Caragana arborescens.*—Siberian pea-tree. One of the hardiest shrubs grown and very useful for hedge purposes in the colder parts of Canada. It is a vigorous quick growing shrub whose delicate green leaves open very early in the spring and are quite attractive throughout the summer. The bright yellow, pea-shaped blossoms also add to the beauty of this hedge. As the Siberian pea-tree makes all its growth in the early part of the summer one pruning each year is sufficient. A hedge of this shrub, planted in 1889, is now 6 feet in height and 5 feet 3 inches in width.

3. *Viburnum Opulus.*—Guelder rose. This is a native shrub which has made one of the most ornamental hedges yet tested here. The bright green leaves, large clusters of pure white flowers, and scarlet fruit make it very attractive most of the year. Planted in 1894, this hedge is now 3 feet 6 inches in height and 3 feet 3 inches in width.

4. *Syringa Josikæa.*—Josika's lilac. The firm, glossy, deep green leaves of this lilac make it more suitable for hedge purposes than the common species. It makes a very neat, compact hedge and as most of the growth is made in the early part of the season, one clipping each year is sufficient to keep it in good order. Planted in 1891, this hedge is now 4 feet 8 inches high and 4 feet 10 inches wide.

5. *Viburnum Lantana.*—Wayfaring tree. This shrub has made a very attractive hedge. It is a neat compact grower with large, rough, pale green leaves and large clusters of white flowers, succeeded by scarlet berries which turn dark purple when ripe. Planted in 1890, its present height is 4 feet 1 inch with a width of 4 feet 7 inches.

6. *Ligustrum amurense.*—Amur privet. This is the only privet yet tested at Ottawa which has proven perfectly hardy. As the privet is very largely used in Great Britain for hedge purposes, it will be especially welcomed by English people settling in Canada. It is a pretty shrub with dark green leaves and forms a very compact hedge. Planted in 1894, its present height is 3 feet 1 inch, with a width of 3 feet 3 inches.

7. *Rhamnus Frangula.*—Alder buckthorn. A rapid growing shrub which makes a firm compact hedge. Its glossy green leaves make it quite ornamental, and where a tall growing deciduous hedge is desired this is one of the best. The flowering period of this shrub extends over a period of five or six weeks, and during that time it is a favourite haunt of the honey bee. Planted in 1890, this hedge is now 5 feet 10 inches in height and 6 feet in width.

EVERGREENS.

8. *Thuya occidentalis.*—American Arbor-vitae. This is the most satisfactory evergreen tested here for hedge purposes. It is a native tree and quite common in many parts of Canada, growing in a great variety of soils which render it very suitable for hedges. Its neat, compact appearance and bright green leaves make it very ornamental in summer, while in winter, although the leaves are duller, it yet remains quite attractive. In 1888 and 1889 more than one mile of this tree was planted at the Central Experimental Farm, as a hedge, which is now very compact and about 6 feet in height. The sample hedge planted in 1890 is now 4 feet in height and 4 feet 7 inches in width. The American arbor-vitae requires only one clipping each year which is best done in August.

9. *Thuya occidentalis aurea Douglasii.*—Douglas' Golden Arbor-vitae. This beautiful golden leaved evergreen is highly recommended for those who desire a golden tinted species for hedge purposes. It has formed one of the most beautiful hedges tested here, being of a bright yellow colour which makes a fine contrast with the green of other hedges. Planted in 1894, this hedge is now 2 feet 4 inches in height and 2 feet in width.

10. *Picea excelsa.*—Norway spruce. The Norway spruce makes a compact, firm, handsome hedge, and is ornamental at all seasons of the year but as it is a very vigorous grower it requires severer clipping than some others to keep it from growing too large; planted in 1889 this hedge is now 5 feet 3 inches in height, and six feet 8 inches in width.

11. *Picea alba.*—White spruce. This native evergreen is not so rapid a grower as the Norway spruce, and does not require as much clipping. It makes a very handsome compact hedge with a better colour than the Norway spruce. Planted in 1889, this hedge is 4 feet in height, and 5 feet 1 inch in width.

12. *Pinus Strobus.*—White pine. Although a little irregular and loose when planted, this native tree has made a beautiful compact hedge. It is soft and yielding to the touch and would not be valuable where a firm hedge is desired. The leaves remain a lively green throughout the winter making it very ornamental all the year.

13. *Picea pungens glauca.*—Rocky Mountain blue spruce. The blue spruce makes one of the most beautiful evergreen hedges grown. Its colour is pale steely blue which produces a fine contrast with a green lawn. It is a slow growing tree and makes a very neat compact hedge, requiring little clipping. Planted in 1891, it is now 3 feet in height and 3 feet 3 inches in width. As this tree varies in colour from green to blue, in procuring hedge plants, the blue variety should be ordered.

A word of caution in regard to the honey locust (Gleditschia triacanthos) is here given to intending hedge planters. While this tree, undoubtedly, makes a very ornamental and useful farm hedge in certain parts of Ontario; at Ottawa, all specimens have not proven hardy; the result being that the hedge is broken and uneven. Furthermore as this is a very vigorous tree making strong growth throughout most of the summer it is difficult to keep it looking well without frequent clipping and if not kept well cut back will soon become quite tree like. The hawthorns which grow in eastern Ontario and Quebec are much hardier, will hold cattle nearly as well and require much less pruning. A hedge of the downy leaved hawthorn (Crataegus tomentosa) planted here in 1891 is now 5 feet 4 inches in height and 4 feet in width. The scarlet fruited hawthorn (Crataegus coccinea) should make a very handsome hedge, as the leaves are glossy and ornamental.

LIST OF HEDGES AT THE CENTRAL EXPERIMENTAL FARM.

Name.	When Planted.	Height, 1897.		Greatest Width, 1897.	
		Ft.	In.	Ft.	In.
Abies balsamea—Balsam fir	1897	0	11	1	0
Acer glabrum—Smooth maple	1895	1	11	1	4
Acer pennsylvanicum—Striped maple	1897	1	0	Has not branched.	
Acer tataricum Ginnala—Ginnalian maple	1894	3	3	3	9
Alnus viridis—Green alder	1896	1	6	1	6
Artemisia Abrotanum—Southern wood	1896	3	4	3	0
Artemisia Abrotanum tobolskianum—Russian Southern wood	1896	3	0	3	5
Berberis Thunbergii—Thunberg's barberry	1890	3	4	4	3
Berberis vulgaris—Common barberry	1889	5	5	6	1
Berberis vulgaris purpurea—Purple-leaved barberry	1889	5	2	5	10
Betula lutea—Yellow birch	1895	3	2	2	6
Betula papyrifera—Canoe birch	1895	3	0	2	7
Betula populifolia—White birch	1897	2	0	1	2
Betula nigra—Black birch	1897	1	1	1	0
Calycanthus floridus—Carolina allspice	1895	1	3	0	6
Caragana arborescens—Siberian pea-tree	1889	6	0	5	3
Caragana frutescens—Woody caragana	1896	1	4	0	6
Celtis occidentalis—Nettle tree	1891	4	0	4	9
Cornus alba—White dog-wood	1897	1	0	0	6
Cornus Amomum	1897	1	5	0	8
Cornus alba sibirica variegata—Variegated Siberian dog-wood	1895	1	8	1	10
" " " "	1896	2	0	1	7
Cotoneaster acutifolia—Sharp-leaved cotoneaster	1896	1	8	1	8
Cotoneaster vulgaris—Common cotoneaster	1896	1	6	1	4
Crataegus tomentosa—Downy leaved hawthorn	1890	5	4	4	0
Cupressus ericoides—Heath-like retinospora	1896	1	5	1	6
Cytisus biflorus—Twin-flowered cytisus	1891	3	3	3	0
Diervilla Sieboldii variegata—Variegated weigelia	1896	1	8	1	8
Elæagnus angustifolia—Russian olive	1894	4	0	4	9
Euonymus americanus	1897	1	0	0	3
Fagus ferruginea—American beech	1897	0	6	0	3
Fagus sylvatica—European beech	1895	1	10	...	...
Gleditschia triacanthos—Honey locust	1889	4	6	4	7
Hippophæ rhamnoides—Sea buckthorn	1895	2	10	2	6
Juniperus communis suecica compacta	1897	0	6	0	6
Juniperus communis fastigiata—Irish juniper	1891	3	10	3	7
Larix americana—Tamarac	1895	2	9	2	10
Larix europæa—European larch	1897	1	1	0	8
Ligustrum amurense—Amur privet	1894	3	1	3	3
Lonicera tatarica—Tartarian honeysuckle	1896	2	0	1	4
Lonicera tatarica elegans—Elegant tartarian honeysuckle	1896	1	11	1	10
Morus tatarica—Russian mulberry	1889	6	8	6	11
Neillia aubifolia	1896	2	5	2	10
Neillia opulifolia aurea—Golden-leaved spiræa	1890	5	8	5	10
Negundo aceroides—Box elder	1891	5	7	6	4
Philadelphus coronarius aureus—Golden-leaved mock orange	1894	2	9	2	7
Philadelphus coronarius primulæflorus—Double-flowered mock orange	1894	1	8	1	9
Picea alba—White spruce	1889	4	0	5	1
Picea excelsa—Norway spruce	1889	5	3	6	8
Picea pungens—Rocky Mountain blue spruce	1891	3	0	3	3
Pinus Cembra—Swiss stone pine	1894	1	7	1	0
Pinus ponderosa—Bull pine	1895	2	7	2	6
Pinus Strobus—White pine	1890	4	0	4	4
Populus pyramidalis	1896	2	8	2	2
Populus nigra fastigiata—Lombardy poplar	1897	2	3	1	0
Prunus americana—Wild plum	1894	4	2	4	0
Prunus Mahaleb—Mahaleb cherry	1897	1	6	0	8
Prunus serotina—Wild black cherry	1897	2	0	0	10
Pseudotsuga Douglasii—Douglas fir	1894	2	3	2	5
Pyrus baccata aurantiaca—Yellow Siberian crab	1897	1	8	0	6
Pyrus Maulei—Maule's Japanese quince	1894	1	0	1	7
Pyrus communis—Wild pear	1897	1	1	0	4
Quercus Robur—Common European oak	1895	2	3	2	4
Rhamnus catharticus—Cathartic buckthorn	1895	3	6	2	6
Rhamnus Frangula—Alder buckthorn	1890	5	10	6	0
Rhamnus Frangula—(Dense form)—Dense alder buckthorn	1895	3	0	3	3
Rosa rubrifolia—Red-leaved rose	1890	5	5	4	5
Rosa rugosa—Japan rose	1890	4	5	5	3

LIST OF HEDGES AT THE CENTRAL EXPERIMENTAL FARM—*Continued.*

Name.	When Planted.	Height, 1897.		Greatest Width, 1897.	
		Ft.	in.	Ft.	in.
Salix acutifolia—Sharp-leaved willow	1896	1	11	2	0
Shepherdia canadénsis—Buffalo berry	1897	1	2	0	6
Spiræa chamaedrifolia—Germander-leaved spiræa	1896	2	5	1	3
Spiræa Douglasii—Douglas' spiræa	1891	3	10	2	7
Spiræa bracteata (media rotundifolia)—Round-leaved spiræa	1894	2	6	2	7
Spiræa Van Houttei—Van Houtte's spiræa	1891	2	2	1	10
Symphoricarpus racemosus—Snowberry	1890	3	0	3	8
Syringa chinensis—Rouen lilac	1890	3	3	3	7
Syringa Josikæa—Josika's lilac	1891	4	8	4	10
Syringa vulgaris—Common lilac	1890	6	6	6	3
Thuya occidentalis—American arbor-vitæ	1890	4	0	4	7
Thuya occidentalis aurea Douglasii—Douglas' golden arbor-vitæ	1894	2	4	2	0
Thuya occidentalis aurea Hoveyi—Hovey's golden arbor-vitæ	1897	1	1	0	6
Thuya occidentalis globosa—Globose arbor-vitæ	1895	1	6	1	8
Thuya occidentalis wareana—Siberian arbor-vitæ	1895	2	5	2	5
Tsuga canadensis—Hemlock	1889	3	0	3	8
Ulmus americana—American elm	1889	6	1	5	4
Viburnum Lantana—Wayfaring tree	1890	4	1	4	7
Viburnum Opulus—High bush cranberry	1894	3	6	3	3
Xanthoxylum americanum—Prickly ash	1889	4	6	4	2

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES

(REPORT OF G. W. FORREST, SUPERINTENDENT.)

NAPPAN, N.S., November 30, 1897.

To DR. WM. SAUNDERS,
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 1897.

WEATHER.

December, 1896, opened rainy, followed by cold on the 2nd. The thermometer registered 12° of frost on the morning of the 3rd, this weather continued with one exception until the 21st, when the thermometer registered 22° of frost, and on the morning of the 22nd the mercury had fallen to 4° below zero; this weather continued for a few days. Some snow fell on the 8th, and about five inches on the 17th, but not sufficient to make sleighing.

January opened cold, the thermometer registered 13° of frost; on the 4th open weather set in with rain, which continued until the 8th, when we had 22° of frost. On the 14th the mercury fell to 17° below zero, and on the 15th 10° below. On the 17th and 18th we had open weather without any frost, and on the 19th the register showed 14° below zero, continuing cold during the remainder of the month. A slight amount of snow fell on the 9th, with a heavy fall and high winds on the 12th. Again on the 29th we had a heavy fall of snow, accompanied by high winds.

February was an unusually fine, open month, having no very cold weather. On the 15th and 16th of March the thermometer registered 24 and 30° of frost, with this exception March weather was rather pleasant. April was rather fine with the exception of rain on the 14th, 24th and 27th. The month was, however, rather cold, making the spring backward.

May opened with cold, east winds, and rain on the 3rd. The whole month continued more or less cold and wet. The first seed was sown on the 8th.

From the 12th to the 20th of May we had almost continuous rain. Rain to the depth of 4·01 inches fell between the 27th of April and 1st June; 3·78 inches rain fell in June; 3·35 inches in July; 3·67 inches in August and 2·05 inches in September.

The whole season was unusually dark and wet until the 20th of September, since then the weather has been exceptionally fine. The first frost this fall was on the 18th of September, it was only light, followed by a heavy one on the 29th.

HAY.

Hay was over an average crop on both upland and marsh. Some 20 acres of upland was in hay, giving a yield of 50 tons. Forty acres of the marsh lands produced 70 tons of English and 12 tons of broad-leaf hay, making a total of 120 tons of mixed hay and 12 tons of broad-leaf. Although the season was unfavourable for making hay, on account of considerable rain and very little sunshine, the hay was all gathered in a fair condition.

In addition to the hay crop the straw harvested amounted to 49 tons 805 pounds.

EXPERIMENTS WITH SPRING WHEAT.

The experimental plots of spring wheat consisted of forty varieties. The yield was hardly up to the average, the straw was all more or less rusted. The soil used for the experiment was a clayey loam, the previous crop being roots. Fertilizer at the rate of 250 pounds per acre was used, it was made up of 125 pounds complete fertilizer and 125 pounds of bone meal mixed together. This was drilled in with the seed. In addition to this, 100 pounds of nitrate of soda was used per acre, 50 pounds sown broadcast when the grain was 3 inches high, and 50 pounds when 6 inches high. No beneficial results were noticeable from the use of nitrate of soda; this was probably due to the wet season. The straw making an abnormal growth consequently lodged badly, and the seed did not fill out well.

The plots were one-twentieth acre each. The seed was sown on the 10th and 11th of May, at the rate of 1¾ bushels per acre. The results obtained are given in the following table:—

WHEAT—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush	Lbs	Lbs.
Wellman's Fife	Aug. 28..	108	48	Very stiff.	5	Beardless.	5,850	30	20	60
White Connell	" 30..	111	44	Medium..	4	"	5,200	28	20	61
Rio Grande	Sept. 1..	113	46	" ..	4	Bearded..	5,000	27	40	60
Advance	Aug. 24..	106	44	Stiff	3	" ..	5,700	26	40	60
Goose	" 25..	107	41	Medium..	2½	" ..	5,000	26	40	62
Red Fern	" 25..	107	45	Weak	4	" ..	4,700	26	40	61
White Russian	Sept. 1..	113	46	Medium..	4	" ..	5,200	26	40	58
Preston	Aug. 24..	106	43	" ..	3½	" ..	5,200	26	20	61
Dion's	" 30..	111	45	Stiff	3½	" ..	4,800	26	00	58
Stanley	" 24..	106	44	Medium..	3	Beardless.	4,500	25	40	61
Admiral	" 28..	110	47	Stiff	4	" .	4,000	25	00	59
Vernon	" 28..	109	44	Weak	3	Bearded..	5,000	23	20	60
Green Mountain	Sept. 1..	113	48	Medium..	4	Beardless.	4,600	23	20	58
Huron	Aug. 30..	111	44	Stiff	3¾	Bearded..	4,400	23	20	61
Monarch	" 30..	111	48	"	4½	Beardless.	5,800	23	20	58
Alpha	" 26..	106	47	"	3	Bearded..	4,200	23	20	61
Colorado	" 25..	107	44	Weak	3	" .	4,700	23	20	62
Beauty	Sept. 1..	113	45	Stiff	3½	Beardless.	5,000	23	20	60
Dufferin	Aug. 27..	109	46	Weak	3	Bearded..	3,800	22	40	62
Emporium	" 30..	111	43	Stiff	3½	" ..	4,500	22	40	58
Crown	" 30..	111	42	Medium..	3½	" ..	4,000	22	00	62
Captor	Sept. 1..	113	48	Stiff..	3½	Beardless.	4,400	22	00	62
Herisson Bearded	Aug. 28..	109	48	Weak	2	Bearded..	4,600	22	00	60
Golden Drop	" 24..	106	44	Stiff	3¾	" ..	5,000	22	00	61
Dawn	" 27..	109	47	"	3	Beardless.	4,000	22	00	60
Black Sea	" 27..	109	50	"	3	Bearded..	4,300	21	40	62
Blenheim	Sept. 1..	113	48	Very stiff.	3½	" ..	4,400	21	00	60
Old Red River	Aug. 30..	111	48	Medium..	4	Beardless.	5,000	21	00	60
Red Fife	Sept. 1..	113	38	Very stiff.	3½	" .	4,300	21	00	60
Hungarian	" 1..	113	42	Medium..	4	Bearded..	4,900	20	40	59
Beaudry	Aug. 30..	111	37	Weak	3	" ..	3,900	20	20	58
Campbell's White Chaff	" 25..	107	43	Stiff	3	Beardless.	4,500	20	20	61
Pringle's Champlain	" 30..	111	48	"	4	Bearded..	4,900	19	00	59
Gehun	" 27..	107	38	Medium..	3½	Beardless.	4,000	18	40	58
Rideau	" 27.	109	42	" ..	3	"	4,000	18	40	56
Progress	Sept. 1..	113	48	" ..	4½	" .	5,600	18	40	61
White Fife	" 1..	113	46	Stiff	3¼	" .	4,500	18	20	60
Ladoga	Aug. 23..	105	40	"	3	Bearded..	4,000	18	00	61
Percy	" 30..	111	48	Medium.	3½	Beardless.	4,300	17	40	60
Countess	Sept. 1..	113	46	Stiff	3	" .	3,700	17	00	61

NOTE.—The weights given here, and also in all other grain tables in this report, were taken as the grain came from the threshing mill, and are not the maximum weights that the grain could be brought to by cleaning.

EXPERIMENTS WITH BARLEY.

The test plots of barley included twenty-one varieties of six-rowed and sixteen of two-rowed.

The grain was up to the average in yield. The land used for these plots was a sandy loam, the previous crop being beans and corn. Fertilizer of similar composition to that used on the wheat plots was applied in the same manner, an equal amount per acre being used. In addition to this 500 pounds per acre of common salt was used for the purpose of checking the growth of weeds. On the six-rowed sorts the salt was sown broadcast and harrowed in before seeding; on the two-rowed varieties it was sown broadcast when the grain was two inches high. There was no noticable difference in its value as a preventive of weeds between the two modes of application. The straw was all unusually bright and free from smut. The salt to all appearances was very beneficial in this respect.

The seed was sown on May 25th and 26th in one-twentieth acre plots, at the rate of two bushels per acre. The following results were obtained :—

Six-rowed Barley—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.		Bush.	Lbs.	Lbs.
Mensury	Aug. 23..	90	39	Weak	2¾	7,800	52	4	50
Oderbruch	" 23..	90	36	Medium	2½	7,600	50	20	50
Royal	" 18..	85	36	"	3	6,100	48	16	48
Vanguard	" 18..	42	42	Stiff	2½	6,700	46	32	48
Odessa	" 19..	86	43	Medium	3	4,500	46	12	48
Petschora	" 17..	84	43	Stiff	2½	4,700	45	20	44
Pioneer	" 19..	86	38	"	2½	4,500	44	8	50
Common Six-Rowed	" 23..	90	36	Medium	2¼	7,600	42	24	50
Blue	" 21..	88	36	"	3	5,000	42	24	43
Rennie's Improved	" 19..	86	38	Very stiff	2	5,000	40	40	51
Phœnix	" 18..	85	42	"	2	5,000	40	20	49
Surprise	" 27..	94	36	Stiff	2½	5,100	40	00	51
Trooper	" 27..	94	40	Medium	2¾	5,000	40	00	51
Nugent	" 27..	94	35	Stiff	2¾	4,600	39	28	51
Summit	" 27..	94	42	Medium	4	5,300	38	36	51
Stella	" 27..	94	36	"	3	5,400	38	36	48
Champion	" 18..	85	48	Stiff	3	6,500	37	44	43
Baxter's Six-Rowed	" 19..	86	42	Very stiff	2½	4,500	37	20	50
Excelsior	" 23..	90	48	Stiff	2	6,500	37	20	42
Success	" 13..	80	46	"	2½	6,000	34	28	45
Silver King (Four-Rowed)	" 20..	87	36	Medium	3½	6,500	41	32	48

Two-rowed Barley—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
Duck-bill	Sept. 6..	103	39	Stiff	3	5,900	41	32	51
Canadian Thorpe	" 6..	103	42	Very stiff	3	5,600	40	40	49
Newton	" 7..	104	43	Medium	3½	5,500	40	40	51
Nepean	" 7..	104	43	"	3½	5,400	40	40	51
Danish Chevalier	" 7..	104	36	Stiff	4½	5,200	39	28	47
Sidney	" 7..	104	42	Medium	4	5,600	38	16	50
Bolton	" 7..	104	36	Weak	3	4,700	37	24	49
Pacer	" 7..	104	38	Stiff	3	5,200	37	4	51
Victor	" 7..	104	36	"	4½	6,000	35	40	50
French Chevalier	" 7..	104	29	Medium	4½	5,100	35	40	50
Beaver	" 7..	104	38	Weak	4	4,500	34	28	51
Prize Prolific	" 7..	104	39	Stiff	4	5,000	34	8	50
Kinver Chevalier	" 7..	104	29	"	4½	4,900	32	44	50
Thanet	" 7..	104	36	Medium	5	3,500	29	8	49
Monck	" 7..	104	42	Stiff	3½	6,800	23	36	51
Rigid	" 7..	104	38	"	4	5,500	21	32	51

EXPERIMENTS WITH OATS.

The soil used for these experiments was a clayey loam, the previous crop being corn. The application, quantity per acre, and quality of the fertilizer used was similar to that of the wheat and barley plots. The straw was all more or less rusted, and of a very heavy growth, due no doubt to the stimulating effect of the nitrate of soda. The seed, however, filled out well.

Some of the varieties which were affected with smut the previous year were treated, by putting the seed to be sown in water raised to the temperature of 142° F., allowing it to remain submerged for two minutes, then cooling it off rapidly and drying. Those plots so treated were entirely free from smut. Some smut was noticeable in many of the other plots.

Sixty-four varieties of oats were sown on May 12th and 20th in plots of one-twentieth acre each. The following table gives the results obtained :—

OATS—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush	Lbs	Lbs.
Wallis	Aug. 26	98	46	Stiff	10	Branching	1,600	87	22	39
Siberian O. A. C.	Sept. 6	109	42	Medium	8	"	5,100	82	12	33
Flying Scotchman	Aug. 21	93	44	Very stiff.	5	"	6,800	82	12	40
Hazletts Seizure	" 21	93	46	Stiff	13	"	6,600	78	22	37
White Wonder	" 21	93	42	Medium	10	"	6,000	76	16	42
White Russian	" 26	106	40	Weak	9	"	6,800	73	18	37
Bavarian	" 27	99	40	Stiff	8	"	6,800	72	12	36
Golden Tartarian	Sept. 13	116	42	"	12	Sided	7,000	72	12	32
Improved American	" 6	109	45	"	11	"	6,800	72	12	32
Mortgage Lifter	" 2	105	40	Medium	13	Branching	6,100	69	14	38
California Prolific (Blk)	Aug. 30	102	44	Stiff	9	Sided	5,800	67	22	39
Columbus.	Sept. 4	107	42	"	12	Branching	4,900	67	2	36
Mennonite	" 1	104	36	"	9	"	6,400	67	2	32
Early Etampes	" 4	115	39	Medium	8	"	5,000	67	2	35
Doncaster Prize	Aug. 26	98	46	Stiff	12	"	7,900	65	30	39
White Monarch	" 26	98	46	"	9	"	7,700	64	24	40
Early Racehorse	" 25	97	41	Medium	10	"	6,500	64	24	41
Lincoln	" 26	98	39	"	9	"	5,000	64	24	36
American Beauty	Sept. 2	105	40	"	8	"	5,100	64	24	32
Rosedale	Aug. 27	107	37	Stiff	9	Sided	5,300	64	4	41
Early Gothland	" 27	99	36	"	9	"	5,300	64	4	40
Cream Egyptian	" 26	98	41	Medium	10	"	6,700	62	32	39
Oderbruch	Sept. 4	107	40	"	11	Half-sided	5,600	62	32	35
Abyssinia	Aug. 30	102	45	Stiff	10	Sided	4,900	62	32	38
Golden Beauty	Sept. 4	107	40	Medium	11	Branching	5,100	61	26	32
Wide Awake	Aug. 30	110	42	Stiff	9	"	5,800	61	26	32
Prize Cluster	" 26	106	41	"	11	"	4,800	61	26	42
Welcome	" 26	106	46	"	13	"	4,700	61	26	41
Newmarket	Sept. 2	105	42	"	10	"	4,800	61	26	33
Banner	Aug. 27	107	38	"	8	"	4,200	60	30	38
Olive	" 27	107	42	Medium	12	Sided	3,500	60	00	37
Master	" 26	98	44	Stiff	13	Branching	4,600	59	14	38
Early Blossom	" 30	110	40	"	10	Sided	4,800	59	14	36
Winter Grey	Sept. 1	104	42	Medium	12	Branching	4,700	58	38	38
Black Beauty	Sept. 2	105	32	Weak	13	Branching	6,100	57	22	33
Improved Ligowo	Aug. 27	107	35	Stiff	8	"	4,200	57	22	34
Coulommiers	Sept. 4	115	40	"	10	"	7,500	56	16	35
Holstein Prolific	Aug. 27	107	35	"	8	"	4,000	55	30	35
Prolific Black Tartarian	" 30	110	42	"	10	Sided	5,700	55	10	34
$1,000	Sept. 1	104	42	Medium	8	Branching	3,800	55	10	33
Pense	Aug. 27	107	40	"	12	Sided	3,500	55	10	34
Golden Giant	Sept. 13	117	42	Stiff	12	"	6,400	53	18	35
Abundance	Aug. 27	99	42	"	8	Branching	4,100	53	18	35
Scotch Hopetoun	Sept. 4	107	47	"	10	"	7,000	53	18	35

OATS—Test of Varieties—*Concluded.*

Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush	Lbs	Lbs.
Medal	Sept. 4..	107	38	Medium..	10	Branching	4,900	52	32	35
Bonanza	Aug. 27..	107	43	Stiff	11	" ..	4,000	52	32	41
Siberian	Sept. 6..	109	44	Very stiff.	10	Sided	6,500	52	32	34
Rennie's Prize	Aug. 26..	98	42	Stiff	10	Branching	5,100	51	26	42
Poland White	" 21..	93	46	Medium..	12	" ..	4,800	51	26	42
Early Golden Prolific..	" 27..	107	37	" ..	7	" ..	5,100	51	26	40
Cromwell	Sept. 4..	107	46	Stiff	10	" ..	5,000	50	00	34
Joanette	" 4..	115	38	Medium..	7	" ..	5,200	50	00	40
White Schonen	Aug. 26..	106	37	Weak	7	" ..	6,500	50	00	42
Early Maine	" 30..	102	40	"	11	Half-sided	3,300	50	00	38
Imported Irish	" 26..	98	46	"	10	Branching	4,800	49	14	42
Brandon	Sept. 1..	103	37	Stiff	9	Half-sided	5,700	48	28	36
Russell	Aug. 27..	99	39	"	8	Branching	4,800	48	28	40
Scottish Chief	" 27..	107	38	"	11	" ..	2,900	47	22	40
Miller	Sept. 4..	107	49	Very stiff.	12	" ..	7,400	45	30	34
Buckbee's Illinois	" 7..	110	48	Medium..	8	" ..	6,400	44	4	34
American Triumph	" 4..	107	48	Very stiff.	14	" ..	6,000	44	4	37
Victoria Prize	Aug. 30..	110	38	Medium..	10	" ..	2,800	44	4	42
Oxford	Sept. 7..	110	48	Stiff	9	" ..	5,500	40	00	35
Early Archangel	" 1..	104	42	Medium..	13	" .	4,500	40	00	36
King	Aug. 27..	107	42	" ..	12	" ..	5,400	40	00	42

RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

Experiments to test the relative value of early, medium and late sowings of grain were again carried on this year. The first set of these plots was sown 19th May, and the sowings were continued until six had been made, one week apart. One variety each of wheat, barley and oats were used in this test. The soil on which these experiments were conducted was a clayey loam. Fertilizer at the rate of 250 pounds per acre, made up of 125 pounds of complete fertilizer and 125 pounds of bone meal, mixed together, was drilled in with the seed when sown.

Owing to the lateness of the season when the last set of plots were sown, and the early frost this fall, the three last sowings of wheat, and the last plot of oats and barley, did not mature. The first plots sown were slightly rusted, the later sown ones were all badly rusted. The plots were one-twentieth acre each. The results are as follows:—

OATS—Results of Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Yield per Acre.		Weight per Bushel
		Bus.	Lbs.	Lbs.
No. 1—Abundance	May 19	61	26	32
No. 2— "	" 26	48	8	35
No. 3— "	June 2	54	4	35
No. 4— "	" 9	59	12	32
No. 5— "	" 16	56	8	32
No. 6— "	" 23	44	24	29

BARLEY—Results of Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Yield per Acre.		Weight per Bushel
		Bus.	Lbs.	Lbs.
No. 1—Canadian Thorpe	May 19	52	44	48
No. 2— "	" 26	34	28	47
No. 3— "	June 2	46	12	51
No. 4— "	" 9	55	25	46
No. 5— "	" 16	53	35	47
No. 6— "	" 23	40	40	45

WHEAT—Results of Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Yield per Acre.		Weight per Bushel
		Bus.	Lbs.	Lbs.
No. 1—Stanley	May 19	19	20	60
No. 2— "	" 26	18		57
No. 3— "	June 2	18	20	55
No. 4— "	" 9	18	20	52
No. 5— "	" 16	16	40	47
No. 6— "	" 23	15	20	45

EXPERIMENTS WITH PEASE.

Forty varieties of pease were sown 16th May, on one-twentieth acre plots. The same land devoted to the experimental plots of pease last year was again used. It was of a rather light clay loam and very poor.

The cut worm did a great amount of damage to these plots in some cases fully one-half the plants were cut off when about 3 inches high.

Fertilizers at the rate of 250 pounds per acre was used, this was made up of 125 pounds of complete fertilizer and 125 pounds of bone meal mixed together, and sown with the seed. The results obtained are as follows :—

PEASE—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of days maturing.	Character of Growth.	Length of Straw.	Weight of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
				In.	Lbs.	In.		Bush.	Lbs.	Lbs.
Early Britain	Sept. 2	109	Weak	78	4,800	2½	...	50	00	59
Crown	Aug. 28	104	"	60	4,200	3	Small	35	00	61
Perth	Sept. 2	109	"	72	4,000	2	...	31	40	61
Centennial	" 16	123	Medium	84	4,200	2½	Medium	31	40	59
King	" 9	116	Stiff	78	3,900	2	...	31	40	60
Chancellor	" 2	109	Medium	72	3,900	2	...	30	00	61
Prussian Blue	" 13	120	Strong	60	4,300	2	...	30	00	62
Oddfellow	" 9	116	Medium	48	3,900	1½	...	28	40	64
Bright	" 20	127	"	50	3,100	2½	...	26	40	62
Duke	" 16	123	"	70	3,500	2¼	Medium	26	40	58
Vincent	" 9	116	"	54	4,000	3	...	26	40	60
Elephant Blue	" 4	111	Weak	60	2,400	2½	...	24	40	61
Archer	" 20	127	Strong	55	2,600	2	...	24	00	61
White Wonder	" 2	109	Very weak	38	2,000	2	...	23	20	61
Nelson	" 4	111	Medium	45	3,400	2	...	23	20	60
Creeper	" 9	116	Weak	66	3,900	2½	Small	22	40	59
Bruce	" 13	120	Strong	75	3,600	2½	Medium	22	20	60
Prince Albert	" 16	123	"	96	3,500	2½	Small	22	20	63
Trilby	" 16	123	Medium	72	4,200	2½	"	22	20	60
Victoria	" 16	123	Strong	55	3,400	2	...	22	00	60
Alma	Aug. 28	104	Weak	32	3,300	2	...	22	00	62
New Potter	Sept. 9	116	Medium	72	4,500	2½	Medium	22	00	60
Pride	" 13	120	"	60	3,300	3	Large	21	40	63
Carleton	" 2	109	"	72	3,900	2	Medium	20	40	59
Large White Marrowfat	" 13	120	"	98	3,600	2½	"	20	40	57
Harrison's Glory	" 4	111	Weak	45	2,600	2	...	19	20	61
Prince	" 13	120	Strong	48	3,200	2½	Medium	19	20	60
Multiplier	" 13	120	Weak	60	2,600	2	Small	18	40	60
Mackay	" 13	120	Strong	65	3,000	2½	Medium	18	20	58
Bedford	" 20	127	"	55	2,600	2	"	17	20	62
Blackeyed Marrowfat	" 4	111	Weak	66	2,700	2½	Large	16	40	60
Mummy	" 28	104	"	36	1,000	1½	Medium	16	40	62
Macoun	" 16	123	Strong	72	3,500	2	Large	16	40	60
Paragon	" 13	120	Medium	55	3,100	2½	Small	16	40	58
Golden Vine	" 9	116	Weak	48	4,000	1½	"	16	00	60
Canadian Beauty	" 9	116	"	44	3,100	2¾	Large	16	00	61
Kent	" 13	120	"	70	2,500	2½	Medium	15	00	58
Arthur	Aug. 28	104	"	32	1,000	2	Small	13	20	61
Daniel O'Rourke	" 28	104	"	39	1,100	2	"	11	20	61
Agnes	Sept. 4	111	"	48	1,100	2½	Medium	11	20	60

GENERAL STATEMENT OF GRAIN CROPS.

The grain plots yielded 412 bushels, 1¼ acre of oats on the marsh yielded 55 bush. 11 acres of oats on the upland yielded 330 bush. Corner lots of different areas sown to barley produced 83 bushels. Also corner lots of oats in different fields produced 22 bushels, 6 acres of buckwheat yielded 85 bushels. This makes a total of 987 bushels of grain harvested.

FERTILIZERS USED ON THE FIELD GRAIN.

The field oats were fertilized with 8 barrels of soft wood ashes and 1 barrel of complete fertilizer per acre. The grain fields were at the same time seeded to clover and it was noticed that the fields in which wood ashes were used gave the best crop of clover, as well as an apparent better crop of oats.

Part of the land used for buckwheat was fertilized with 8 barrels of soft wood ashes per acre. This was sown broadcast and harrowed in, and the other part with 250 pounds of mixed fertilizer (125 pounds bone meal and 125 pounds of complete fertilizer) per acre. The part on which the wood ashes were sown made the best growth and gave apparently the best yield.

EXPERIMENTS WITH TURNIPS.

Eighteen varieties of turnips were used in this experiment. The land was a sandy loam, the previous crop was potatoes. The land was ploughed in the fall.

Thirty 20-bushel cart loads of barn-yard manure, and 100 pounds of complete fertilizer were used per acre. After the rows were run up for seeding a small drill was made by hand into which the fertilizer was also sown by hand, the seed was then sown and covered. All the seed sowing is done by hand for the root plots.

Two sowings were made of each variety. The first set of plots were sown 4th June, the second two weeks later, 18th June. The yield of all the root plots per acre has been calculated from the quantity obtained from two rows each 66 feet long and 26 inches apart. The following results were obtained :—

TURNIPS.—Test of Varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per acre. 1st Plot.		Yield per acre. 1st Plot.		Yield per acre. 2nd Plot.		Yield per acre. 2nd Plot.	
					Tons.	lbs.	Bush.	lbs.	Tons.	lbs.	Bush.	lbs.
Shamrock Purple Top....	June 4.	June 18.	Oct. 14.	Oct. 18.	37	480	1,241	20	33	120	1,102	00
Halewood's Bronze Top..	" 4.	" 18.	" 14.	" 18.	36	200	1,203	20	25	1,820	863	40
Hartley's Bronze........	" 4.	" 18.	" 14.	" 18.	32	600	1,076	40	28	1,760	962	40
Perfection Swede........	" 4.	" 18.	" 14.	" 18.	31	1,080	1,051	20	31	1,840	1,064	00
Skirving's..............	" 4.	" 18.	" 14.	" 18.	31	320	1,038	40	20	1,180	686	20
East Lothian............	" 4.	" 18.	" 14.	" 18.	30	800	1,013	20	24	360	806	00
Selected Purple Top.....	" 4.	" 18.	" 14.	" 18.	29	520	975	20	25	1,060	851	00
Bangholm Selected......	" 4.	" 18.	" 14.	" 18.	28	1,760	962	40	24	780	813	00
Selected Champion......	" 4.	" 18.	" 14.	" 18.	28	240	937	20	24	1,540	825	40
Carter's Elephant........	" 4.	" 18.	" 14.	" 18.	27	1,380	923	00	19	1,520	658	40
Marquis of Lorne........	" 4.	" 18.	" 14.	" 18.	26	1,960	899	20	24	360	806	00
Prize Purple Top........	" 4.	" 18.	" 14.	" 18.	26	1,960	899	20	22	840	747	20
Mammoth Clyde.... ...	" 4.	" 18.	" 14.	" 18.	25	1,820	863	40	24	780	813	00
Sutton's Champion	" 4.	" 18.	" 14.	" 18.	25	1,820	863	40	24	1,540	825	40
Hall's Westbury.........	" 4.	" 18.	" 14.	" 18.	25	1,060	851	00	26	1,960	899	20
Prize Winner.......	" 4.	" 18.	" 14.	" 18.	25	1,060	851	00	23	1,880	798	00
Jumbo or Monarch......	" 4.	" 18.	" 14.	" 18.	24	360	806	00	19	760	646	00
Giant King...... . ..	" 4.	" 18.	" 14.	" 18.	24	640	810	40	21	560	709	20

EXPERIMENTS WITH MANGELS.

Sixteen varieties of mangels were sown in this test. The soil and its preparation was similar to that of the turnip plots. Two sowings were made of each variety. Results as follows were obtained :—

MANGELS—Test of Varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per acre. 1st Plot.		Yield per acre. 1st Plot.		Yield per acre. 2nd Plot.		Yield per acre. 2nd Plot.	
					Ton.	lbs.	Bush.	lb.	Ton.	lbs.	Bush.	lbs.
Giant Yellow Intermediate....	June 4.	June 18.	Oct. 14.	Oct. 15.	34	400	1,140	..	23	1,880	798	..
Norbitan Giant.	" 4.	" 18.	" 14.	" 15.	34	400	1,140	..	23	340	772	40
Giant Yellow Half Long.	" 4.	" 18.	" 14.	" 15.	33	840	1,114	..	25	300	838	20
Ward's Large Oval Shaped.....	" 4.	" 18.	" 14.	" 15.	30	....	1,000	..	19	1,520	658	40
Yellow Intermediate........ .	" 4.	" 18.	" 14.	" 15.	29	1,280	988	..	21	1,320	722	..
Giant Yellow Globe..........	" 4.	" 18.	" 14.	" 15	29	1,280	988	..	23	340	772	20
Canadian Giant........	" 4.	" 18	" 14.	" 15.	28	1,000	950	..	20	1,040	684	..
Mammoth Long Red (Evans)..	" 4.	" 18.	" 14.	" 15.	27	1,480	924	40	23	1,100	785	..
Prize Mammoth Long Red.....	" 4.	" 18.	" 14.	" 15.	27	720	912	..	21	1,320	722	..
Champion Yellow Globe.	" 4.	" 18.	" 14.	" 15.	26	1,200	886	40	23	1,100	785	..
Gate Post..	" 4.	" 18.	" 14.	" 15.	26	1,200	886	40	17	960	582	40
Golden Fleshed Tankard.......	" 4.	" 18.	" 14.	" 15.	26	1,200	886	40	18	1,220	620	40
Golden Tankard.......... .. .	" 4.	" 18.	" 14.	" 15.	25	1,060	851	..	19	1,520	658	40
Red Fleshed Tankard..........	" 4.	" 18.	" 14.	" 15.	25	300	838	20	14	880	481	20
Warden Orange Globe.........	" 4.	" 18.	" 14.	" 15.	24	1,540	825	40	23	340	772	20
Red Fleshed Globe............	" 4.	" 18.	" 14.	" 15.	21	560	709	20	22	80	734	40

EXPERIMENTS WITH CARROTS.

Fifteen varieties of carrots were experimented with. These plots were on soil similar in character and preparation to that used for the mangel and turnip plots. Two sowings were made of each variety, and the following results were obtained :—

CARROTS—Test of Varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per acre. 1st Plot.		Yield per acre. 1st Plot.		Yield per acre. 2nd Plot.		Yield per acre. 2nd Plot.	
					Ton.	lbs.	Bush.	lb.	Ton.	lbs.	Bush.	lb.
Iverson's Champion	June 4.	June 18.	Oct. 14.	Oct. 15.	21	1,320	722	00	13	580	443	00
Giant White Vosges	" 4.	" 18.	" 14.	" 15.	21	560	709	20	16	680	544	40
Green Top White Orthe	" 4.	" 18.	" 14.	" 15.	18	1,220	620	40	12	320	405	20
Half-long Chantenay	" 4.	" 18.	" 14.	" 15.	17	960	582	40	12	320	405	20
Improved Short White	" 4.	" 18.	" 14.	" 15.	17	960	582	40	16	680	544	40
Yellow Intermediate...........	" 4.	" 18.	" 14.	" 15.	16	1,140	557	20	8	1,280	288	00
Guerande or Ox Heart	" 4.	" 18.	" 14.	" 15.	16	1,440	557	20	11	40	367	20
Mammoth White Intermediate...	" 4.	" 18.	" 14.	" 15.	16	1,440	557	20	14	100	468	20
Half-long White.........	" 4.	" 18.	" 14.	" 15.	16	680	544	40	12	1,840	430	40
White Belgian	" 4.	" 18.	" 14.	" 15	13	1,360	456	00	10	1,280	354	40
Early Gem	" 4.	" 18.	" 14.	" 15.	13	1,360	456	00	14	100	468	20
Scarlet Intermediate............	" 4.	" 18.	" 14.	" 15.	11	800	380	00	7	1,000	250	00
Carter's Orange Giant...... ...	" 4.	" 18.	" 14.	" 15.	9	1,000	316	40	7	1,760	262	40
Long Scarlet Altringham	" 4.	" 18.	" 14.	" 15.	9	1,000	316	40	8	520	275	20
Long Orange or Surrey	" 4.	" 18.	" 14.	" 15.	9	240	304	00	7	1,760	262	40

EXPERIMENTS WITH SUGAR BEETS.

Six varieties of sugar beets were sown. These were on soil of similar character and prepared in the same manner as that used for the turnip, mangel and carrot plots. Two sowings were made of each variety. The following results were obtained :—

SUGAR-BEETS—Test of Varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per acre. 1st Plot.		Yield per acre. 1st Plot.		Yield per acre. 2nd Plot.		Yield per acre. 2nd Plot.	
					Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
French White Red Top..........	June 4.	June 18.	Oct. 14.	Oct. 15.	23	1,880	798	00	19	760	646	00
Danish Improved..........	" 4.	" 18.	" 14.	" 15.	22	1,600	760	00	15	1,920	532	00
Red Top Sugar..........	" 4.	" 18.	" 14.	" 15.	22	1,600	760	00	16	1,440	557	20
Wanzleben..........	" 4.	" 18.	" 14.	" 15.	22	840	747	20	14	1,640	494	00
Improved Imperial..........	" 4.	" 18.	" 14	" 15.	20	1,040	684	00	15	400	506	40
Vilmorin's Improved..........	" 4.	" 18.	" 14.	" 15.	15	1,160	519	20	14	120	468	40

EXPERIMENTS WITH POTATOES.

One hundred and two varieties of potatoes were planted on the 25th of May. They were on a loamy soil, the previous crop was sunflowers. The land was manured in the fall of 1896 with thirty 20-bushel cart loads of barn-yard manure per acre, which was ploughed in. The land was again ploughed this spring and 200 pounds of bone meal was sown broadcast per acre and harrowed in. The plots consisted of two rows each 66 feet long and 26 inches apart.

All the plots were treated during the season with the Bordeaux mixture and very few rotten potatoes were found. The following results were obtained :—

POTATOES—Test of Varieties.

Name of Variety.	Dug.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.	
		Bus.	lbs.	Bus.	lbs.	Bus.	lbs.
Early Puritan..........	Oct. 1...	460	..	450	..	10	..
Clarke's No. 1..........	" 1...	412	30	385	..	27	30
Lee's Favourite..........	" 9...	412	30	385	..	27	30
Holborn Abundance..........	" 12...	412	30	387	30	25	..
I. X. L..........	" 9...	400	..	377	30	22	30
Seedling No. 7..........	" 11...	400	..	372	30	27	30
Pearce's Prize Winner..........	" 11...	400	..	337	30	62	30
Seedling No. 230..........	" 1...	390	..	325	..	65	..
Early Rose..........	" 9...	380	..	250	..	130	..
Freeman..........	" 9...	377	30	315	..	62	30
Seattle..........	" 12...	377	30	317	30	60	..
Burpee's Extra Early..........	" 11...	370	..	310	..	60	..
Troy Seedling..........	" 11...	362	30	330	..	32	30
Dakota Red..........	" 9...	360	..	307	30	52	30
Carman No. 3..........	" 1...	360	..	287	30	72	30
Peerless Junior..........	" 1...	352	..	325	..	27	30
Ideal..........	" 1...	350	..	300	..	50	..
State of Maine..........	" 1...	347	30	277	30	70	..
Good News..........	" 11...	345	..	275	..	70	..
General Gordon..........	" 9...	345	..	260	..	85	..
McKenzie..........	" 1...	345	..	320	..	25	..
Maule's Thoroughbred..........	" 11...	337	30	272	30	65	..

POTATOES—Test of Varieties.—*Continued.*

Name of Variety.	Dug.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.	
		Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
Carman No. 1	Oct. 9	335	..	305	..	30	..
Rural No. 2	" 11	335	..	297	30	37	30
Quaker City	" 11	327	30	270	..	57	30
Early Ohio	" 1	325	..	290	..	35	..
Lizzie's Pride	" 1	325	..	300	..	25	..
Record	" 1	325	..	235	..	90	..
Burnaby Seedling	" 9	322	30	265	..	57	30
Everett	" 11	320	..	282	30	37	30
Lightning Express	" 11	320	..	300	..	20	..
Great Divide	" 9	320	..	297	30	22	30
Irish Cobbler	" 11	317	30	252	30	65	..
Queen of the Valley	" 9	317	30	255	..	62	30
Rochester Rose	" 1	312	30	290	..	22	30
Green Mountain	" 9	315	..	237	30	77	30
Maggie Murphy	" 9	315	..	225	..	90	..
Reeve's Rose	" 9	315	..	250	..	65	..
Brownell's Winner	" 1	312	30	287	30	25	..
Early Gem	" 1	310	..	277	30	32	30
Early Harvest	" 1	307	30	207	30	100	..
Russell's Seedling	" 9	307	30	145	..	162	30
Money Maker	" 11	305	..	267	30	37	30
Fill-Basket	" 11	300	..	200	..	100	..
Northern Spy	" 1	300	..	270	..	30	..
Henderson's Late Puritan	" 9	295	..	242	30	52	30
Hopeful	" 1	295	..	252	30	42	30
Sharpe's Seedling	" 1	295	..	227	30	67	30
Bill Nye	" 9	295	..	270	..	25	..
Brown's Rot Proof	" 11	295	..	212	30	82	30
Wonder of the World	" 11	295	..	270	..	25	..
Hale's Champion	" 9	292	30	250	..	42	30
Columbus	" 11	292	30	255	..	37	30
Charles Downing	" 11	290	..	175	..	115	..
Dreer's Standard	" 1	290	..	207	30	82	30
Reading Giant	" 1	287	30	187	30	100	..
Vick's Extra Early	" 1	287	30	192	30	95	..
Early Six Weeks	" 1	285	..	232	30	52	30
Munro County	" 9	285	..	257	30	27	30
Kidney	" 11	280	..	262	30	17	30
Early Sunrise	" 1	280	..	250	..	30	..
Irish Beauty	" 9	277	30	180	..	97	30
American Wonder	" 11	275	..	225	..	50	..
Pride of the Table	" 11	275	..	250	..	25	..
Daisy	" 11	275	..	250	..	25	..
New Variety No. 1	" 11	275	..	262	30	12	30
Algoma No. 1	" 1	275	..	250	..	25	..
Crown Jewel	" 9	272	30	250	..	22	30
Rural Blush	" 9	272	30	202	30	70	..
World's Fair	" 9	270	..	237	30	32	30
Harbinger	" 1	267	30	167	30	100	..
London	" 11	265	..	187	30	77	30
Thorburn	" 11	265	..	197	30	67	30
New Queen	" 9	265	..	250	..	15	..
Pride of the Market*	" 9	262	30	250	..	12	30
Orphans	" 9	257	30	217	30	40	..
Vanier	" 11	255	..	205	..	50	..
Empire State	" 1	252	30	225	..	27	30
Early White Prize	" 1	252	30	200	..	52	30
Victor Rose	" 9	250	..	205	..	45	..
Uncle Sam	" 9	250	..	220	..	30	..
Honeoye Rose	" 11	250	..	187	30	62	30
Delaware	" 11	245	..	185	..	60	..
Chicago Market	" 11	245	..	220	..	25	..
King of the Roses	" 11	240	..	145	..	95	..
Earliest of All	" 1	240	..	187	30	52	30
Stourbridge Glory	" 9	235	..	170	..	65	..
Satisfaction	" 1	225	..	175	..	50	..
Beauty of Hebron	" 1	222	30	182	30	40	..
Houlton Rose	" 11	220	..	175	..	45	..
Early Norther	" 9	217	30	162	30	55	..
Bruce's White Beauty	" 11	215	..	150	..	65	..

POTATOES—Test of Varieties—*Concluded.*

Name of Variety.	Dug.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.	
		Bush.	lbs.	Bus.	lbs.	Bus.	lbs.
Table King	Oct. 11	215	..	167	30	47	30
Seedling No. 214	" 9	200	..	87	30	112	30
Prize Taker	" 11	195	..	125	..	70	..
Clay Rose	" 9	192	30	140	..	52	30
Polaris	" 11	182	30	157	30	25	..
Flemish Beauty Seedling	" 11	177	30	140	..	37	30
Ohio Junior	" 9	175	..	137	30	37	30
Pearce's Extra Early	" 1	170	..	100	..	70	..
Sir Walter Raleigh	" 11	165	..	150	..	15	..

EXPERIMENTS WITH INDIAN CORN.

Twenty-five varieties of Indian Corn for ensilage were sown on 4th June. The land used for this experiment was a sandy loam, the previous crop was wheat, barley, and oats; it being the land used for the early, medium and late sown plots of grain last year. This was ploughed in the spring.—It was fertilized with 5 barrels of hardwood ashes and 200 pounds of bone meal per acre, which was sown broadcast and harrowed in.

Owing to the limited amount of barn-yard manure there was none of this available for the corn land, with result that a smaller yield than usual was obtained.

One set of plots were sown in rows 3 feet apart, and a duplicate set were planted alongside in bills 3 feet apart each way. The following table gives the results obtained:—

INDIAN CORN—Test of Varieties.

Name of Variety.	Character of Growth.	Height.	When Tasselled.		In Silk.		Early Milk.		Late Milk.		Condition when Cut.	Weight per acre grown in rows.		Weight per acre grown in hills.	
		In.										Tons.	Lbs.	Tons.	Lbs.
Comptons Early	Very strong.	84	Aug.	20	Aug.	30	Sept.	16	Sept.	30	2nd milk	11	1,100	10	460
Longfellow	Strong	83	"	20	"	31	"	14	"	30	"	11	000	11	550
Sanford	"	60	"	20	Sept.	1	"	15	"	30	"	11	000	11	440
Early Butler	"	60	"	31	"	10	"	20	Oct.	1	"	10	1,670	6	1,970
Angel of Midnight	Very strong.	84	"	18	Aug.	31	"	16	Sept.	30	"	10	1,450	10	240
Cloud's Early Yellow	Strong	64	Sept.	10	Sept.	16	"	25	....		"	10	1,340	9	1,470
New White Cap, Yellow Dent	"	80	Aug.	30	"	16	"	20	....		1st "	10	130	9	150
King of the Earliest	Medium	70	"	25	Aug.	31	"	14	Sept.	22	2nd "	9	370	9	700
Mamm. 8-Rowed Flint.	"	60	"	20	Sept.	6	"	20	....		1st "	8	1,270	13	400
North Dakota, White	Weak	65	"	20	"	8	"	20	....		"	8	850	7	1,400
Mitchell's Extra Early	"	50	"	15	Aug.	28	"	6	Sept.	15	Glazed.	8	170	4	800
Red Cob Ensilage	Medium	40	Sept.	16	....		....		....		Tassel'g.	7	1,400	13	500
Champion White Pearl	"	60	"	16	....		....		....		"	7	630	11	000
Extra Early Huron Dent	"	60	Aug.	31	Sept.	10	Sept.	20	Oct.	1	2nd milk	7	300	6	870
Pearce's Prolific	Weak	84	"	18	Aug.	31	"	15	Sept.	28	"	7	300	6	870
Selected Leaming	Medium	60	Sept.	16	Sept.	22	"	28	....		1st "	6	1,200	13	400
Thoroughbred White Flint	"	60	Aug.	28	"	15	"	28	....		"	5	1,550	6	870
Pride of the North	Weak	65	"	27	"	10	"	20	Sept.	28	2nd "	5	1,550	6	870
Canada White Flint	Medium	60	"	24	"	8	"	21	"	28	"	5	1,000	9	1,800
Cuban Giant	"	60	Sept.	16	"	30	....		....		Silk	5	1,000	8	1,270
Kendall's Giant	Weak	40	Aug.	20	"	5	Sept.	20	Oct.	1	2nd milk	4	1,900	6	1,200
Giant Prolific, Ensilage	"	45	Sept.	16	"	28	....		....		Silk	4	1,200	4	250
North Dakota, Yellow	"	50	Aug.	25	"	1	Sept.	20	Oct.	3	2nd milk	4	800	5	1,000
Mammoth Sweet Fodder.	"	40	"	25	"	5	"	20	"	2	"	4	800	4	250
Ninety Day	Very weak.	35	Sept.	6	"	25	Oct.	5	....		1st "	2	1170	5	340

GENERAL STATEMENT OF FODDER CROPS.

In addition to the turnip plots which yielded 299 bushels; 3 acres of turnips yielded 800 bushels per acre, and one-third acre plot produced 360 bushels, making a total of 3,059 bushels.

The mangel plots yielded 227 bushels, and $\frac{2}{3}$ of an acre yielded 360 bushels, making a total of 587 bushels of mangels. To this may be added the yield from the carrot plots, 108 bushels and also that from the plots of sugar beets, 71 bushels. This makes 3,825 bushels as the total amount of roots harvested.

One and one-quarter acre of horse beans produced 11 tons 250 pounds, equal to 9 tons per acre; $\frac{1}{2}$ acre of sunflowers, 2 tons 712 pounds; $2\frac{1}{2}$ acres of corn yielded 7 tons per acre, and $\frac{1}{8}$ acre 1 ton 1,250 pounds, equal to 13 tons per acre. This together with the product of corn plots of 10 tons 360 pounds, makes a total of 42 tons 1,572 pounds, all of which was put into the silo.

PREPARATION OF THE LAND FOR THE FIELD TURNIPS.

The field turnips were grown on land the previous crop of which was oats. The land was ploughed in the fall. In the spring it was again ploughed, worked up and drilled into rows 28 inches apart. Into these drills barn-yard manure at the rate of thirty 20-bushel cart loads per acre was put, and a fertilizer at the rate of 300 pounds per acre, made of 150 pounds of complete fertilizer, and 150 pounds of bone meal mixed together, which was sown along on top of the manure, and the whole covered.

PREPARATION OF LAND FOR THE FIELD CORN.

The land on which the field corn was planted was in timothy and clover hay the two previous seasons. This was ploughed in the spring and fertilizer at the rate of 250 pounds per acre used. This fertilizer consisted of 125 pounds of bone meal and 125 pounds of complete fertilizer mixed together. The corn was sown with the grain drill, in rows 3 feet apart. The fertilizer was applied at the same time by allowing all the pipes of the fertilizer attachment of the seed drill to run; thus the fertilizer was sown over the whole ground, being drilled in, as when sowing grain, in rows 6 inches apart.

One strip of this land of $\frac{1}{8}$ acre was manured on the sod, the previous fall at the rate of thirty 20-bushel cartloads of barn-yard manure per acre. On the land so treated the yield of corn per acre was 13 tons, and that which received no barn-yard manure bnt treated similar in every other respect, yielded only 7 tons per acre.

PREPARATION OF THE LAND FOR THE HORSE BEANS AND SUNFLOWERS.

The land on which the English horse beans were sown was in timothy and clover the two previous years. Barn-yard manure at the rate of forty 20-bushel cart loads per acre, was ploughed under in the fall of 1896. This was worked up in the spring, and the beans sown in rows 3 feet apart.

The sunflowers were also sown, in rows 3 feet apart, on land adjoining that used for the beans, which received similar treatment.

MILLET.

Four varieties of millet were sown 12th June in one-fortieth acre plots. The land was in timothy and clover the previous year. It was ploughed in the fall of 1896. The millet made a good strong growth and was cut for feed 30th August. The stock did not eat it readily. I do not consider it as valuable as oats, pease and vetches for feeding stock.

The weight of green fodder per acre as calculated from these plots was as follows :—

	Tons.	Lbs.
Japan	22	1,980
New Manitoba	12	200
Golden Millet	9	1,360
New Siberian	8	940

GRAIN CROPS WITH AND WITHOUT CLOVER.

In order to further test the value of sowing Mammoth Red Clover with grain crops, for the purpose of ploughing under a similar experiment to the one conducted last year was carried out this season. The plots used for this purpose last year were again utilized. The whole set of plots were, however, sown with oats. Clover at the rate of ten pounds per acre was sown on the plots which had clover on them last year; the check plots were left as before without seeding to clover. Fertilizer at the rate of 250 pounds per acre was used. It was made of 125 pounds of bone meal and 125 pounds of complete fertilizer mixd together.

No difference was noticed in the growth of grain on the plots which were seeded to clover last year and those which were not. This was, no doubt, due to the very poor growth made by the clover on these plots last season. The clover this season has made a strong growth and an after-math of from 6 to eight inches has been ploughed under,

RATION FED MILCH COWS.

During the winter months the cows were fed the following ration night and morning, with a feed of long hay at noon :—

	Lbs.
Hay	4
Straw	2
Roots (Turnips and Mangels)	15
Meal	2½

The straw and hay being cut and the roots pulped, the whole was mixed together and sprinkled with water till quite damp. For the month of May 30 pounds of ensilage per day was substituted for 30 pounds of roots, with this change there was no noticeable difference in the flow of milk. The ration of meal was continued when the cows were turned out to grass in the spring. The following table gives the total yield of milk from the cows for the season :—

MILK produced from Seven Cows during the past year.

Name.	Date of Calving.	When due to Calve again.	Condition Nov. 1st.	No. of Days Milking.	Total Pounds of Milk for the Period.	Average Yield per Day.
Piggott	Jan. 6, 1897.	Jan. 30, 1898.	10 lbs. per day	286	6,913	24
Eva Rooker	Nov. 1, 1896.	Oct. 11, 1897.	Milking	288	4,176	14½
Smith	Sept. 28, 1896.	April 16, 1898.	15 lbs. per day	397	7,213	18
Tingley	Dec. 6, 1896.	Nov. 15, 1897.	Dry	289	7,225	25
Jennie	Feb. 6, 1897.	Mar. 19, 1898.	19 lbs. per day	233	6,281	27
Reid	May 5, 1897.	Not in calf	24 "	148	5,152	34⅘
Brindle	Oct. 31, 1896.	Dec. 17, 1897.	Dry	306	5,118	13½

STOCK SOLD.

On the 4th of November I received instructions to sell a part of the farm stock. The animals disposed of included 12 cows and 2 bulls, as follows :—

4 Holstein cows, 1 Ayrshire cow, 2 Durham cows, 1 Grade cow, 1 Holstein bull, 1 Ayrshire bull.

As a result of the sale of this stock in November, and no purchases to replace them a large quantity of bran and ensilage were left over. As many roots as could be fed to the remaining animals were used, and all that could be sold in the neighbourhood were so disposed of, but a portion was unavoidably spoilt.

MANURE AND FERTILIZERS USED.

Owing to the limited amount of stock kept last winter only 150 tons of barn-yard manure was made, this together with $275 worth of fertilizers; including 100 barrels of soft wood ashes, bone meal and complete fertilizers, was not sufficient to manure much more than the extensive area devoted to plot work; consequently the large field crops did not receive the manure they should, with the result that small crops were harvested.

DRAINING.

On the marsh 1,000 feet of wooden 14 x 20 inch sluice drain was laid, and 1,000 feet of open ditch 2½ feet wide by 2 feet deep. On the upland 1,500 feet of 2 inch tile drain was laid.

DISTRIBUTION OF SEED GRAIN AND POTATOES.

In all 543 applicants have been supplied during the past year with 3 pound samples of potatoes, oats, wheat, barley, pease and rye.

The number of packages sent out was as follows :—

Potatoes	302
Oats	345
Barley	183
Wheat	91
Pease	83
Rye	6
Total	1,010

MEETINGS ATTENDED.

I have addressed meetings during the past year at Fredericton, N.B., Annapolis, N.S.; Musquodoboit, N.S.; and in Prince Edward Island.

EXHIBITIONS ATTENDED.

An exhibit of the farm produce was made at Charlottetown, P.E.I., from September 21st to the 24; at Halifax, N.S., 27th September to 5th October, and at the Westmoreland County Exhibition, Sackville, N.B., 14th October.

I have the honour to be,
Your obedient servant,

GEO. W. FORREST,
Superintendent.

REPORT OF THE HORTICULTURIST.

(W. S. BLAIR.)

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

SIR,—I have the honour to submit herewith a report of some of the work done in the Horticultural Division of the Experimental Farm for the maritime provinces for the year 1897.

The apple crop during the past year has been small; the pear, plum and cherry crops were a failure. The strawberries yielded well, and the new plantation of 36 varieties has made good growth. The raspberries were a fair crop. The raspberry canes as well as those of the blackberries were badly diseased with the raspberry anthracnose *Glœosporium venetum*; as a result the present growth is only fair. New varieties of small fruits have been planted, many of which are making strong growth.

The balance of orchard No. 2 was this year planted with trees; some of which were taken from the nursery here, where they had been set in the spring of 1895, when received from the Central Experimental Farm; the remainder were from the Ellwanger and Barry, nurseries, Rochester, N.Y. The former have not made very promising growth; the latter were very thrifty looking trees which arrived in good condition, and have made good growth.

The shrubs, trees and hedges have made fair growth and each year are becoming more of a source of interest. The new varieties received from the Central Experimental Farm in the spring will, no doubt, be a valuable addition.

The flower garden was continued as usual. The bulbs planted in the fall of 1896 were much admired in the early spring. Many new varieties of tulips, hyacinths, narcissus and lillies were this fall added to this interesting collection. A collection of 28 varieties of Japanese Paeonies, and 48 varieties of Japanese Irises were received this autumn and planted.

Experiments were again carried on with different varieties of vegetables, and a summary, of the relative value of those tested, is given in this report.

Data on the blossoming period of the different varieties of fruit trees grown on the farm were again furnished the horticulturist of the Central Experimental Farm.

Few particulars of immediate value were gathered from the experimental grass plots. The plots of crimson clover sown on the 18th of August and 1st September, did not stand the winter. The plot of Tussock grass reported upon last year has turned out to be *Bromus inermis.* The land on which this was sown was previously in Brome grass and quite probably was not well enough worked up; at any rate the growth made proved to be largely made up of the grass named.

APPLE ORCHARD, NO. 1.

In this orchard there are now growing 176 trees of 82 varieties. In the annual report for 1895, particulars relating to the planting and growth of the trees from this orchard were given from the time of the first planting in 1889, to, and including, 1894. Since then there has been lost from various causes 29 trees of the following varieties: 2 Baldwin, 1 Baxter, 2 Coopers Market, 1 Early Prolific, 1 Fallawater, 1 Gipsy Girl, 2 Grimes's Golden, 1 Nonpareil, 2 Newtown Pippin, 1 Pryor's Red, 2 Ribston Pippin, 1 Roxbury Russet, 1 Spitzenburg, 2 St. Lawrence, 1 Scott's Winter, 1 Talman's Sweet, 1 Twenty-ounce Pippin, 1 Wagener, 2 White Pippin, 2 Wealthy, 1 Walbridge. Part of these have been winter-killed while some others have died from the effects of a disease in the bark and a few from being received in bad order, having been heated in the package during transportation.

Some of the trees now growing present a stunted and unthrifty appearance, and I find in most cases such trees have unhealthy heart-wood.

The following tabular arrangement gives the names of the varieties planted and their present condition:

APPLE ORCHARD NO. 1.

Name of Variety.	When Planted.	Number of Trees.	Fruited.	Character of Growth.
Anisovka	1889	1	Yes	Strong.
Aport	1889	2	"	"
Ananasnoe	1889	2	"	"
Anis	1890	2	"	1 fair, 1 strong.
Alexander	1890	3	"	Strong.
Autumn Strawberry	1895	2	No	1 fair, 1 weak.
Benoni	1890	2	Yes	1 strong, 1 fair.
Blue Pearmain	1890	1	"	Strong.
Blackwood	1889	2	"	"
Bank's	1895	1	No	1 weak.
Borovinka	1889	1	Yes	Strong.
Bellflower	1889	1	"	"
"	1892	2	No	"
Bottle Greening	1891	1	"	"
Blushed Calville	1895	1	"	"
Buckingham	1895	2	"	1 strong, 1 fair.
Belle de Boskoop	1897	1	"	Weak.
Ben Davis	1893	2	Yes	Strong.
Canada Baldwin	1890	3	"	"
Canada Red	1890	2	"	1 fair, 1 weak.
Chenango Strawberry	1892	2	"	Fair.
Crimean Bogdanoff	1895	1	No	Strong.
Carolina Red June	1895	2	"	Fair.
Colvert	1890	2	Yes	"
Duchess	1890	3	"	2 strong, 1 fair.
"	1892	4	"	1 " 3 "
Dominie	1895	2	No	Strong.
Fameuse	1890	4	Yes	Fair.
Flory Belle	1897	1	No	Weak.
Fallawater	1895	1	"	1 weak.
Gravenstein	1889	1	"	Fair.
"	1895	2	"	1 strong, 1 fair.
Golden Reinette	1895	1	"	Strong.
Golden Russet	1890	3	Yes	"
"	1892	1	"	"
Grimes' Golden	1890	3	"	1 strong, 2 fair.
Golden White	1895	2	No	Fair.
Haas	1890	3	Yes	Strong.
Hibernal	1894	1	No	"
"	1895	1	"	"
Hyde's King	1897	1	"	Weak.
Jonathan	1890	3	Yes	2 fair, 1 strong.
Keswick Codlin	1890	3	"	Fair.
King	1893	3	No	1 fair, 2 strong.
Kara Synap	1895	2	"	Weak.
Longfield	1890	3	Yes	Strong.
Mann	1890	3	No	Fair.
Maidens Blush	1890	3	Yes	1 strong, 2 fair.
Milding	1893	1	No	Strong.
McIntosh Red	1890	3	Yes	Fair.
McMahan White	1895	1	No	Strong.
Northern Spy	1890	3	"	1 strong, 1 fair, 1 weak.
Ostrakoff	1889	3	Yes	Strong.
Ontario	1890	2	"	1 fair, 1 weak.
Peach	1893	3	"	Weak.
"	1894	1	No	Strong.
"	1895	1	"	"
Pewaukee	1890	3	Yes	"
"	1892	2	"	"

APPLE ORCHARD NO. 2—*Concluded.*

Name of Variety.	When Planted.	Number of Trees.	Fruited.	Character of Growth.
Princess Louise	1892	2	Yes	Fair.
Pewaukee Russet	1895	1	No	Strong.
Peck's Pleasant	1895	1	"	"
Peter	1893	1	"	Weak.
Rambo	1890	2	Yes	Fair.
Ribston Pippin	1894	2	"	"
R. I. Greening	1890	3	"	"
Rome Beauty	1895	2	"	Strong.
Red Astrachan	1890	5	Yes	3 strong, 2 fair.
Royal Table	1895	2	No	1 " 1 "
Red Bietigheimer	1893	2	"	1 " 1 "
Roxbury Russet	1893	1	"	1 "
Stark	1894	1	"	Fair.
Serinkia	1889	2	"	"
Spitzenburg	1894	1	"	1 strong.
Sultan	1890	2	Yes	1 strong, 1 fair.
Seek-No-Further	1895	2	No	Strong.
St. Lawrence	1890	3	"	1 strong, 2 fair.
Sop of Wine	1897	1	"	Weak.
Scott's Winter	1890	2	Yes	2 strong,
Shannon	1897	1	No	Fair.
Tetofsky	1889	1	Yes	"
Titovka	1889	2	"	Strong.
Trenton	1893	1	"	"
Talman's Sweet	1890	2	"	2 strong.
Twenty-ounce Pippin	1893	1	No	Weak.
Wellington	1893	2	Yes	1 strong, 1 fair.
Wagener	1890	1	"	Fair.
Wealthy	1890	1	"	"
"	1897	2	No	"
Walbridge	1893	1	"	Strong.
Yellow Transparent	1890	5	Yes	2 strong, 3 fair.

APPLE ORCHARD NO. 2.

This orchard is situated on a somewhat higher piece of land than orchard No. 1, and is protected on all sides by a windbreak of a natural growth of spruce.

The land was cut and cleared in 1890 and some 39 apple trees were planted amongst the stumps at that time. Some of the trees then planted have made good growth, with others the growth has not been so satisfactory. The land has since been broken up and was this year all planted with apple trees. Part of this land was under-drained in the fall of 1896; the other part was drained this autumn. The very wet season was very unfavourable for the trees planted in the undrained land and they have made weak growth, and some few have died. The trees planted on the under-drained part have all made strong growth.

Between the growth of the trees in this orchard, and those in orchard No. 1, there is a decided difference in favour of the latter.

Two trees planted have died from the effects of "sun scald;" 12 were so badly girdled by mice in the winter of 1894–95, that they had to be replaced.

This orchard now contains 160 living trees of 90 varieties—67 of which are not represented in orchard No. 1. This gives us in the two orchards a total of 336 apple trees including 149 varieties.

The following table gives the present condition of the orchard :—

APPLE ORCHARD No. 2.

Name of Variety.	Planted.	Number of trees planted.	Number of trees living.	Fruited.	Character of Growth.
Arabskoe	1897	2	2	No	Strong.
Antonovka	1897	2	2	"	Weak.
Atkison	1897	2	2	"	"
Arabka, Winter	1897	2	2	"	"
Avenarius No. 15	1897	2	2	"	"
Blue Pearmain	1890	2	1	Yes	1 strong ; 1 dead, 1895.
Bell Pippin	1897	3	3	No	2 fair, 1 strong.
Blushed Calville	1897	1	1	"	Fair.
Blenheim Pippin	1897	2	2	"	1 fair, 1 weak.
Brownlee's Russet	1897	2	2	"	Weak.
Ben Davis	1897	2	2	"	Strong.
Belle de Boskoop	1897	1	1	"	Fair.
Babbit	1897	2	2	"	Weak.
Basil The Great	1897	2	2	"	"
Beautiful Arcad	1897	2	2	"	"
Cinnamon Pine	1895	1	1	"	Strong.
" "	1897	1	1	"	Weak.
Charlotten Thaler	1897	1	1	"	"
Canada Reinette	1897	2	2	"	1 fair, 1 weak.
Cox's Pomona	1897	2	2	"	Strong.
Cross 15.M	1897	2	2	"	Weak.
Derby	1890	3	2	Yes	2 strong, 1 dead, 1894.
Duchess	1893	2	2	"	Strong.
Danver's Winter Sweet	1897	2	2	No	Weak.
Early Strawberry	1897	2	2	"	Strong.
Early Colton	1897	2	2	"	Weak.
Enormous	1897	1	1	"	"
Fameuse	1893	2	2	"	Strong.
Fanny	1897	2	2	"	"
Grimes' Golden	1891	2	1	Yes	1 strong, 1 dead, 1895.
Golden Russet	1892	2	2	"	Strong.
Gravenstein	1893	3	1	No	1 strong, 1 dead, 1895.
Grandmother	1897	2	2	"	Weak.
Golden Reinette	1897	1	1	"	"
Gano	1897	2	2	"	Fair.
Golden Sweet	1897	1	1	"	"
Hastings	1892	2	1	"	1 strong, 1 dead, 1893.
Hurlbut	1897	2	2	"	Strong.
Hibernal (Fisk)	1897	2	1	"	1 weak, 1 dead, 1897.
Headley	1897	2	2	"	Weak.
Jeffries	1897	2	2	"	Strong.
John A.	1897	2	0		Dead, 1897.
King	1897	1	1	No	Strong.
Little Hat	1897	2	1	"	1 weak, 1 dead, 1897.
Lord Suffield	1897	2	2	"	Fair.
Long Arcad	1897	2	2	"	Weak.
Missouri Pippin	1897	2	2	"	Strong.
Mother	1897	2	2	"	1 strong, 1 weak.
Melonen	1897	1	1	"	Weak.
Munson's Sweet	1897	2	0		Dead, 1897.
Nothern Spy	1892	3	2	No	2 strong, 1 dead, 1895.
Newtown Pippin	1897	2	2	"	Strong.
Worth-western Greening	1897	2	2	"	Weak.
Newell's Winter	1897	2	2	"	"
Occident	1897	2	2	"	Strong.
Ontario	1897	1	1	"	"
Pointed Pipka	1896	4	4	"	"
Pewaukee	1891	2	2	"	"
Pryor's Red	1896	1	1	"	Weak.
Palmer Greening	1897	2	2	"	Strong.
Primate	1897	2	2	"	Fair.
Porter	1897	2	2	"	Strong.
Pomme Grise	1897	2	2	"	"
Pipka Winter Bogdanoff	1897	2	1	"	1 weak, 1 dead, 1897.

APPLE ORCHARD NO. 2—*Concluded.*

Name of Variety.	Planted.	Number of trees planted.	Number of trees living.	Fruited.	Character of Growth.
Patten's Greening	1897	2	2	No.	Weak.
Peck's Pleasant	1897	1	0	...	Dead, 1897.
Russian Tyrol	1895	1	1	No.	Strong.
Red Astrachan	1893	3	1	"	1 fair, 2 dead, 1895.
Red Russet	1897	2	2	"	1 fair, 1 weak.
Red Canada	1897	2	2	"	" "
Rome Beauty	1897	2	2	"	1 strong, 1 weak.
Renand Seedling	1897	2	2	"	Weak.
Ribston Pippin	1897	2	2	"	1 weak, 1 fair.
Silken Leaf	1897	2	2	"	Weak.
Smith's Cider	1897	2	2	"	Strong.
Sutton's Beauty	1897	2	2	"	"
Stump	1897	2	2	"	"
Summer Rose	1897	2	2	"	1 strong, 1 fair.
Swaar	1897	2	2	"	Weak.
Sunbeam	1897	1	1	"	"
Snelling Seedling	1897	2	0	....	Dead, 1897.
Shannon	1897	1	1	No.	Weak.
Sops of Wine	1897	1	1	"	Fair.
Tuft's Baldwin	1897	2	2	"	Strong.
Uncle Sam	1897	2	1	"	1 weak, 1 dead, 1897.
Winter Bough	1890	3	3	Yes.	Strong
White Astrachan	1891	3	2	"	Fair, 1 dead, 1892.
Wine Sap	1897	2	2	No.	Weak.
William's Favourite	1897	2	2	"	1 strong, 1 weak.
White Pigeon	1897	2	2	"	Weak.
Watterson	1897	2	2	"	1 weak, 1 fair.
Western Beauty	1897	2	2	"	Weak.
Windsor Chief	1897	2	2	"	"
Wagener	1891	1	0	....	Dead, 1895.
Yellow Transparent	1892	2	1	Yes.	Strong, 1 dead, 1895.
York Imperal	1897	2	2	No.	Strong.

CRAB APPLES.

Most of the varieties of crab apples have made excellent growth. The variety Whitney, planted in 1890, made a strong growth for a few years, fruited well but has since been gradually dying out. Those planted in 1893 have made only fair growth.

This collection consists of 31 trees of ten varieties as shown in the following table.

Name of Variety.	Planted.	Number of trees planted.	Number of trees living.	Fruited.	Character of Growth.
General Grant	1892	2	2	Yes.	Strong.
Hyslop	1890	3	3	"	"
"	1893	2	2	"	Fair.
Leslie's Sweet	1897	2	2	No.	"
Montreal Beauty	1890	3	3	Yes.	Strong.
"	1893	1	1	"	Fair.
"	1894	1	1	"	"
Martha	1893	2	2	"	Strong.
Soulard	1895	2	2	"	"
Siberian	1890	4	4	"	3 strong, 1 weak.
Transcendent	1890	3	3	"	Strong.
"	1893	2	2	"	"
Van Wycke	1895	1	1	No.	"
Whitney	1890	3	1	Yes.	1 weak, 2 dead, 1895.
"	1893	2	2	"	Fair.

PEARS.

Some of the pear trees have made very good growth. The varieties Seckel and Doyenne Boussock have been winter-killed.

Particulars regarding this orchard from 1892 to 1894 will also be found in the Annual Report for 1895. The collection of pears now consists of 68 trees including 30 varieties.

The following table shows the present state of the pear orchard :—

Name of Variety.	When planted.	No. of Trees.	Fruited.	Condition of Growth.
Bezi de la Motte	1897	2	No	1 fair, 1 strong.
Bessemianka Budd, 108	1897	2	"	Fair.
" Budd and Gibb	1897	1	"	Strong.
" Var. 102	1895	2	"	"
" Var. 102	1897	1	"	Fair.
Bartlett	1892	3	"	2 strong, 1 fair.
Beurré Hardy	1893	2	Yes	1 fair, 1 dead, 1897.
Beurré Superfin	1892	2	No	1 strong, 1 fair.
Beurré Clairgeau	1892	1	"	1 fair.
Beurré d'Anjou	1892	5	"	2 strong, 2 fair, 1 weak.
Clapp's Favourite	1892	3	"	1 strong, 2 weak.
" "	1893	1	"	1 "
Doyenne Boussock	1897	2	"	Weak.
Dempsey	1893	1	"	Strong.
Dr. Reeder	1892	1	"	"
"	1897	1	"	"
Duchess	1892	1	Yes	"
Flemish Beauty	1892	5	"	4 strong, 1 fair.
Frederick Clapp	1893	1	No	Fair.
Goodale	1893	1	"	1 dead, 1894.
Howell	1893	2	"	1 fair, 1 strong.
Helen	1897	2	"	2 dead, 1897.
Idaho	1895	2	"	Fair.
Justine	1897	2	"	Strong.
Josephine	1897	2	"	1 fair, 1 weak.
Keiffer	1895	2	"	Fair.
Longworth	1897	2	"	1 weak, 1 dead, 1897.
Lawson	1895	2	"	Strong.
Lawrence	1892	2	Yes	"
Louise Bonne	1897	2	No	1 weak, 1 dead, 1897.
Matilda	1897	2	"	1 strong, 1 weak.
Mount Vernon	1893	3	"	2 weak, 1 strong.
Margaret	1895	2	"	Dead, 1897.
Osband's Summer	1895	2	"	Strong.
Seckel	1895	2	"	Both dead, 1896.
Sheldon	1892	1	"	Strong.
"	1893	2	"	1 strong, 1 weak.
Tyson	1892	2	"	Strong.
"	1895	1	"	"
Vermont Beauty	1895	2	"	"
Wilder	1895	2	"	1 strong, 1 dead, 1896.

CHERRIES.

Last winter was so severe that the fruit buds of the cherry trees were killed. The variety Dyehouse, planted in 1892, was completely winter killed. This tree was a strong vigorous grower and had fruited well. Gov. Wood, also a very strong grower and excellent fruiter, was badly injured by winter. Two-thirds of the branches of this variety including all on the south side, were killed. Leib fruited very young but killed out last winter. Particulars of the history of this orchard from 1891 to 1894 inclusive. will be found in the annual report for 1894.

The cherry orchard now contains 68 trees including 36 varieties. The following table gives years when the trees were planted and the deaths which have occurred since 1894.

Name of Variety.	When Planted.	Number of Trees.	Fruited.	Condition of Growth.
Archduke	1897	2	No.	Strong.
Black Tartarian	1892	2	"	1 fair, 1 strong.
Black Eagle	1893	1	"	Fair.
Belle Magnifique	1895	2	"	1 strong, 1 fair.
Black Heart	1892	2	"	1 fair, 1 strong.
Centennial	1895	2	"	Both dead, 1895.
Coe's Transparent	1892	1	Yes	Weak.
Carnation	1897	2	No.	1 fair, 1 weak.
Dyehouse	1892	1	Yes	Dead, 1897.
" "	1895	2	No.	Strong.
English Morello.	1892	3	Yes	2 strong, 1 fair.
" "	1893	2	"	Strong.
Early Richmond	1891	5	"	"
" "	1892	4	"	"
Elton	1893	1		1 dead, 1897.
Governor Wood	1892	3	Yes	Badly winter-killed.
Gruner Glass	1895	2	"	Strong.
Knight's Early Black	1893	2		Dead, 1896-7.
Leib	1893	2	Yes	" 1897.
Late Duke	1892	2	No.	1 fair, 1 dead, 1895.
"	1897	2	"	1 strong, 1 weak.
Lithauer	1895	2	"	1 fair, 1 dead, 1897.
Love Apple	1895	2	"	1 strong, 1 dead, 1897.
Louis Philippe	1892	1	Yes	Strong.
" "	1893	1		Dead, 1894.
May Duke	1895	2	No.	1 strong, 1 fair.
Montmorency	1892	2	Yes	Strong.
"	1893	2	"	"
Napoleon	1892	1	"	"
"	1893	1	No.	Fair.
Ostheim	1892	2	Yes	Strong.
Olivet	1892	2	"	1 fair, 1 strong.
Orel	1893	1	"	Strong.
"	1895	4	"	2 dead, 1896, 2 strong.
Ohio Beauty	1895	2	No.	Strong.
Plymouth Rock	1895	2	"	1 weak, 1 dead, 1895.
Rockport	1895	2	"	1 strong, 1 dead, 1897.
Royal Duke	1897	2	"	1 fair, 1 weak.
Reine Hortense.	1895	2	"	1 fair, 1 dead, 1896.
" "	1897	1	"	Weak.
Shadow Amarelle	1893	3	Yes	2 strong, 1 dead, 1896.
Späte Amarelle	1895	2	"	1 strong, 1 dead, 1895.
Sparhawk's Honey	1897	1	No.	Strong.
Schmidt	1897	2	"	1 fair, 1 strong.
Tradescant's	1897	1	"	Fair.
Vladimer	1895	2	"	1 strong, 1 fair.
Wragg	1892	2	Yes	" "
Windsor	1892	3	"	2 strong, 1 dead, 1896.
"	1893	1	No.	Strong.
Yellow Spanish	1892	2	Yes	"

PLUMS.

Some of the plum trees are making strong and many only fair growth. They have so far fruited but little.

The plant louse which affects the plum, *Aphis prunifolii*, has been very troublesome, and the vigorous use of tobacco water is found to be the best remedy. The use of kerosene emulsion is also effective ; but great care is necessary as the foliage is apt to be injured if the mixture is improperly made.

The following table gives the names of the varieties planted, and their present condition:—

Particulars relating to this orchard from 1892 to 1894, inclusive, are also given in the annual report for 1895. The plum orchard now contains 122 trees, including 51 varieties.

Name of Variety.	When Planted.	Number of Trees.	Fruited.	Condition of Growth.
Arch Duke	1895	2	No.	1 fair, 1 weak.
Abundance	1895	2	"	1 strong, 1 fair.
Bryanston's Gage	1897	2	"	Strong.
Burbank	1895	2	"	1 strong, 1 dead, 1896.
"	1897	1	"	Weak.
Beauty of Naples	1895	2	....	Dead, 1896.
Botan	1897	3	No.	2 fair, 1 weak.
Bradshaw	1892	3	"	2 fair, 1 strong.
Copper	1897	1	"	Weak.
Cheney	1897	2	"	Fair.
Czar	1895	2	"	Weak.
Coe's Golden Drop	1892	2	Yes.	1 strong, 1 fair.
Duane's Purple	1892	2	No.	" "
"	1897	2	"	" "
De Soto	1897	2	"	Fair.
Field	1897	2	....	Dead, 1897.
Fellenburg	1892	1	....	Dead, 1896.
"	1893	2	No.	Strong.
Goliath	1897	2	"	1 weak, 1 strong.
Gueii	1892	2	Yes.	Strong.
"	1893	2	No.	1 strong, 1 fair.
Golden Prolific	1893	2	"	1 weak, 1 dead, 1896.
Grand Duke	1895	2	"	1 strong, 1 fair.
Gen Hand	1897	2	"	Weak.
German Prune	1892	3	"	Strong.
Hawkeye	1895	2	....	Dead, 1897.
Hudson River Purple Egg	1893	1	No.	Weak.
" "	1897	1	"	"
Italian Prune	1895	2	"	1 fair, 1 dead, 1896.
Imperial Gage	1892	5	Yes.	4 strong, 1 fair.
" "	1893	2	"	Fair.
Jefferson	1897	2	No.	1 fair, 1 weak.
Kingston	1897	1	"	Fair.
Luscombe's Nonesuch	1897	2	"	Strong.
Lombard	1892	6	Yes.	"
"	1893	1	"	"
Lawrence's Favourite	1892	1	"	Fair.
Moore's Arctic	1892	3	"	Strong.
" "	1893	2	"	"
McLaughlin	1892	1	....	1 dead, 1895.
"	1897	1	No.	Weak.
Niagara	1892	2	"	1 fair, 1 dead, 1895.
"	1893	2	"	Fair.
Ouellin's Golden	1897	2	"	Strong.
Orange	1897	2	"	1 strong, 1 fair.
Ogon	1897	2	"	1 fair, 1 weak.
Prince of Agen	1897	2	"	Strong.
Prince Englebert	1897	2	"	"
Prince of Wales	1895	2	....	Dead, 1896.
Pond's Seedling	1892	3	Yes.	2 fair, 1 dead, 1896.
Prince's Yellow Gage	1892	6	"	Strong.
Prunus Simonii	1893	1	....	Dead, 1896.
Quackenboss	1897	2	No.	Strong.
Reine Claude	1892	2	Yes.	"
" "	1893	2	No.	Fair.
St. Lawrence	1897	2	"	"
Shipper's Pride	1892	3	Yes.	"
" "	1893	2	"	Strong.
Satsuma	1895	2	....	Dead, 1896.
Smith's Orleans	1895	2	....	Dead, 1895-96.
" "	1897	1	No.	Fair.
Saunders	1893	1	"	Weak.

PLUMS—*Concluded.*

Name of Variety.	When Planted.	Number of Trees.	Fruited.	Condition of Growth.
Shropshire Damson	1892	1	Yes	Fair.
Stanton	1892	2	No.	Strong.
Victoria	1897	2	"	1 weak, 1 fair.
Weaver	1895	1	....	Dead, 1897.
"	1897	2	No.	1 fair, 1 dead, 1897.
Washington	1892	2	"	Strong.
"	1893	1	"	"
Wangenheim	1897	2	"	Fair.
Willard	1895	2	"	Strong.
Yellow Egg	1895	2	"	1 strong, 1 dead, 1896.
Yellow Gage	1892	2	....	Dead, 1895.

PEACHES.

These two varieties of peaches were planted in 1897 in Orchard No. 2, where protection is afforded :—

Name of Variety.	Planted.	No. of Trees Planted.	No. of Trees Living.	Condition of Growth.
Alexander	1897	2	2	Strong.
Hale's Early	1897	2	2	"

APRICOTS.

These varieties are on peach stocks. Only the variety Gibb has made very promising growth. The branches kill back badly in winter, and in some cases, as will be seen from the following table the trees have killed out completely :—

Name of Variety.	Planted.	No. of Trees Planted.	No. of Trees Living.	Condition of Growth.
Acme	1897	2	1	1 dead, 1897; 1 weak.
Beckland	1895	2	1	" 1896; "
Gibb	1895	2	2	Strong.
Harris	1895	2	1	1 dead, 1896; 1 fair.

NUTS.

The following table will show the varieties of nuts grown and their condition of growth :—

Name of Variety.	Planted.	Number of Trees Planted.	Number of Trees Living.	Condition of Growth.
American Chestnut	1895	2	1	1 dead 1896 ; 1 fair.
Black Walnut	1895	2	2	Strong.
Filberts, Kentish Cob	1895	2	2	"
" Cosford Cob	1895	2	2	1 fair ; 1 weak.
Japanese Walnuts, Juglans Max	1895	2	2	Strong.
" " " Sieboldi	1895	2	2	"
Japanese Chestnut	1895	2	....	Dead 1896.

NUMBER and Varieties of Fruit Trees now growing in Orchards.

Name.	Number of Trees.	Number of Varieties.
Apples	336	149
Crab Apples	31	10
Pears	68	30
Cherries	78	36
Plums	122	51
Peaches	4	2
Apricots	5	4
Nuts	11	6
Total	655	288

SMALL FRUIT PLANTATION.

It seems to be a common practice for many of our farmers to order those varieties of small fruits which the agent recommends. In many cases the variety ordered is not the best, and too often failure is a result. It is not necessary when buying small fruits such as raspberries to get 50 or 100 plants, for by beginning with one dozen plants in a few years there will be plants enough to start a large plantation. The same can be said of strawberries, and 25 or 50 plants of two or three good varieties will enable one to make a start from which he can soon increase his plantation to any size he may wish.

The following chart gives the names of some of the most desirable varieties of small fruits to order, also the distances at which they may be planted. Should only one variety of each kind be wanted I would advise the first named :—

Name of Variety.	No. of Plants.	Rows distance apart.	Distance apart in the row.
		Feet.	Feet.
Strawberries :—			
Beder Wood. B	25 to 50	4	1
Crescent. P	25 " 50	4	1
Wilson, B	25 " 50	4	1
Warfield, P	25 " 50	4	1
Raspberries :—			
Red, { Cuthbert	12 " 24	6	1
Red, { Heebner	12 " 24	6	1
White, Golden Queen	12 " 24	6	1
Black, Gregg	12 " 24	6	1
Blackberries :—			
Agawam	12 " 15	7	3
Ancient Briton	12 " 15	7	3
Currants :—			
Black, Lee's Prolific	6 " 12	5	4
Red, Cherry	3 " 6	5	4
White, White Grape	3 " 6	5	4
Gooseberries :—			
Downing	6 " 12	5	4
*Industry	6 " 12	5	4
*Whitesmith	6 " 12	5	4

* English varieties.

ORNAMENTAL TREES AND SHRUBS.

The ornamental trees and shrubs now include 236 species and varieties, making a total of 448 individual specimens, many of which are making strong growth, some only fair, and others poor growth. In addition to the varieties planted in previous years and which were reported on in 1894 and in 1896, the following were planted this year :—

Betula pumila, Dwarf Birch.
Carya olivæformis, Pecan Nut.
Carpinus Caroliniana, American Hornbeam.
Cornus sericea, Dogwood.
Celtis occidentalis, American Hackberry.
Caryopteris Mastacanthus.
Comptonia asplenifolia, Sweet Fern.
Callicarpa purpurea.
Cornus sanguinea variegata, English Variegated Dogwood.
Cerasus serotina, Wild Black Cherry.
Euonymus Americanus. Strawberry Bush.
Halesia tetraptera. Snowdrop Tree.
Ilex opaca, American Holly.
Itea Virginica.
Juniperus Suecica, Swedish Juniper.
Ligustrum Stauntoni, Staunton's Privet.
Magnolia acuminata, Cucumber tree.
Nyssa multiflora, Sour Gum tree.
Neviusa Alabamensis.
Populus fastigiata, Lombardy Poplar.
" Van Geerti.
Paliurus aculeatus, Christ's Thorn.
Philadelphus coronarius semiplenus.
Pyrus rosea alba.
Robinia hispida, Rose Acacia.
Salix aurea pendula.
" Villarsiana.
" purpurea pendula.
" regalis.
" Salamoni.
" capraea.
" alba, White Willow.
Spiræa vaccinifolia.
Tamarix Indica.
Thuya occidentalis Meehan's Golden, Meehan's Golden Arbor-vitæ.
Thuya occidentalis Hoveyi Golden.
" " pumila.

DESIRABLE VARIETIES OF ORNAMENTAL TREES AND SHRUBS.

The following list of shrubs and trees can be safely recommended as good sorts for lawn planting, or for other ornamental purposes. These are all hardy varieties and have made a vigorous growth here :—

Deciduous Trees.

Acer platanoides, Norway Maple.
" rubrum, Red Maple.
" saccharinum, Sugar Maple.
Betula alba, European White Birch.
" purpurea, Purple Birch.
Fraxinus Americana, American Ash.
Larix Europea, European Larch.
Negundo aceroides, Box Elder.
Pyrus Aucuparia, European Mountain Ash.
Quercus Robur, English Oak.
Sophora Japonica, Japan Sophora.
Tilia Europæa, European Linden.
Ulmus Americana, American Elm.
" campestris, European Elm.
" racemosa, Cork Elm.

Evergreen Trees.

Abies balsamea, Balsam fir.
Picea pungens, Colorado Blue Spruce.
" Douglasii, Douglas Spruce.
" excelsa, Norway Spruce.
Pinus Austriaca, Austrian Pine.
" sylvestris, Scotch Pine.
Thuya occidentalis pyramidalis, Pyramidal Arbor-vitæ.

Deciduous Shrubs.

Artemisia Abrotanum, Southern wood.
Berberis Thunbergii, Japanese Barberry.
" vulgaris, Common Barberry.
" " purpurea, Purple Barberry.
Caragana arborescens, Siberian Pea-Tree.
Cornus alba, Red-twigged Dogwood.
Cotoneaster vulgaris, Common Cotoneaster.
Deutzia gracilis,
Diervilla (Weigelia) rosea, Rose flowered Weigelia.
Diervilla (Weigelia) candida, white flowered Weigelia.
Diervilla (Weigelia) Lonerii, Dark red Weigelia.
Elæagnus angustifolia, Russian Olive.
Hydrangea paniculata grandiflora, Japanese Hydrangea.
Lonicera, Tatarica, White flowered Bush Honeysuckle.
Lonicera Tatarica, Red flowered Bush Honeysuckle.
Lonicera chrysantha, Bush Honeysuckle.
Philadelphus coronarius, Mock Orange.
Potentilla fruticosa, Shrubby Cinquefoil.
Rhamnus catharticus, Common buckthorn.
Ribes aureum, Yellow Flowering Currant.
Rosa rubrifolia, Red-leaved Rose.
Sambucus Canadensis, Common Elder.
Sambucus Canadensis aurea, Golden-leaved Elder.
Spiræa opulifolia aurea, Golden-leaved Spiræa.
Spiræa van Houttei, van Houtte's Spiræa.
" callosa.
" " alba.
" Billardi.
Syringa Emodi.
" Josikæa, Josika's Lilac.
" Charles X, Charles X Lilac.
" vulgaris alba, White Lilac.
" " purpurea, Purple Lilac.
Viburnum Opulus, High bush Cranberry.
" sterilis, Common Snowball.
" Lantana, Pliant Viburnum.

Evergreen shrubs.

Juniperus Virginiana, Red cedar.
" communis, Common Juniper.
Pinus montana, Dwarf mountain pine.
Retinospora plumosa, Plumose retinospora.
" " Aurea, Golden pl."
" filifera, Thread-like "
Thuya occidentalis globosa, Globose Arbor-vitæ.
Thuya occidentalis Hoveyi.
" " variegata.
Mahonia Aquifolium, Holly Barberry.

VEGETABLE GARDEN.

Generally speaking, our farmers do not pay the attention they should to the growing of vegetables, to supply at least their own tables during the greater part of the year. It is generally the case that only a small percentage of those that might be cultivated are grown, and those varieties which require much care and attention are not usually included in the average kitchen garden. It is too often the case that more expensive foods take the place of those which the farmer might grow for himself.

There is nothing more conducive to the general health than a good free use of garden vegetables ; not only that but from an economical standpoint their growth to supply a part of our daily food is worthy of our consideration.

The work of keeping a well laid out kitchen garden properly cared for is not great if done at the proper time. There is probably more thought required than actual time, and the result of good planning are more marked in this department of farm work than almost any other. To have the very earliest and best varieties of vegetables it is quite necessary that we bring to our aid the hot-bed and the cold-frame. These are within the reach of almost every farmer, and should form a part of every farm's equipment.

During the past four years experiments have been carried on with some of the different varieties of vegetables and in this report a summary is given of the results obtained, and at the same time some hints given on the management of a kitchen garden. The kitchen garden well furnished is a desirable adjunct to the farm not only for supplying the table with wholesome food, but also that the young may be interested in garden work and see something in farm life beyond the routine of general field work. The seed required for a kitchen garden can be divided into two groups those to be started under glass and those for the open ground. Of the former the most important are : cabbage, cauliflower, tomatoes, lettuce, onions and celery. The following observations may be of help to those who have never had any experience in the construction of a hot-bed or cold frame.

THE HOT-BED.

A hot-bed should be located where protection can be had from the cold north and westerly winds. A southern exposure protected on the north by a building, tight fence or a hedge will furnish a desirable spot.

Horse-stable manure is the best to produce a good reliable steady heat, this should not be "fire-fanged" nor should it contain too much straw. Sufficient to make a bed 7 feet square and 18 inches deep is taken to the spot selected and put in a good square pile. Any dry parts of this manure should be mixed with the wet, and in some cases it is advisable to use water to make all parts of as even a dampness as possible. All parts of this pile should be firmed alike, if this is neglected the less firm parts will be liable to burn out while the more compact will just begin to generate a heat. This pile should be left for 6 or 8 days, or until its steaming indicates that fermentation is well under way, when it should be forked over again and made into a similar pile. In 3 or 4 days the manure will be ready for the permanent bed. When placing the manure in the bed see that all the parts are firmed alike in order that the heat may be generated evenly and thus uniformity of temperature secured.

The frame to place upon the bed to support the sashes should be 6 feet square. Boards 1½ inches thick are good material for the construction of a frame. Make the front 12 inches high and the back 18 inches, thus giving 6 inches for a southern slope to the sash. Bank the frame well around the outside with strawy manure, and inside put 5 inches of earth. The soil used should be a light loam of good quality. A good plan is to make a pile for this purpose the previous fall and cover it with strawy manure to keep it from freezing.

The above frame would support 2 sashes 3 x 6 feet in size. These would hold 3 rows of 10 x 12 inch glass. No cross bars are used, but bars running the length of the sash hold the glass. The lights are lapped like shingles about ½ inch.

After the bed is finished allow it to stand for a few days ventilating it occasionally to allow the rank steam to go off. Often the temperature in a newly made bed will run up to 100° making it desirable that we have a thermometer to determine the temperature. Seed should not be sown when the temperature is higher than 80°. From 45 to 50° Fahrenheit at night, and 75 to 80° during the day, have given good results here. In order to keep up such a temperature during very cold nights, the glass will have to be covered with mats, bags or straw. If such are used, they should be removed as soon in the morning as possible, as the early morning sun materially advances the growth of young plants.

During the day care and judgment must be exercised to ventilate according to the condition of the weather. A few hour's sun with no ventilation towards the middle of the day will sometimes do a great amount of damage. When water collects on the inside of the glass it shows that ventilation is required. In any case the frame should be closed about the middle of the afternoon thus preventing the bed from cooling too much before night.

Watering should not be neglected, but it should be done judiciously. Too much water should not be used especially if the weather is dark and cold, as the soil is liable to become soggy and sour, and the seeds, if not germinated, are liable to rot. Never water when the sun is shining brightly, for in doing so the foliage of the plant is liable to be injured. Keep in mind that success depends upon the bottom heat supplied from manure, the top heat from the sun, the giving of sufficient water and the necessary ventilation.

THE COLD-FRAMES.

Cold-frames are simply frames and sashes the same as those used on the hot-bed, the pit being filled with soil and no heat below. As soon as the plants started in the hot-bed are large enough, they are transplanted into cold-frames where they grow stronger and stouter, and being gradually hardened may be transplanted to the open ground more successfully.

CABBAGE.

Of the different varieties of cabbage experimented with the following seven varieties have proved the most desirable :—

Seed sown in the hot-bed April 1. Transplanted to the cold frame April 20. Transplanted to the open ground May 10.

EARLY VARIETIES.

Extra Early Express.—The earliest variety tested, a firm conical shaped head, of medium size with few outside leaves. Can be planted about 20 inches apart in the rows.

Early Jersey Wakefield.—The best early variety. It is about four days later than the Express but has made better heads. Medium size with few outside leaves and conical in shape, of excellent quality. It can also be planted close.

MEDIUM EARLY VARIETIES.

Henderson's Succession.—A very attractive variety, heads large and even, firm, round and a good header. The best to head of all the varieties tested.

Vandergaw.—Considerably later than Succession ; a large round firm head, of excellent quality. It heads well and is a good keeper—one of the best all round cabbages.

LATE VARIETIES.

Marblehead Mammoth Drumhead.—A very large variety, a good header, and firm. Quality excellent, a good keeper. A very desirable late sort.

Late Flat Dutch.—Large solid, round, flat head, a good header ; quality excellent and a good keeper.

Mammoth Rock Red.—Deep red colour, heads large, round and firm, an excellent header. The best red variety so far cultivated here.

CABBAGE SEED SOWN IN THE OPEN GROUND.

Seed of the varieties, Succession and Vandergaw, sown on May 15, also on June 1, in the open ground produced an excellent crop of good keeping winter cabbage. The seed was sown in rows 3 feet apart, scattered at intervals of 2½ feet in the rows, and thinned out to one plant when large enough. Cabbage grown this way have usually escaped the attack of the root maggot and are not set back by transplanting.

CAULIFLOWER.

For early cauliflower sow the seed in the hot bed April 1. Transplant to the cold frame April 20. Transplant to the open ground about the middle of May or earlier if possible. Cauliflower, as well as cabbage, will stand a light frost, and it is well where a few are wanted for early use to plant early and protect if necessary by covering. Those started early have made the best heads. Seed sown in the open ground along with cabbage have produced very fine heads for autumn use. The variety, Demi-Dur, gave the best results of the varieties sown in this way.

The following have been found to give the best results :—

Early—Early Snowball.—This is one of the earliest varieties and the most reliable in heading. Dwarf in habit it has a compact deep head, white, medium in size with short outer leaves. The plants can be set in rows 2½ feet apart and 20 inches apart in the rows.

Early—Selected Early Dwarf Erfurt.—Dwarf and compact, with a large white head, solid and of excellent quality. Heads well, plant 24 inches apart in the rows.

Half Early—Demi-Dur, or Half Early Paris.—White solid compact head, a good header. This variety comes in well as a medium early variety. Has a large head of excellent quality.

Late—Large Late Algiers.—A favourite late variety, a sure header, producing large compact heads of excellent quality.

TOMATOES.

The past season was not favourable for the growth of tomatoes. The vines made strong growth and although vigorously cut back the fruit did not set well.

The seeds were sown in the hot-bed April 10. Transplanted to the cold frame May 3, and set in the open ground June 9. When removing the plants from the cold frame to the open ground a transplanter is used, thus considerable earth is lifted with the plant and the growth is but slightly checked. Of the red varieties tested the following four have proved the most desirable. They ripened in the order named.

Imperial.—Ripens its fruit well, of excellent quality, medium in size, solid, smooth The fruit is inclined to crack open badly. Fruit ripe August 22.

Fordhook's First.—Medium in size, ripens about the same time as the Atlantic Prize, August 30. The fruit is smooth, solid, of a deep red colour, quality excellent, and ripens up well.

Early Ruby.—Good form, smooth, solid. The earliest large sized tomato. The vines are open, allowing the fruit to ripen up evenly. The best market variety so far tested.

Conqueror.—A late variety but very prolific, the best variety to plant if unripe fruit is desired. Fruit large, medium smooth, solid and of good quality.

Golden Queen.—A bright yellow smooth fruit. The best yellow variety tested. Flavour good.

To ripen tomatoes after they have been picked.—This can be successfully done by putting them in a cool, dark, dry place. Fruit of a much better flavour and solidity can be had by ripening in this way than in some sunny part of the house as is generally the practice. When fruit is gathered for this purpose be careful not to bruise it, as careful handling is quite essential if good results are to be obtained.

CELERY.

About the last of March sow the seed in a flat box or a large flower pot is sometimes used. Sow the seed shallow and cover with a piece of white cotton, thus keeping the soil dark and moist. Water frequently but do not go to extremes. Place in a window or where a moderate heat can be obtained. About ten days after sowing the seed will begin to sprout. Remove the covering and be careful not to allow the earth to dry out. As soon as the plants are large enough to handle transplant to the hot-bed placing them in rows 3 inches apart and from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch apart in the row. Keep shaded for a day or two if the weather should be bright, and keep the plants well watered. With good plants secured early celery culture may be made a success. When the celery is ready to transplant to the open ground, make a trench by ploughing deep, and taking out the loose material with a shovel, put in this trench 6 or 8 inches of well rotted barnyard manure covering with earth and mixing well. Firm the ground well when it will be ready for the plants. If the plants are strong and vigorous the tip of the roots and top should be clipped off. Plant in rows 4 feet apart, and 5 inches apart in the rows. It is advisable to shade the plants for a few days after planting.

Not much cultivation other than an occasional hoeing is required. Should the season prove dry the plants should occasionally be thoroughly watered. For blanching the early crop of such varieties as the white plume, boards are successfully used placing one on each side of the row, and in a couple of weeks the celery is fit for use. Other varieties of celery for the late supply can be more thoroughly blanched by earthing up. This is done where only a limited quantity is grown by wrapping paper around the plants in September and banking with earth. Should paper not be used hold the plant firmly with one hand while the first earth is being placed around the plant, thus preventing the earth from getting in around the stalks, after which bank nearly to the top.

When storing for the winter, lift the plants with a spade allowing earth to adhere to the roots, pack upright in a deep box in about 6 or 8 inches of earth, place the box on an earth floor in a cool dry cellar. Essential requirements for keeping celery in winter are a cool temperature with roots moist and tops dry.

The following varieties are recommended as among the most desirable.

White Plume.—The finest early celery, of dwarf self-blanching habit. It is crisp and solid and has a rich nutty flavour. One of the finest fall and early winter varieties and blanches easily. It is not as good a keeper as the *Paris Golden.*

Paris Golden.—Being of the self-blanching habit, it blanches easily. Not as early as the white plume but of a much larger growth. Has a compact solid growth, is crisp, and has a flavour that cannot be surpassed. It is a good keeper and the best early variety we have tested.

Giant Pascal.—Blanches quickly. Stalks are large, thick and crisp, and of a superior nutty flavour. It retains remarkable freshness after harvesting and is the best late market variety that we have grown, keeping well all winter.

LETTUCE.

There is no garden crop that will give as satisfactory returns for liberal cultivation and manure as lettuce. The value of the crop, as far as quality goes, depends largely upon the richness of the soil. Seed sown in the hot-bed, and transplanted to the open ground as early in the spring as possible, will give the earliest crop. To obtain a succession of crops, sow at intervals of two weeks in rows, in the open ground, and thin out or transplant to one foot apart, making the first sowing as early in the spring as possible. The varieties which have been most satisfactory for general use are as follows :—

Early Curled Silesia.—This is a valuable variety for forcing. It does not form a cabbage head, but the leaves are large and form a compact mass. The leaves are light green in colour, white inside, tender, crisp, and of fine flavour. It does not wilt readily, and stands well after cutting.

Hanson.—Forms a large, solid head, resembling a cabbage; white, crisp, tender, and quality excellent. Leaves green on the outside. One of the best for general culture. A standard market variety, and withstands dry weather well.

Paris White Cos.—The leaves of the Cos varieties do not form a head, are long, and require to be tied up to insure blanching; thus forming a bunch of tender, white, crisp leaves of excellent flavour. One of the best of the Cos type.

GARDEN PEASE.

Considering the great number of varieties of garden pease placed upon the market by the different seedsmen, experiments with as many varieties as possible was thought advisable. As a result of the information collected, the following three varieties can be safely recommended for general use :—

Little Giant.—Very early; medium sized pod; peas green, wrinkled, of delicious flavour. The vines are of very dwarf habit, and need no support. One of the most prolific early varieties.

Heroine.—Second early; large pod; peas wrinkled and large, of excellent quality. The vines grow about two feet high, are stiff, and will grow well without support. Very productive.

Stratagem.—One of the best varieties for general crop. Large pods, well filled; peas wrinkled, large, and of the finest flavour. Vines make strong growth about two feet high, and can be grown without support. Very prolific.

BEETS.

As soon as the ground can be prepared beet seed should be sown. If the seed is soaked in water for a few hours then put into a cotton bag and covered with earth for 24 hours before sowing, this treatment will promote early growth.

The following varieties are excellent for general use :—

Flat Egyptian Turnip.—A flat beet with dark-red, tender flesh of good quality. The earliest variety tested.

Extra Early Eclipse.—A globe-shaped, smooth beet of fine quality, deep red, tender flesh. Very few tops. Keeps well and is one of the best varieties for general crop.

Half Long Blood.—Long, smooth, dark-red, tender, flesh of excellent quality. A good keeper and fine winter variety.

EARLY TURNIPS.

The seed of these should also be sown as soon as the ground is fit.

Extra Early Milan.—The earliest variety we have tested. Rather a flat round bulb; flesh white, firm, and of excellent quality. It keeps well and is the best early market variety so far tested.

Early Golden Ball or Orange Jelly.—The best yellow variety tested; flesh bright yellow, firm, of good quality. Globe shape; a good keeper and valuable market variety. One of the best table sorts.

CARROTS.

Carrot seed can be sown as early as the ground is fit to work. Of the early garden and market sorts the following two varieties are entitled to a place among the best :—

Early Scarlet Horn.—A very early carrot, size small, quality excellent, skin orange red. Its shape is something similar to the Guerande. This variety is excellent for early crop.

Guerande or Oxheart.—One of the best varieties for general crop. Growth short and large, tapering abruptly to a small tap root. A deep red coloured carrot of very fine quality.

PARSNIPS.

Parsnip seed does not germinate readily and care should be taken to properly prepare the soil. Cover the seed not more than half an inch deep, and when up thin to 4 inches apart.

Parsnips not wanted for winter use can be left in the ground all winter in this climate and can be used as soon as the frost is out of the ground in the spring. Frost seems to improve the quality of these roots.

Guernsey.—A half-long variety best adapted to a shallow soil, of excellent quality, and a very desirable sort.

Hollow Crown.—Long, white and smooth; sweet and tender. A favourite variety, and its culture is recommended, although it is harder to gather than the Guernsey.

GARDEN CORN.

For early corn the liberal use of well rotted barn-yard manure, or even better that from the pig-yard, is quite essential. Plant the corn in hills 3 feet apart and about 5 kernels to the hill; put a good forkful of manure under each hill and sow the seed about the second week in May 1 inch deep. Give frequent culture if the best results are to be obtained.

The following varieties have proven the best here for general use:—

Early White Cory: A very early white sweet corn, of excellent quality, very productive.

Extra Early Marblehead: Later than the Cory, of excellent quality, white and sweet. A prolific and promising sort.

Mitchell's Extra Early: A very early corn, white, of good quality, one which produces well.

CUCUMBERS.

For early cucumbers plant in the hot-bed about the middle of April, and as soon as danger from spring frosts is over transplant, being careful that the earth around the roots is disturbed as little as possible. This can best be done by thoroughly soaking the ground and using a transplanter. For general crop plant in the open ground from the 10th to the 15th May. By removing from 10 to 12 inches of the top soil; filling in with manure, and covering with from 4 to 6 inches of earth, a very suitable place for growing cucumbers can be obtained. The following varieties have given good results:

Siberian: The earliest variety tested, grows from 4 to 5 inches long, and is very prolific.

White Spine: The most promsing sort for general culture, grows from 8 to 12 inches long, and when cut young are excellent for pickling.

Chicago Pickling: A small growing variety used entirely for pickling, the most prolific of the pickling sorts tested.

SQUASH.

The different varieties of squash can be easily divided into two quite distinct kinds—bush and running. The Bush Scallop and Summer Crookneck belong to the former and can be planted in rows 6 feet and 4 feet apart in the rows; the later and running sorts 12 feet apart each way. When preparing the hills use a liberal amount of barn-yard manure. Throw out the surface soil, put in the manure and cover with from 4 to 6 inches of earth. The following 3 varieties are very prolific and on account of their superior quality can be safely recommended.

Summer Crookneck: Bush habit of growth, very early; fruit long with a crooked neck, orange yellow colour, flesh firm and of excellent quality. Gives the best satisfaction of all the early varieties.

Essex Hybrid: Of a running habit, resembles the Turban Squash in appearance, but is much superior in quality. It has a hard shell and is an excellent keeper. Flesh thick, solid, fine grained, dry, sweet and of superior flavour. It has a rich yellow colour, is quite early and a very desirable sort.

Hubbard: A well known standard variety. Large, green, late, a good keeper, of excellent quality, fine grained and dry. One of the best for late winter use.

EXHIBITIONS ATTENDED.

An exhibit has been prepared of the products of the Maritime Experimental Farm, which were shown at the Charlottetown, P.E.I., exhibition, from 21st to 24th of September, also at the Nova Scotia provincial exhibition at Halifax, from September 28th to October 5th, and at the Westmoreland County exhibition, Sackville, N.B., October 14th. This exhibit included many of the varieties of fruits, besides the varieties of grains and grasses, grown on the farm.

AGRICULTURAL MEETINGS.

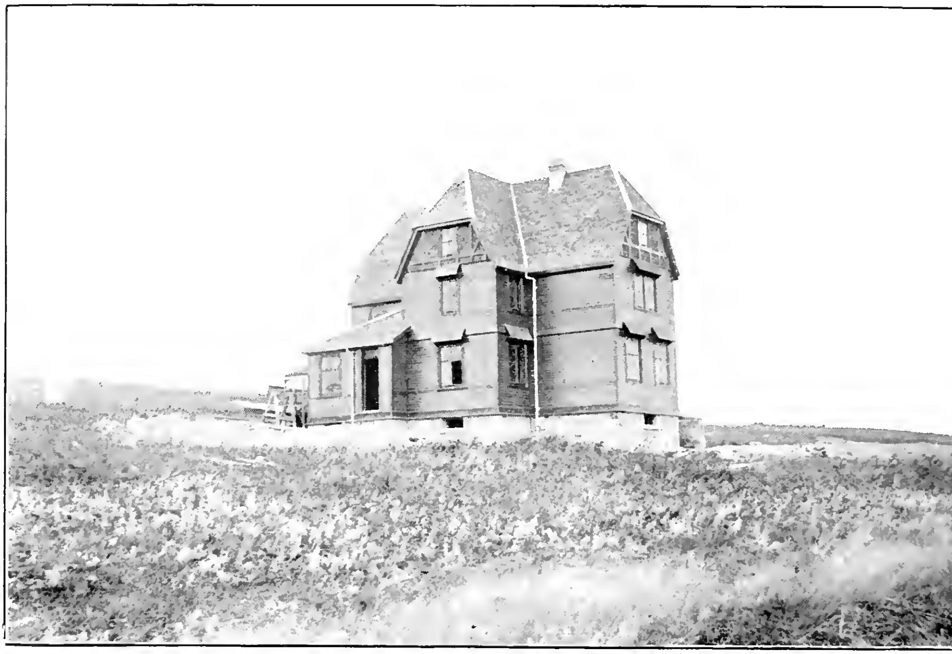
I attended the Nova Seotia Fruit Growers' Association at Wolfville, N.S., from January 19th to 22nd, also the Nova Scotia Farmers' Association at Middleton from the 26th to 29th January. Attended and took part in the meetings of the New Brunswick Farmers' Association at Fredericton, N.B., February 9th to 12th; the Colchester County Fruit Growers' Association, Truro, N.S., January 19th; and agricultural meetings at Jeffries' Corner, King's County, N.B., February 16th; Penobsquis, King's County, N.B., February 17th; and, at Point de Bute, West Co., N.B., February 26th.

Addressed farmers' meetings, called by Mr. W. W. Hubbard, secretary of the New Brunswick Farmers' Association, as follows:—

March 10th, Westfield, King's Co., N.B.
" 12th, Clifton "
" 13th, Central Norton "
" 15th, Berwick "
" 17th, Carsonville "
" 18th, Corn Hill "
" 23rd, Elgin, Albert Co., N.B.
" 26th, Harvey "
" 30th, Shediac, West Co., N.B.
April 5th, Baie Verte "
" 7th, Great Shemogue, West Co., N.B.
" 9th, Upper Cape "
May 3rd, Jolicure "

I have the honour to be, sir,
Your obedient servant,

W. S. BLAIR,
Horticulturist.



Appearance of grounds surrounding house of Superintendent, Experimental Farm Brandon, Manitoba, at time of building.

Appearance of grounds surrounding house of Superintendent, Experimental Farm, Brandon, Manitoba, three years after grading and planting, with addition of verandah

EXPERIMENTAL FARM FOR MANITOBA.

BRANDON, MAN., 30th November, 1897.

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

SIR,—I have the honour to submit herewith to you my tenth annual report with details of the experiments undertaken and work accomplished on the Brandon Experimental Farm during the past year.

Although the past season has generally been a very favourable one for the Manitoba farmer owing to the excellent quality of wheat and the high prices obtained for all kinds of farm produce, it has not been as favourable as usual for experimental purposes, especially with the oat crop on account of the prevailing severe wind storm and frost in the early part of the season.

The rainfall throughout the provinces during the growing season was very variable, the eastern portions generally having a plentiful supply while in the western districts it was considerably below the average, on this farm the rainfall was about 50 per cent of either of the two previous years, two inches only falling during June and July the two most critical months of the season.

The last week of May and first of June were noticeable for very low temperatures and high wind storms, which was very disastrous to the oat crop in exposed situations, the one-tenth acre plots devoted to the varietal test of oats suffering severely.

The benefit of hedges and shelter belts was very clearly demonstrated at this time, the grain growing on portions of the farm protected ever so slightly by a hedge or wind-break escaped injury from drifting soil and when this was followed by severe frost the unbruised plants in the protected areas were not frozen while the exposed grain was in many instances completely killed.

Fortunately the test plots of wheat and barley were uninjured by frost or wind and the results from them were very satisfactory.

There has been an almost total absence of rust among the grain crops and very little smut.

I beg to draw special attention to that portion of my report devoted to grasses and clovers, this very satisfactory series of plots has attracted considerable attention during the year and may open up the way to a more general cultivation of grasses and especially clovers in this country where nitrogenous gathering plants are so much needed.

Owing to the light rain-fall the yield of all fodder crops was below the average, but the favourable weather enabled them to be stacked in good condition.

No injury whatever was experienced from fall frosts, the grain all being harvested before there was any injury from this cause.

EXPERIMENTS WITH WHEAT.

Although the yield of wheat throughout the province has generally been much below the average, the returns of this cereal on the experimental farm has been about the average and the quality and weight much better than usual, owing to patches of scrub land many fields on this farm will not usually produce No. 1 Hard, but this year all fields and plots of Red Fife graded No. 1 hard and No. 1 extra.

Although the $\frac{1}{10}$ acre plots of wheat were grown in the same field as the oats and suffered equally from the winds of May ; the frosts during that month and early in June did not appear to injure the wheat plants and the crop was a very even one and the several experiments with wheat very satisfactory.

As usual Red and White Fife and White Connell are near the head of the list for productiveness and every effort is being made on this farm to improve the quality and productiveness of these excellent varieties.

Velvet Chaff, generally known here as Blue Stem, is being highly recommended by many farmers in this country, but we have found it no more productive than Red Fife and generally about five days later than that variety, an obvious disadvantage in this climate.

In addition to the varietal test of wheat will be found the following experiments in connection with wheat growing; different ways of summer-fallowing, preventatives of drifting soil, wheat on stubble and fall and spring ploughed land, preventatives of smut in wheat, sowing at different dates, &c.

The varietal test included thirty-nine varieties all were sown on 26 April, on black sandy loam. The size of the plots was one-tenth of an acre each and there was no injury from rust in any case.

WHEAT—Test of Varieties.

Name of Variety.	Date of Ripening.		Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre		Weight per Bush.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
White Fife	Aug.	19	115	42	Stiff	3¼	Beardless	3,570	40	30	61
White Russian	"	19	115	36	"	3	"	3,370	36	20	62
Red Fife	"	19	115	36	"	3½	"	3,080	35	20	61
Golden Drop	"	16	112	32	"	3	"	2,700	34	10	62
Monarch	"	20	116	41	"	3	"	3,310	34	..	61
Crown	"	14	110	41	"	3½	Bearded	2,870	33	..	59½
White Connell	"	23	119	37	"	3	Beardless	3,190	32	40	62
Wellman's Fife	"	23	119	34	"	3½	"	2,450	32	30	61
Blenheim	"	16	112	37	"	3	Bearded	3,110	31	30	60
Velvet Chaff or Blue Stem	"	24	120	42	"	2½	Beardless	3,370	31	20	60
Vernon	"	13	109	29	"	2½	Bearded	2,730	31	10	62
Emporium	"	20	116	36	"	3	"	3,490	31	..	61
Pringle's Champlain	"	19	115	33	"	3	"	2,790	31	..	61
Percy	"	16	112	41	"	3½	Beardless	2,610	30	40	62
Admiral	"	19	115	38	"	3½	"	2,870	30	30	61
Advance	"	16	112	36	"	4	Bearded	2,790	30	10	60
Hungarian	"	14	110	33	"	2½	"	2,640	30	10	62
Alpha	"	16	112	36	"	3	Beardless	2,370	29	40	60½
Beaudry	"	14	110	33	"	2	Bearded	2,670	29	40	62
Red Fern	"	19	115	34	"	3	"	2,900	29	10	61
Campbell's White Chaff	"	17	113	32	"	3¼	Beardless	2,640	28	30	61½
Colorado	"	14	110	40	"	3¾	Bearded	2,690	28	30	61
Rio Grande	"	15	111	32	"	3½	"	2,430	27	50	61
Preston	"	20	116	49	"	3	"	3,120	27	10	61½
Goose	"	20	116	42	Weak	2½	"	2,710	26	30	62½
Dion's	"	19	115	33	Stiff	2½	"	3,470	26	20	61
Rideau	"	19	115	33	"	2½	Beardless	2,190	26	..	60½
Old Red River	"	18	114	35	"	3	"	1,890	26	..	61
Dawn	"	13	109	26	"	2½	"	2,740	26	..	62½
Herrison Bearded	"	15	111	27	"	1	Bearded	2,370	25	30	63
Dufferin	"	17	113	33	"	3	"	2,170	24	40	60½
Countess	"	16	112	34	"	3	Beardless	2,540	24	20	61½
Ladoga	"	14	110	36	"	3	Bearded	2,690	24	20	59
Black Sea	"	14	110	33	"	3	"	3,240	23	30	59½
Progress	"	20	116	35	"	3	Beardless	2,570	23	.	62
Captor	"	20	116	38	"	3	"	4,390	22	40	61
Stanley	"	16	112	33	"	3	"	2,900	22	30	61
Beauty	"	18	114	33	"	3	"	1,800	22	30	59
Huron	"	16	112	35	"	3	Bearded	2,060	22	20	62

TEST OF DIFFERENT WAYS OF SUMMER FALLOWING.

It is claimed by some of our leading farmers that land can be ploughed in the early part of the season, a crop of green fodder taken off or pastured, and as large a yield of wheat obtained the following year as could be had from a bare fallow.

The following table shows the result of a series of plots devoted to this test.

The ploughing for all was done on the 22nd May, the oats on plot 3 were cut when in the milk stage, and yielded 2½ tons of dry fodder per acre, cattle were first turned into plot 1 when the oats were nine inches high.

The size of plots for this test were $\frac{1}{10}$ acre, the soil a strong black loam, and the seed was sown on the 28th of April.

From the foregoing table it would appear—

1. That sowing oats at the end of May and cutting them for green fodder lessened the yield of wheat the following year.

2. That where oats were sown on the 31st July and fed off the yield of wheat was somewhat larger than was obtained from bare fallow.

Name of Variety	How treated during 1896.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.	Lbs.	Bus.	lbs.	Lbs.
Red Fife....	Oats sown in July and fed off..	Aug. 20	114	33	Stiff..	3½	2,790	34	20	61½
"	Ordinary bare summer fallow........	" 20	114	37	" ..	3½	3,130	32	50	61
"	Oats sown in spring and cut........	" 19	113	36	" ..	3½	1,130	22	50	61

TEST OF PREVENTIVES FOR DRIFTING SOIL.

Certain classes of soil, when cultivated for a number of years, have a tendency here to drift badly in high winds, bruising some of the grain plants and uncovering the roots of others, and thereby greatly lessening the yield.

With a view of ascertaining whether different modes of sowing have any effect in lessening this evil, a number of plots on one of the most exposed parts of the farm were sown to wheat with different machines or at varying depths.

Owing to the prevailing wind storms being more northerly than usual, these plots were not as badly drifted as they have been in other years, still the results are suggestive.

All the plots were sown on 14th May, on summer fallow; soil, a light loam; size of plots, $\frac{1}{10}$ acre.

Name of Variety.	How Sown.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.	Lbs.	Bus.	lbs.	Lbs.
Red Fife....	Shoe drill, 4 inches deep............	Aug. 26	107	34	Stiff..	2½	2,650	32	30	61½
"	" 3 "	" 26	107	34	" ..	3	2,380	32		61
"	" 1 "	" 26	107	37	" ..	3	2,730	29	30	61
"	Hoe drill........................	" 26	107	35	" ..	3	2,750	29	10	61

RESULTS.

1st. The yield from the grain sown with the shoe drill exceeded that sown with the hoe drill by two bushels and fifty pounds per acre.

2nd. The yield increased in proportion to the depth of sowing. Many plants on the shallow sown plot were injured, which somewhat delayed their ripening.

FALL OR SPRING PLOUGHING FOR WHEAT.

This test has given the result usually obtained on this farm, the spring ploughing giving the largest return; this agrees with the experience of many Manitoba farmers on similar soil, but under the system of farming generally adopted here there does not appear to be sufficient time in the spring to plough for wheat.

For comparison the yield of an adjoining plot of summer fallowed land is given.

The soil was a black loam and the size of plots $\frac{1}{10}$ acre each.

Name of Variety.	How prepared.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
					In.		In.	Lbs.	Bsh	Lbs	Lbs
Red Fife ...	Summer fallowed	Apr. 26.	Aug. 19	115	36	Stiff..	$3\frac{1}{2}$	3080	35	20	61
" ...	Spring ploughed...........	" 26.	" 16	112	32	" .	3	2620	29	40	60
" ...	Fall ploughed.............	" 26.	" 16	112	33	" .	3	2200	26	40	$59\frac{1}{2}$

PREPARING STUBBLE LAND FOR GROWING WHEAT.

In some districts increased areas are being sown on clean unploughed stubble, the second crop after fallow, but there is a great difference of opinion regarding the most suitable treatment for such land.

Four plots each $\frac{1}{10}$ acre were selected for this test, the soil was a moderately rich black loam.

The burning and disc harrowing of the stubble was all done in the spring, and the sowing was made with a drill.

Size of plots $\frac{1}{10}$ acre, soil a moderately rich loam.

Name of Variety.	How treated.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				Inch.			In.	Lbs.	Bsh	Lbs	Lbs
Red Fife....	Disced on burnt stubble...	May 3..	Aug. 18.	107	33	Stiff..	3	2260	30	40	61
"	Drilled on burnt stubble....	" 3..	" 18.	107	33	" ..	"	1860	24		61
"	" on unburnt stubble.	" 3..	" 18.	107	34	" ..	$3\frac{1}{2}$	2480	23	40	61
"	Disced on " "	" 3..	" 18.	107	33	" ..	3	2040	22	40	61

THE TREATING OF SEED WHEAT FOR SMUT

Although experiments for the prevention of smut in wheat have been conducted here for a number of years, it is still one of the principal subjects dealt with by correspondents; for that reason it was thought advisable to repeat the experiments again this year.

From the accompanying table, it will be seen that the result of the test is very emphatically in favour of bluestoning. This result, however, should not encourage any one to sow smutty wheat, even when treated, if clean seed can be procured.

The proper use of bluestone is to prevent comparatively clean wheat from becoming smutty rather than to encourage the sowing of wheat already badly affected.

The size of the plots used for this test was $\frac{1}{10}$ acre, the soil a light loam, and both were sown on 12th of May.

Variety.	How treated.	When Ripe.	No. of Days Maturing.	No. of smutty heads on three feet square.	No. of good heads on three feet square.	Yield per Acre.		Pounds per Bushel.
						Bush.	Lbs.	Lbs
Red Fife, very smutty.. ..	Not treated....................	Aug. 26	106	435	95	8	40	46
" "	Blue stone sprinkled, 1 lb. to 10 bushels......................	" 26	106	84	355	20	10	59

EARLY, MEDIUM AND LATE SOWINGS.

The Red Fife wheat plots in this series are particularly regular in the yields and dates of maturing; the second sown plot as usual giving slightly the largest yield.

The injurious effects of the severe wind storms and frosts of May and June are very apparent on the earlier sown oats; the two earliest sown being completely killed out and the third plot of Abundance badly injured.

Its effect is also shown in the uneven ripening of this grain, the early sown plots being thin the plants continued to stool out and did not ripen in some instances as early as the later sown plots.

The Canadian Thorpe barley is evidently more susceptible to injury from frost than Odessa, as two plots of the former were destroyed from this cause, while no injury was apparent to the Odessa.

The third and fourth sown plots of Golden Vine pease were so badly mixed by a severe wind storm soon after cutting that it was impossible to keep the yields separate; this frequently occurs with pease here if sown alone. The only preventative I know for this is to sow oats with them at the rate of two pecks per acre, the combined crop can then be cut with a binder and stooked the same as any other grain.

All these plots were sown on summer fallow with a hoe drill. Soil a clay loam, uniform in character.

WHEAT—Early, medium and late sowings.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Red Fife........	April 28..	Aug. 17..	111	37	Stiff..	3	Beardless...	2,330	32	50	61½
"	May 5..	" 23..	110	35	" ..	3	" ...	2,370	33		61½
"	" 12..	" 25..	105	36	" ..	3½	" ...	2,640	31		61½
"	" 19..	" 31..	104	33	" ..	3½	" ...	2,750	30	50	60
"	" 26..	Sept. 2..	99	37	" ..	3½	" ...	2,690	26		60
"	June 2..	" 11..	101	32	" ..	3½	" ...	1,820	21	20	59½
Stanley	April 28..	Aug. 14..	108	39	" ..	3½	" ..	2,290	26		61
"	May 5..	" 23..	110	34	" ..	3½	" ...	1,990	21	50	61
"	" 12..	" 25..	105	39	" ..	3½	" ...	2,080	21	10	60
"	" 19..	" 27..	100	38	" ..	3½	" ...	2,490	26		61
"	" 26..	" 31..	97	39	" ..	3½	" ...	2,620	20	30	60
"	June 2..	Sept. 4..	94	38	" ..	4	" ...	3,540	15	10	58

OATS—Early, medium and late sowings.

Banner	April 28..	......	......	...	.....	.....	Killed by	wind &	frost.		
"	May 5..	....	......	...	.....	.....	"	"	"		
"	" 12..	Aug. 25..	105	42	Stiff..	9	Branching..	3,280	44	24	34
"	" 19..	" 23..	96	41	" ..	7	" ..	2,700	54	24	35
"	" 26..	" 25..	91	42	" ..	8	" ..	3,730	41	26	34
"	June 2..	" 31..	90	40	" ..	8½	" ..	3,900	29	14	33
Abundance......	April 28..	....	...	....	....	.....	Killed by	wind &	frost.		
"	May 5..	....	...	....	....	.....	"	"	"		
"	" 12..	Aug. 27.	107	42	Stiff..	8	Branching..	3,930	27	2	34
"	" 19..	" 25..	98	42	" ..	9	" ..	2,540	48	28	34
"	" 26..	" 23..	89	41	" ..	8	" ..	3,990	31	6	34
"	June 2..	" 25..	84	42	" ..	8	" ..	4,090	25	10	33

BARLEY—Early, medium and late sowings.

Odessa	April 28..	Aug. 14..	108	23	Stiff..	2½	6 rowed.....	1,860	20	30	47
"	May 5..	" 18..	105	29	" ..	3	"	2,240	22	4	47
"	" 12..	" 18..	98	31	" ..	2	"	1,970	31	42	49
"	" 19..	" 19.	92	29	" ..	2½	"	1,880	32	34	49
"	" 26..	" 20..	86	29	" ..	2	" ...	2,280	35	40	49
"	June 2..	" 31..	90	29	" ..	2	"	2,340	31	22	47
Canadian Thorpe.	April 28..	....	.....	....	......	.....	Destroyedby	wind &	frost.		
" .	May 5..	....	.....	....	......	.....	"	"	"		
" .	" 12..	Aug. 31..	111	30	Stiff..	3	2 rowed.....	2,380	21	12	48
" .	" 19..	" 31..	104	33	" ..	3½	"	2,180	28	26	49
" .	" 26..	Sept. 4..	101	30	" ..	3	"	3,700	25		49
" .	June 2..	" 11 .	101	32	" ..	3	"	2,960	24	38	48

PEASE—Early, medium and late sowings.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
				In.	In.		Bush.	Lbs.	Lbs.
Golden Vine	April 28..	Aug. 20..	114	26	2½	Small	27	30	64
"	May 5..	" 22..	109	40	2½	"	27	10	64
"	" 12..	" 30..	110	34	2¼	" .... }	60	50	64*
"	" 19..	Sept. 3..	107	34	2¼	" ... }			
"	" 26..	" 9..	106	38	2½	"	34	10	63
"	June 2..	" 12.	102	40	2½	"	28		63
Mummy	April 28..	Aug. 22..	116	28	3½	Medium ...	27		64
"	May 5..	" 30..	117	29	3	"	20	50	64½
"	" 12..	Sept. 1..	112	30	3	"	29	50	64
"	" 19..	" 8..	112	33	3	"	30	20	63½
"	" 26..	" 10..	107	40	3	"	33	30	63
"	June 2..	" 13..	103	42	3	"	25	30	63

* The crop from these two plots was badly mixed by a wind storm after cutting and the yield given is the product of both.

EXPERIMENTS WITH OATS.

More injury was done to the oat crop by spring frost last May than during any year in the history of the province, where the frost was preceded by drifting soil, carried by strong winds, many fields of oats were either completely destroyed or the plants so badly thinned that weeds took possession of the ground choking out the grain.

In the varietal test of oats on this farm, 15 varieties were completely killed out, 11 badly injured and many others more or less thinned; depending on their exposure to the high north-west winds of 29th May; for this reason the results obtained from the series of plots planted as a comparative test of varieties are unfortunately this year of little or no value for the purpose designed.

All the plots uninjured by wind and frost gave a fair yield of grain and the straw was unusually free from rust; the seed of all varieties was immersed for five minutes in a bluestone liquid composed of 1 pound bluestone to 3 pails (24 quarts) of water before sowing and very little injury was done by smut.

Sixty-one varieties of oats were sown with a hoe drill, all on 1st May, on $\frac{1}{10}$ acre plots, soil a fairly rich black loam which had been summer-fallowed.

OATS—Test of Varieties.

Name of Variety.	Date of Ripening	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs
Golden Tartarian	Aug. 23	114	42	Stiff	12	Sided	2,760	83	18	33
New Electric	" 18	109	37	Weak	8	Branching	3,040	78	8	36
Early Golden Prolific	" 18	109	42	Stiff	8	"	2,640	76	26	37
Joanette	" 21	112	29	Weak	6	"	3,120	71	16	36½
California Prolific Black	" 23	114	42	Stiff	8	Sided	3,130	68	8	36
Rosedale	" 20	111	41	"	8	Half sided	3,410	67	12	36½
Pearce's Black Beauty	" 20	111	40	Weak	10	Branching	2,770	67	2	36
Pense	" 25	116	44	Stiff	10	Sided and half sided	3,550	64	24	36
Russell	" 18	109	42	"	10	Half branch'ng	2,870	62	22	35
Golden Beauty	" 20	111	42	"	9	Branching	2,650	57	12	34
Siberian O. A. C.	" 25	116	42	"	10	"	3,260	57	2	34
Early Etampes	" 25	116	42	"	9	"	3,690	56	6	33
Prize Cluster	" 10	101	42	"	11	"	2,140	56	6	38
Holstein Prolific	" 20	111	42	"	9	"	3,130	55	..	34
Scotch Hopetoun	" 25	116	38	Weak	9	"	4,290	54	24	36
Banner	" 19	110	42	Stiff	9	"	3,240	53	8	34
Columbus	" 25	116	38	"	9	"	3,220	52	12	35
Victoria Prize	" 18	109	43	"	9	"	2,480	52	2	38
Coulommiers	Sept. 4	126	44	"	9	"	4,080	52	2	35
Early Maine	Aug. 24	115	39	"	8	"	3,030	52	2	34
Early Blossom	" 20	111	42	"	10	Half sided	3,690	51	26	35
White Schonen	" 29	120	42	"	6	Branching	3,190	50	10	33
Oxford	" 19	110	41	"	10	Branching and half sided	3,490	48	28	35½
Miller	" 19	110	35	"	6	Branching	3,160	48	8	34
Flying Scotchman	" 19	110	42	"	10	"	3,940	47	12	37½
Improved Ligowo	" 25	116	40	"	8	"	2,590	47	12	37½
Early Archangel	" 18	109	39	"	7	"	3,370	46	16	37
Mortgage Lifter	" 10	101	42	"	10	"	2,480	44	26	35
Master	" 25	116	42	"	8	Branching and half sided	3,040	44	14	35
King	" 19	110	36	"	7	Branching	3,460	42	12	31
Wallis	" 25	116	42	"	10	"	3,370	39	4	35
Abundance	" 25	116	49	"	9	"	3,530	38	28	34½
Newmarket	" 11	102	42	"	9	"	2,480	38	28	34
Dunn	Sept. 4	126	44	"	10	"	3,980	37	12	34
Lincoln	Aug. 25	116	40	"	8	"	3,080	37	12	36
Oderbruch	" 19	110	40	"	7	Half branch'ng	3,040	37	2	35½
White Russian	" 25	116	42	"	11	Branching	4,630	35	30	34
Welcome	" 13	104	38	"	10	"	2,860	35	..	38
Winter Grey	" 24	115	42	"	9	"	3,060	35	..	37
Abyssinia	" 31	122	42	"	10	Half sided	3,850	33	28	34
Green Russian	" 14	105	40	"	8	Branching	3,780	32	32	32
Hazlett's Seizure	" 24	115	42	"	10	"	3,290	32	22	35
Medal	" 26	117	42	"	9	Branching and half sided	3,080	31	16	35
Rennie's Prize White	" 18	109	44	"	10	Branching	2,640	29	24	38
Poland	" 20	111	42	"	10	"	2,940	28	8	36
Imported Irish	" 23	114	41	"	9	"	3,340	28	8	38
Cream Egyptian	" 19	110	42	"	9	Half sided	3,340	26	26	37
Excelsior	" 8	99	34	"	8	Branching	480	21	6	34
Doncaster Prize	" 20	111	37	"	7	"	3,360	20	10	36
Wide Awake	" 25	116	39	"	8	"	3,870	18	18	35

Excelsior was extremely early, for that reason birds gathered on this plot and destroyed a large proportion of the grain.

OATS TEST OF VARIETIES ON SPRING-PLOUGHED WHEAT STUBBLE.

Many farmers have the impression that Banner Oats may possibly prove the most prolific variety on summer-fallowed land, but that Black Tartarian gives the largest yield on spring-ploughed stubble.

From the accompanying table, it will be seen that in this instance the Black Tartarian equalled the Banner Oats in yield, a result which is seldom obtained on summer-fallowed land.

The soil on these plots was a moderately rich black loam, size of plots, $\frac{1}{20}$ acre; sown with a shoe drill.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Abundance	May 3..	Aug. 13.	102	34	Stiff..	7	Branching	1,790	41	16	42
Banner	" 3..	" 14.	103	35	" ..	7	" ..	1,450	36	26	43
Black Tartarian......	" 3..	" 16.	105	33	" ..	8	Sided.....	1,050	36	26	44
White Russian......	" 3..	" 16.	105	36	" ..	7	Branching	1,810	35		44

EXPERIMENTS WITH BARLEY.

The barley plots fortunately were sown this year somewhat later than usual, and escaped injury both from wind and frost; the test as a comparison of varieties was a very successful one, and the yield good for such a dry year.

The size of the plots for both six and two-rowed varieties was $\frac{1}{10}$ acre, and the soil a clay loam, which had been summer fallowed. Thirty-eight varieties were tested, twenty of six-rowed and eighteen of two-rowed, and all were sown on the 13th of May. No rust occurred on any of the plots.

BARLEY, SIX-ROWED.—Test of Varieties.

Name of Variety.	Date of ripening.	Number of Days maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			Inch.		Inch.	Lbs.	Bush.	Lbs.	Lbs.
Trooper	Aug. 17..	96	28	Stiff....	2½	2,690	51	12	50
Summit	" 19..	98	33	" ...	3½	3,240	50	10	49
Excelsior	" 11..	90	34	" ...	3½	2,640	49	8	40
Champion	" 11..	90	38	" ...	3	2,910	47	34	37
Success	" 10..	89	28	" ...	3	1,950	44	38	40
Common	" 11..	90	29	" ...	3	2,310	43	26	50
Rennie's Improved	" 16..	95	33	" ...	2	2,000	42	34	49
Nugent	" 17..	96	28	" ...	3	2,180	41	2	48
Odessa	" 17..	96	33	" ...	3	2,300	40	30	48½
Phœnix	" 17..	96	32	" ...	2½	2,260	39	18	51
Surprise	" 20..	99	30	" ...	3	2,980	38	46	51
Petschora	" 25..	104	31	" ...	2	2,230	35	40	47
Oderbruch	" 16..	95	34	" ...	3	2,490	34	28	49
Mensury	" 17..	96	33	" ...	4	2,400	34	18	49
Stella	" 23..	102	31	" ...	3	2,590	33	26	48½
Baxter's	" 18..	97	32	" ...	2	2,580	32	34	51
Vanguard	" 16..	95	30	" ...	2½	2,090	29	18	49
Pioneer	" 24..	103	31	" ...	3	2,600	29	8	52
Blue	" 14..	93	30	" ...	2½	1,870	27	34	48
Royal	" 16..	95	27	" ...	2¾	3,330	25	20	49

BARLEY, TWO-ROWED—Test of Varieties.

Name of Variety	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.	Lbs.	Bush.	Lbs.	Lbs.
Sidney	Aug. 17	96	30	Stiff	3½	3,010	46	32	53
Pacer	" 20	99	34	"	3½	3,630	46	12	52
Nepean	" 20	99	32	"	3½	3,340	46	2	50
French Chevalier	" 23	102	32	"	5	3,610	43	26	48
Thanet	" 24	103	30	"	5	3,480	42	4	50
Victor	" 20	99	32	"	3½	3,480	42	4	51½
Emerson	" 19	98	31	"	3	2,710	40	20	51
Bolton	" 17	96	32	"	3¾	2,320	37	4	52
California Prolific	" 20	99	32	"	3	2,750	36	22	47
Prize Prolific	" 24	103	31	"	5	4,030	34	38	49
Beaver	" 20	99	28	"	3½	2,710	34	8	52
Rigid	" 17	96	31	"	3	2,240	32	24	47½
Danish Chevalier	" 24	103	33	"	4	3,340	30	20	48
Canadian Thorpe	" 25	104	33	"	3	3,180	23	16	48
Duckbill	" 20	99	30	"	3	2,830	22	14	48½
Newton	" 23	102	33	"	3	2,840	22	4	49
Monck	" 23	102	34	"	3½	3,770	21	22	51
Kinver Chevalier	" 25	104	32	"	4½	3,230	21	12	48

EXPERIMENTS WITH PEASE.

For the first time in the history of the farm the crop of field pease was injured by spring frost, it was noticeable, however, that only such plants as were bruised by drifting soil showed serious injury, ten degrees of frost having very little injurious effect on the unbruised plants.

The following varieties were exposed to the full force of the north-west storms of early June, and in consequence were seriously injured, hence the returns given of these cannot fairly be used in comparing the productiveness of varieties—Archer, White-eyed Marrowfat, White Wonder and Chancellor.

The four most productive sorts this year were all cross-bred varieties, which have been originated on the experimental farms.

The sample of pease was much finer this year than usual, the care exercised in selecting uniform seed each year has greatly improved many sorts.

All the varieties were sown on the 17th of April, the size of the plots was $\frac{1}{20}$ acre each, and the soil a clay loam, which had been summer fallowed; a hoe drill was used in seeding and from 2 to 2½ bushels of seed sown per acre.

PEASE—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Length of Pod.	Size of Pea.	Yield Per Acre.		Weight per Bushel.
			Inch's	Inch's		Bush.	Lbs.	Lbs.
King	Aug. 26	131	38	3	Large	42	40	62
Alma	" 26	131	34	3½	"	40	40	63½
Bedford	Sept. 6	142	28	2½	Medium	40		64
Trilby	Aug. 26	131	39	3½	Large	38	20	62
Mummy	" 25	130	24	2	Medium	37	40	62
Bright	Sept. 6	142	35	3	"	37	20	63½
Carleton	" 4	140	38	3	Small	36	40	64
Creeper	Aug. 26	131	30	2	"	36	40	63½
Archer	" 26	131	44	2½	Medium	36		64
Centennial	" 26	131	33	3½	Large	35	40	62
Victoria	" 30	135	36	3	"	35	20	64
Mackay	" 26	131	33	3½	"	35		63
Prussian Blue	" 26	131	42	3	Medium	35		63
White Wonder	" 18	123	24	2	"	34	40	64
New Potter	" 26	131	28	2	"	34	40	63
Kent	" 26	131	31	3½	Large	34		63
Golden Vine	" 20	125	30	2	Small	34		63½
Chancellor	" 10	115	32	2	"	34		63
Elephant Blue	" 20	125	34	3	Medium	34		62½
Crown	" 20	125	30	2	Small	33	40	63½
Prince	" 26	131	39	3½	Large	33	20	63
Prince Albert	Sept. 5	141	32	3	Small	32		63½
Agnes	Aug. 25	130	33	3	Medium	32		63½
Harrison's Glory	" 25	130	20	3	"	32		62
Pride	" 19	124	16	3	"	31	40	65
Canadian Beauty	" 26	131	36	3	"	30	20	63½
Black Eyed Marrowfat	" 26	131	33	3½	Large	29	20	64
Oddfellow	" 26	131	36	3	Medium	29	20	65
Arthur	" 20	125	30	......	"	29	20	62
Duke	Sept. 4	140	30	.....	Large	27		64
Nelson	Aug. 23	128	37	2½	Medium	26	40	64
Early Britain	" 20	125	27	3	"	26	40	61
Paragon	Sept. 6	142	30	3	"	26	40	63
Multiplier	" 2	138	42	2½	Small	26	20	63
Vincent	Aug. 25	130	33	3	Medium	26		63
Daniel O'Rourke	" 18	123	31	3	"	25	20	65
Macoun	Sept. 4	140	34	3	"	25		62½
Perth	Aug. 26	131	36	3	"	24	40	62
Large White Marrowfat	" 30	135	44	3½	Large	22	40	64
Bruce	Sept. 6	142	30	3½	"	21	20	63¼

EXPERIMENTS WITH INDIAN CORN.

The very light rainfall of the past season lessened the yield of fodder corn very materially, and the returns were considerably below the average.

The soil was a black loam; all the varieties were sown on the 19th of May, and the yield per acre has been calculated from the weight of crop cut from two rows, each 66 feet long.

The long open fall was favourable for ripening, and matured ears could have been obtained from many varieties, but it was thought advisable to cut the fodder at the usual date, 28th August.

For the first time in our experiments, the yield from corn sown in hills exceeded that sown in drills. This is probably to be attributed to the hills being in a soil slightly more moist.

In addition to the test plots of fodder a field of 8 acres was planted for ensilage purposes, and a fair crop was harvested and cured for ensilage. As the corn in this field was in the late milk stage when cut, the ensilage will doubtless be fully up to the average in quality. The yield, however, is less than usual.

INDIAN CORN—Test of Varieties.

Name of Variety.	Height.	Leafiness.	When Tasselled.	In Silk.	Early Milk.	Late Milk.	Condition when cut.	Weight per acre grown in rows.		Weight per acre grown in hills.	
	Inches.							Tons.	Lbs.	Tons.	Lbs.
Red Cob Ensilege	82	Very leafy	Aug. 20				In tassel	19	500	16	100
Wisconsin White Dent	73	"	" 7	Aug. 13	Aug. 21	Aug. 27	Late milk	18	1,400	14	1,700
Rural Thoroughbred White Flint	66	"	" 21	" 26			In silk	17	1,200	16	100
North Dakota Yellow Flint	60	"	" 7	" 13	Aug. 24		Early milk	17	1,200	11	
Longfellow	68	"	" 7	" 21	" 25		"	16	1,000	11	1,100
Giant Prolific Ensilage	79	"	" 10	" 24			In silk.	15	800	13	400
Canada White Flint	72	Fairly leafy.	" 6	" 14	Aug. 24		Early milk	15	800	10	900
Saltzer's North Dakota	65	Very leafy	" 8	" 13	" 21	Aug. 25	Late milk	15	800	11	
Kaffir Corn	52	"					Not in tassel	15	800	18	1,400
White Pearl Pop Corn	67	"	Aug. 25				In tassel	15	800	12	1,300
Sanford	64	Fairly leafy.	" 13	Aug. 21	Aug. 25		Early milk	14	600	9	1,800
Extra Early Huron Dent	60	"	" 6	" 13	" 21	Aug. 25	Late milk.	14	600	12	1,300
White Rice Pop Corn	78	"	" 6	" 14	" 21		Early milk	13	1,500	10	900
Champion White Pearl	73	Very leafy	" 7	" 13	" 21	Aug. 27	Late milk.	13	400	19	1,600
Sweet Fodder Corn	52	Fairly leafy.	" 5	" 12	" 21	" 25	"	13	400	9	700
Clouds Early Yellow	92	"	" 20	" 25			In silk	12	1,300	16	1,000
Mammoth 8-rowed flint	73	Very leafy	" 6	" 13	Aug. 21	Aug. 25	Late milk	12	200	16	1,000
King of the Earliest	69	"	" 8	" 13	" 21	" 25	"	12	200	14	600
Ninety-day Corn	74	Fairly leafy.	" 12	" 21	" 25		Early milk	12	200	11	1,760
Early Butler	77	"	" 6	" 14	" 20		"	11	1,760	18	1,400
Compton's Early	66	"	" 7	" 13	" 20		"	11	1,100	14	1,700
Angel of Midnight	62	Very leafy	" 8	" 14	" 21		"	11	1,100	19	1,600
Selected Leaming	79	"	" 21	" 25			In Silk	11	1,100	13	400
New White Cap Yellow Dent	84	"	" 9	" 15	Aug. 20		Early milk	11		15	1,800
Pearce's Prolific	62	Fairly leafy.	" 8	" 16	" 21	Aug. 25	Late milk	11		9	700
Cuban Giant	80	Very leafy	" 20	" 25			In silk	11		17	1,200
Amber Rice Pop Corn	62	Few leaves	" 8	" 15	Aug. 21	Aug. 25	Late milk	11		9	700
Wisconsin Yellow Dent	72	Fairly leafy.	" 14	" 21	" 27		Early milk	11		9	700
Mitchell's Extra Early	42	"	" 1	" 6	" 10	Aug. 21	Late milk	8	1,600	13	400
Pride of the North	77	"	" 13	" 20	" 25		Early milk	8	500	11	
Kendalls Giant Corn	45	Few leaves	" 1	" 8	" 14	Aug. 23	Late milk	7	300	9	700

FIELD ROOTS.

The season has not been a favourable one for field roots, the rainfall being much too light for these moisture-loving plants.

The land for all kinds of field roots was prepared by spreading ten loads of well rotted manure per acre in the fall. The land was then ploughed at once eight inches deep, and well harrowed and rolled. In the spring the field was simply harrowed and the seed sown in flat drills, and kept clean during the growing season by means of a one-horse cultivator and hoeing.

EXPERIMENTS WITH TURNIPS.

Eighteen varieties of turnips were tested this year, sown at two different dates. The previous crop was mangels. They were quite free of injury from insect enemies, but the yield, owing to insufficient rainfall, was much below the average, although the quality was excellent. As usual, the early sown plots, with few exceptions, gave the largest returns. The purple top varieties continue to take the lead for productiveness.

The soil was a rich sandy loam; the estimate of yield has been made from the product of two rows, each 66 feet long. The roots are free of rot. The first plots were sown on the 20th May, the second on the 3rd June, in drills 30 inches apart; all were pulled on 1st October.

TURNIPS—Test of Varieties.

Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Hall's Westbury	11	1,232	387	12	8	1,952	299	12
Halewood's Bronze Top	11	440	374	..	8	1,424	290	24
Mammoth Clyde	10	328	338	48	6	1,200	220	
Shamrock Purple Top	9	1,800	330	..	8	1,424	290	24
Prize Purple Top	9	1,536	325	36	8	1,160	286	.
Marquis of Lorne	9	1,008	316	48	6	1,992	233	12
East Lothian	9	480	308	..	8	1 688	294	48
Pearce's Prize Winner	9	216	303	36	10	856	347	36
Bangholm Selected	9	216	303	36	8	1,424	290	24
Carter's Elephant	8	1,952	299	12	7	520	242	
Skirving's	8	1,952	299	12	8	1,160	286	
Giant King	8	1,688	294	48	7	1,576	259	36
Jumbo or Monarch	8	1,424	290	24	8	632	277	12
Hartley's Bronze	8	896	281	36	8	1,952	299	12
Sutton's Champion	8	632	277	12	9	1,800	330	
Perfection Swede	7	1,576	259	36	9	744	312	24
Selected Champion	7	1,048	250	48	6	1,728	228	48
Selected Purple-Top Swede	4	712	145	12	11	440	374	

EXPERIMENTS WITH MANGELS.

The light rainfall of the past year has reduced the crop of mangels to one-half of last year's returns.

Eighteen varieties were sown, but the seed of three of these germinated badly, and the yield given is not a fair test of these varieties.

The first set of plots were sown on the 20th of May, the second on the 3rd of June, and the roots from both were pulled on 30th September.

They were sown after turnips, the soil was a rich sandy loam which was ploughed deeply in the fall, the seed was sown in flat drills 30 inches apart, and the yields per acre have been estimated from the product of two rows each 66 feet long.

MANGELS—Test of Varieties.

Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Champion Yellow Globe	26	8	866	48	15	96	501	36
Mammoth Long Red	25	424	840	24	15	1,944	532	24
Selected Mammoth Long Red	23	464	774	24	26	1,328	888	48
Giant Yellow Intermediate	22	352	739	12	16	1,000	550	
Canadian Giant	21	32	700	32	20	1,184	686	24
Norbitan Giant	20	1,976	699	36	23	1,256	787	36
Red Fleshed Globe	20	392	673	12	13	1,984	466	24
Giant Yellow Globe	19	808	646	48	15	1,944	532	24
Ward's Large oval shaped	18	1,488	624	48	19	1,336	655	36
Golden Tankard	17	584	576	24	14	1;832	497	12
Giant Yellow Half Long	15	1,944	532	24	18	112	585	12
Mammoth Long Red (Evans)	15	1,680	528	..	18	696	611	36
Warden Orange Globe	14	1,832	497	12	12	816	413	36
Gate Post	14	776	479	36	20	128	668	48
Golden Fleshed Tankard	13	400	440	..	11	1,760	396	
Red Fleshed Tankard	11	176	369	30	6	144	202	24
Large Oval Globe	10	856	347	36	12	1,344	347	36
Yellow Intermediate	6	672	211	12	17	56	567	36

EXPERIMENTS WITH CARROTS.

As usual carrots have suffered more from the light rainfall than any of the other field roots, and the yield of all varieties is much below the average.

Fifteen varieties of carrots have been under test this year. The soil was a rich sandy loam which had been deeply fall ploughed; the previous crop was turnips. The seed was sown in flat drills 18 inches apart at two different dates, the first plots on the 20th of May, the second on the 3rd of June, and all were pulled on the 30th September.

The yields per acre have been calculated from the product of two rows each 66 feet long.

CARROTS—Test of Varieties.

Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
White Green Top Orthe	4	360	139	20	3	600	110	
Mammoth Intermediate	3	600	110		3	1,480	124	40
Giant White Vosges	3	600	110		5	1,440	190	40
Iverson's Champion	3	600	110		5	1,000	183	20
White Belgian	2	1,720	95	20	3	160	102	40
Early Gem	2	840	80	40	3	1,480	124	40
Half Long White	2	840	80	40	4	1,240	154	
Yellow Intermediate	2	400	73	20	3	1,920	132	
Half Long Chantenay	2	400	73	20	2	400	73	20
Long Orange or Surrey	1	1,520	58	40	3	160	102	40
Scarlet Intermediate	1	1,520	58	40	3	1,920	132	
Improved Short White	1	1,080	51	20	3	160	102	40
Guerande or Ox Heart	1	640	44		2	400	73	20
Carter's Orange Giant	1	640	44		2	1,280	88	
Long Scarlet Altringham		1,760	29	20	3	160	102	40

EXPERIMENTS WITH SUGAR BEETS.

The following are the yields obtained from five varieties of sugar beets, sown at two different dates on rich black loam treated in the same manner as mangels.

The first plots were sown on the 20th of May, and the second on 3rd June.

All were pulled on the 30th September, and the yield per acre has been calculated from the produce of one row 66 feet long.

SUGAR BEETS—Test of Varieties.

Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Red Top Sugar	20	1,184	686	24	16	1,792	563	12
Vilmorin's Improved	20	656	677	36	10	1,120	352	
Improved Imperial	15	1,680	528	.	13	1,192	453	12
Danish Improved	13	928	448	48	20	392	673	12
Wanzleben	11	176	369	36	13	1,720	462	

EXPERIMENTS WITH POTATOES.

The yield of potatoes was not only lessened by the unusually light rainfall, but from some unknown cause many varieties germinated badly.

The land selected was in barley last year, and was deeply ploughed in early spring. It was again ploughed shallow on 21st of May, and the tubers cut in pieces, with two or three eyes each, were planted in every third furrow.

The field was kept clean of weeds during the growing season by the use of harrows and cultivator.

There were no rotten potatoes and very few scabby ones.

All the varieties were planted on the 21st May, in black loam soil, without manure, and were dug 29th September.

The yield per acre has been estimated in each case fr m the product of one row, 66 feet long.

The following varieties germinated badly and the returns given from them should not be considered a fair test of their productiveness: Pearce's Prize Winner, Lee's Favourite, Good News, Early White Prize, Honeoye Rose, Orphan's, Beauty of Hebron, Albany No. 1, Daisy, Lightning Express, Early Ohio and I.X.L.

POTATOES—Test of Varieties.

Name of Variety.	Character of Growth.	When Matured.	Average Size.	Quality.	Yield per Acre. Total.		Marketable.		Unmarketable.		Form and Colour.
					Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
New Variety No. 1	Rank	Sept. 9	Med. to large	Fair	363	..	341	..	22	..	Flat, white.
Reeve's Rose	"	" 9	Sm'll to med.	Very dry	341	..	333	40	7	20	Round, red.
Seedling No. 7 B.C.	Very rank	" 9	Med. to large	Wet	322	40	322	40	...	..	Long, flat, deep red.
Reading Giant	Fair	" 9	Medium	Dry	315	20	293	20	22	..	Round oval, pink and white.
Flemish Beauty Seedling	Rank	" 12		"	304	20	275	..	29	20	Long, red.
E. J. Hunter	"	" 9	Med. to large	"	300	40	300	40	...	..	Long, round, red.
Clarke's No. 1	"	" 9	Medium	"	289	40	282	20	7	20	" pink.
General Gordon	Fair	" 13	Med. to large	"	264	..	245	40	18	20	" red.
Everett	"	" 9	"	"	260	20	260	20	...	..	" light red.
Great Divide	"	" 9	Sm'll to med.	Wet	256	40	242	..	14	40	" white.
Lizzie's Pride	"	" 9	Med. to large	Dry	256	40	256	40	...	..	Flat oval, lt. red.
Late Puritan	Rank	" 9		Fair	253	..	238	20	14	40	Long, red.
Pride of the Market	"	" 9	Med. to large	Dry	253	..	253	..	...	..	Wht. kidney.
Hale's Champion	Fair	" 13	Sm'll to med.	"	249	20	231	..	18	20	Flat, round, wht.
Brown's Rot Proof	Very rank	" 9	"	Fair	249	20	238	20	11	..	Round oval, red.
King of the Roses	Fair	" 3	Medium	Dry	245	40	245	40	...	..	Oval, light red.
Dreer's Standard	Rank	" 9	"	Fair	242	..	238	20	3	40	Long, round, wht
Chicago Market	Fair	" 13	Med. to large	Dry	238	20	220	..	18	20	Flat oval, light yellow.
Houlton Rose	"	" 9	"	Fair	238	20	238	20	...	..	Long, round, lt. pink.
Irish Cobbler	Weak	" 13	"	Dry	231	..	231	..	...	..	Flat, round, wht.
Hopeful	Rank	" 9	"	Fair	223	40	223	40	...	..	Long, flat, white.
Seedling No. 7	Very rank	" 9	"	Damp	220	..	220	..	...	..	Round oval, deep pink.
Lady Frances	Rank	" 9	Sm'll to med.	Fair	216	20	179	40	36	40	Oval white.
McKenzie	"	" 9	"	Choice	216	20	198	..	18	20	Long, round, wht.
American Wonder	"	" 9	Med. to large	Wet	212	40	205	20	7	20	Large, oval "
Money Maker	Fair	" 9	Sm'll to med.	Dry	209	..	179	40	29	20	" round "
State of Maine	Very rank	" 9	"	Fair	209	..	198	..	11	..	" flat "
Russell's Seedling	Rank	" 9	Med. to large	Dry	205	20	187	..	18	20	Round oval "
Delaware	Fair	" 9	"	Damp	201	40	201	40	...	..	Long flat "
Forty Fold	Rank	" 9	Sm'll to med.		201	40	154	..	47	40	Round, blue.
Quaker City	Very rank	" 9	Med. to large	Fair	201	40	201	40	...	..	Flat oval, white.
Carman No. 1	Rank	" 9	Sm'll to med.	Wet	201	40	201	40	...	..	Long, round "
Seattle	"	" 9	Medium	Dry	201	40	190	40	11	..	" "
Charles Downing	Fair	" 9	Med. to large	"	198	..	198	..	...	..	Flat oval "
Early Rose	Fair	" 13	"	Dry	198	..	198	..	...	...	Oval, pink.
Burpee's Extra Early	Weak	" 5	"	Fair	198	..	183	20	14	40	"
Sharpe's Seedling	"	" 5	"	Dry	198	..	198	..	...	...	"
Empire State	Very rank	" 9	Medium	Wet	194	20	194	20	...	...	Round, white.
Early Gem	Weak	" 10	"	Dry	194	20	172	20	22	..	Oval, red.
Green Mountain	Rank	" 9	Med. to sm'll	"	194	20	190	40	3	40	Long, white.
Munroe Country	Fair	" 9	" to large	Choice	194	20	194	20	...	.	" red.
Troy Seedling	"	" 9	Sma. to med.	Wet	190	40	157	40	33	..	" white.
Wonder of the World	"	" 5	Med. to large	Dry	190	40	190	40	...	...	Oval, red.
Uncle Sam	"	" 9	Sma. to med.	Wet	190	40	190	40	...	...	Long, white.
Northern Spy	"	" 9	Med. to large	Dry	187	..	176	..	11	..	" deep red.

POTATOES—Test of Varieties—*Continued.*

Name of Variety.	Character of Growth.	When Matured.	Average Size.	Quality.	Yield per acre. Total. Bush.	Lbs.	Marketable. Bush.	Lbs.	Unmarketable. Bush.	Lbs.	Form and Colour.
Satisfaction (Suttons)	Rank	Sept. 9..	Sma. to med.	Wet	187	..	161	20	25	40	Round, lig. y'l'w.
S. E. Bill..........	Fair	" 9..	" ..	Fair	183	20	110	..	73	20	" blu. wh'e.
Seedling No. 230....	"	" 13..	" ..	Choice....	183	20	183	20	..	..	" white.
Queen of the Valley.	Very rank	" 9..	Large	Dry	183	20	183	20	..	..	Long, pink.
Early Six Weeks....	Weak	" 10.	Med. to large	"	183	20	168	40	14	40	Round, "
Dakota Red.........	Rank	" 9..	Large	Wet	183	20	183	20	..	..	Long, red.
Crown Jewel........	Weak	" 10..	Med. to large	Dry	179	40	161	20	18	20	Round, light red.
Earliest of All....	"	" 3..	" ..	"	179	40	176	..	3	40	Oval, "
Ideal..............	Rank	" 9..	Large	Fair	179	40	179	40	..	..	Long, red.
White Beauty.......	Fair	" 13.	Med. to large	Dry	179	40	179	40	..	..	" white.
Early Norther	"	" 5..	" ..	Fair	176	..	176	..	..	..	" pink.
Satisfaction	Rank	" 12..	Medium....	Dry	176	..	157	40	18	20	" white.
Vanier	"	" 9..	Med. to small	"	176	..	168	40	7	20	" pink.
World's Fair........	Fair	" 9..	Med. to large	"	176	..	176	..	..	..	Flat, white.
Early Harvest	Weak	" 10..	" ..	Choice....	172	20	172	20	..	..	Long, "
Early Puritan......	Fair	" 9..	Sma. to med.	Wet	172	20	165	..	7	20	" "
Good News.........	....	" 9..	Med. to large	Fair	168	40	168	40	..	..	Long, round, pink
Pride of the Table...	Fair	" 9..	" ..	Dry	168	40	157	40	11	..	Flat, oval, "
Brownell's Winner..	Rank	" 9..	" ..	Fair	168	40	168	40	..	..	" red.
Duke of York.	....	" 9..	" ..	"	165	..	165	..	..	..	" yellow.
Victor Rose.........	Fair	" 9..	" ..	Wet	165	..	161	20	3	40	Long, flat, red.
Columbus..........	Rank	" 9..	Sma. to med.	Dry	165	..	146	40	18	20	" round, "
Burnaby Seedling...	Fair	" 9..	Large to med	Fair	161	20	161	20	..	..	" " "
Peerless Junior......	Rank	" 9..	Small to med	Fair	161	20	154	..	7	20	Round, white.
Rough Red..........	Fair......	" 9..	" ..	"	161	20	88	..	73	20	" pink.
Grampions..........	"	" 9..	" ..	Wet......	157	40	135	40	22	..	" "
Irish Daisy..........	"	" 9..	" ..	Dry	157	40	157	40	..	..	"
Polaris	Weak	" 9..	Med. to large	"	154	..	150	20	3	40	" pink.
Rochester Rose.....	Fair.. ...	" 9..	" ..	"	154	..	154	..	..	..	Long "
Maule's Thoroughb'd	"	" 9..	" ..	Wet......	154	..	150	20	3	40	" "
Jennie Deans.......	Rank.....	" 9..	Small......	Dry	150	20	143	..	7	20	Round, white.
Early Sunrise.	Weak	" 5..	Med. to large	Fair	146	40	124	40	22	..	" oval, pink.
Pearce's Extra Early	"	" 10..	" ..	Dry......	146	40	139	20	7	20	Oval, lt. red.
Rural Blush.........	Rank.....	" 9..	Small to med	"	146	40	146	40	..	..	" red.
Seedling 214........	Very weak	" 13..	" ..	Fair	146	40	146	40	..	..	" white.
American Giant....	Fair......	" 9..	Medium	"	143	..	132	..	11	..	White.
Algoma No. 1.......	Very weak	" 1..	Med. to large	Dry.....	139	20	132	..	7	20	Oval, pink.
Thorburn.	Fair......	" 13..	" ..	"	139	20	139	20	..	..	" "
Princess May.......	"	" 13..	Small.	Fair.....	135	40	102	40	33	..	" "
"Bill Nye".........	"	" 9..	Small to med	Wet......	132	..	132	..	..	..	Long r'nd, white.
Early White Prize..	Weak	" 5..	Med. to large	Fair......	124	40	124	40	..	..	Oval, lt. yellow.
Fill-basket..........	Fair......	" 9..	" ..	Dry......	124	40	124	40	..	..	Long, deep pink.
London............	Weak	" 5..	" ..	"	124	40	124	40	..	..	Flat, oval, red.
Rose No. 9..........	Rank.....	" 9..	" ..	Fair......	121	..	113	40	7	20	" " "
Snowdrop	Fair......	" 9..	Small to med	Dry......	113	40	95	20	18	20	" " white.
Harbinger..........	"	" 10..	" ..	"	113	40	99	..	14	40	" pink.
Sir Walter Raleigh..	"	" 9..	" ..	... .	110	..	110	..	..	..	" white.
New Queen.........	Weak	" 10..	Large	Fair......	110	..	102	40	7	20	Long r'nd, pink.
Freeman...........	Fair......	" 10..	Small to med	Wet......	110	..	110	..	..	..	Flat oval, white.
Abundance (Sutton's No. 6)...........	Rank.....	" 9..	Small	... .	110	..	58	40	51	20	White.
Maggie Murphy....	"	" 9..	Med. to large	Dry	106	20	106	20	..	..	Long flat, lt. red.
Stourbridge Glory...	"	" 9..	Small	Wet......	102	40	47	40	55	..	White.
I. X. L.	Fair......	" 9..	Med. to large	Fair......	102	40	102	40	..	..	Long round, red.
Her Majesty........	Rank.....	" 9..	Small ...	... .	99	..	51	20	47	40	
Beauty of Hebron...	Weak	" 10..	Med. to large	Dry......	95	20	95	20	..	..	Long oval, red.
Rural New Yorker, No. 2.	Fair.....	" 9..	Small to med	Wet......	91	40	55	..	36	40	Round flat, white
Carman No. 3.....	"	" 9..	" ..	Fair......	88	..	51	20	36	40	Long flat, lt. yel'w
Clay Rose	Rank.....	" 9..	Med. to large	Wet......	88	..	51	20	36	40	Long flat, red.
Lee's Favourite.....	Very weak	" 10..	" "	Dry......	88	..	80	40	7	20	Oval, light red.
Record.....	Rank.....	" 9..	Small	Fair.	88	..	7	20	80	40	White.
Bovee..	Weak.....	" 5..	Med. to large	Choice....	78	20	71	..	7	20	Oval light red.

POTATOES—Test of Varieties—*Concluded.*

Name of Variety.	Character of Growth.	When Matured.	Average Size.	Quality.	Yield per Acre. Total. Bush.	Total. Lbs.	Marketable. Bush.	Marketable. Lbs.	Unmarketable. Bush.	Unmarketable. Lbs.	Form and Colour.
Holborn Abundance	Fair	Sept. 9	Sm'll to med.	Wet	73	20	36	40	36	40	Round, white.
Early Ohio	Weak	" 1	Med. to large	Choice	73	20	73	20	..	..	" light rose.
Vick's Extra Early	Fair	" 9	Sm'll to med.	Fair	71	..	71	..	..	..	" " yellow
Ohio Junior	Very weak	" 1	Med. to large	Dry	71	..	71	..	..	..	" " pink.
Prize Taker	Fair	" 9	" "	Fair	71	..	71	..	..	..	" deep red.
Orphans	"	" 9	Small	Wet	66	..	36	40	29	20	White.
Daisy	Very weak	" 10	Medium	Dry	51	20	51	20	..	..	Round oval, red.
Lightning Express		" 9	Large	"	44	..	44	..	..	..	Long flat, pink.
Turner's Hall Seedling No. 5	Rank	" 9	Small	Wet	44	..	..	..	44	..	
Pearce's Prize Winner		" 9	Med. to large	Dry	36	40	36	40	..	..	Flat oval, white.
Honeoye Rose		" 9	" "	Fair	22	..	22	..	..	..	Oval, light pink.
Albany No. 1		" 9	Small	Wet	18	20	18	20	..	..	Kidney.
Table King	Fair	" 9	Sm'll to med.	Dry	14	40	14	40	..	..	Round, white.

EXPERIMENTS WITH FLAX.

The series of experiments with flax begun in 1896, were continued during the past season, the yield of straw is heavier this year but the return of seed is less.

The soil was a rich clay loam summer-fallowed, size of plots $\frac{1}{20}$ acre. One half of each plot was pulled as soon as the seed pods had turned brown, the other half was left until the seed had ripened, when it was cut and threshed in the usual way.

Variety.	Amount of Seed sown per acre. Lbs.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw. Inch.	Date when Pulled for Fibre.	Weight of Straw when pulled for Fibre, per Acre. Lbs.	Yield per Acre. Bush.	Yield per Acre. Lbs.	Weight per Bushel. Lbs.	Weight of Straw when cut per Acre. Lbs.
Flax	40	May 26	Aug. 27	93	30	Aug. 17	2,600	9	36	56	3,180
"	80	" 26	" 27	93	25	" 17	3,700	11	44	56	3,320
"	40	June 2	" 31	90	29	" 25	3,300	11	24	56	2,660
"	80	" 2	" 31	90	29	" 25	3,900	14	16	56	2,560
"	40	" 9	Sept. 3	86	29	Sept. 1	3,500	12	28	56	2,100
"	80	" 9	" 3	86	29	" 1	3,800	12	48	56	2,280
"	40	" 16	" 6	82	28	" 5	3,540	10	20	56	2,720
"	80	" 16	" 6	82	28	" 5	2,040	11	44	56	2,140

The plots sown on the 2nd of June gave the best return of seed, the sowings of the 9th June the largest quantity of straw. In every instance the thicker sowing gave the largest return of seed per acre and with one exception the largest quantity of straw also.

EXPERIMENTS WITH GRASSES AND CLOVERS.

Owing to the rapidly increasing herds of cattle and the lessening natural pasturage in Manitoba, the interest in grasses and fodder plants is increasing each year. For this reason special attention has been paid to this branch of experimental work, and during the past season about one hundred plots, varying in size from $\frac{1}{40}$ acre each to 6 acres, have been devoted to grasses and clovers with gratifying success.

The objects in view when undertaking this work were :—

1st. To ascertain the hardiness and suitability for this country of the different varieties tested.

2nd. To compare results from sowing grass seed with and without a crop of grain.

3rd. To ascertain the most suitable quantities of seed for sowing.

4th. To see whether a crop of clover, sufficiently heavy to benefit the soil as a green manure, could be grown either in one or two years.

5th. To gain information regarding the most suitable mixtures of grasses for hay and permanent pasture.

The summer of 1896 was an exceptionally favourable season for grasses, and all the varieties were in good condition by fall; the snow came early and remained until the following spring, making an excellent covering during the severe months of winter.

The following plots of grass were one-tenth acre in size and the clovers one-twentieth acre each. The field was in barley during 1895 and the stubble was ploughed in the spring of 1896. The seed was sown broadcast on all the plots on the 8th of May, 1896, and at once harrowed in. Weeds were mowed twice during 1896, but none of the plots produced sufficient grass in that year to pay for cutting.

The soil was a medium sandy loam.

GRASSES—Test of Varieties.

Variety.	Seed per Acre.	Height on 15th May.	Height of Aftermath.	Thickness of Aftermath.	Yield per Acre.	
	Lbs.	In.	In.		Tons.	Lbs.
Western Rye Grass (Agropyrum tenerum)	20	6	8	Thin	3	750
Awnless Brome Grass (Bromus inermis)	20	10	10	Very thick	3	400
American Rye Grass (Elymus americanus)	20	6	8	Thin	2	510
Bald Rye or Wheat Grass (Elymus Virginicus)	20	7	4	Poor	2	200
Fall Meadow Oat Grass (Avena elatior)	30	8	11	Fair	1	400
Meadow Foxtail (Alopecurus pratensis)	20	7	12	Germinated badly	1	200
Hard Fescue (Festuca duriuscula)	20	4	6	" "	1	200
Timothy (Phleum pratense)	15	4	9	Thin	1	200
Orchard Grass (Dactylis glomerata)	25	5	10	Very thick	1	50
Red Top (Agrostis vulgaris)	20	7	8	Fair	1	
Timothy, mixed	10	4	10	"		750
Common Clover "	10	4	12	"		

GRASSES—Thin, Medium and Thick Sowing.

Variety.	Seed per Acre.	Apparent Thickness on 6th July.	Height when cut.	Yield per Acre.	
	Lbs.		In.	Tons.	Lbs.
Timothy (Phleum pratense)	5	Rather thin	27	1	600
" "	10	Right thickness	27	1	670
" "	15	Too thick	27	1	750
" "	20	"	27	1	700
Awnless Brome Grass (Bromus inermis)	10	Thin	28	2	350
" " "	15	Right thickness	28	2	
" " "	20	Too thick	28	2	400
Western Rye Grass (Agropyrum tenerum)	10	Too thin	27	3	400
" " "	15	Right thickness	27	3	200
" " "	20	Too thick	27	3	300
Bald Rye or Wheat Grass (Elymus Virginicus)	10	Too thin	26	2	700
" " "	15	Right thickness	26	2	700
" " "	20	Too thick	26	2	750
American Rye Grass (Elymus americanus)	10	Too thin	32	3	
" " "	15	Right thickness	32	3	555
" " "	20	Too thick	32	3	500

GRASSES—Mixtures for Hay and Pasture.

No.	Variety.	Seed of each Variety.	Total seed per Acre.	Appearance 6th July.	Aftermath.	Yield per Acre.	
		Lbs.	Lbs.			Tons.	Lbs.
1	Western Rye Grass	10	15	Principally Western Rye Grass	Poor	2	800
	Canadian Blue	5					
2	Alfalfa Clover	20	40	" Alfalfa Clover	"	2	400
	Western Rye Grass	20					
3	White Dutch Clover	5	20	" Timothy	Fair	2	200
	Kentucky Blue Grass	10					
	Timothy	5					
4	Hard Fescue	5	25	" Timothy and Fescue	"	1	900
	Sheep "	5					
	Canadian Blue	5					
	Timothy	5					
	Red Top	5					
5	Canadian Blue	5	15	" Timothy	"	1	600
	Timothy	10					
6	Canadian Blue	10	20	" Timothy	"	1	400
	Timothy	10					
7	Awnless Brome Grass	10	20	" Awnless Brome	Good	1	200
	Canadian Blue	10					

CLOVERS—Test of Varieties.

Variety.	Seed per Acre.	Height on 15th May.	Aftermath Height.	Aftermath Thickness.	Yield per Acre.	Remarks.
	Lbs.	Inch's	Inch's		Tons. Lbs.	
Bokhara..	10	4	32	Fair......	14 ..	Very woody.
Alfalfa..........................	60	6	15	"	2 100	Promising.
Mammoth Red..................	25	4	8	"	1 500	"
Alsike...........................	10	3	4	"	1 100	Too short for hay.
Red Clover....	20	4	15	Thick	.. 900	Injured by drought.
White Dutch........	12	2	....	....	not cut....	Only fit for pasture.

SUMMARY.

1st. In a favourable season, that is when the snow comes early and remains all winter; many of the hardier varieties of grasses and clovers will winter successfully in this climate,

2nd. Western Rye Grass (a native of our prairies) again takes the lead for yield of hay, the quality is also excellent but Awnless Brome Grass gives nearly as much hay and better aftermath, the pasture in spring is also earlier.

3rd. The yield of hay for the first year is not materially influenced by the amount of seed used above a certain quantity, but thick seeding is expected to lessen the yield during the second and following years.

4th. Western Rye Grass and Canadian Blue gave the largest yield of any mixtures tested but the aftermath is light for the first year, but may improve in a year or two when the Blue Grass gets established.

5th. Clover sown without a nurse crop can be depended upon for a green manure in a favourable season, but it is doubtful whether it will prove a success if sown with a grain crop.

GRASS SEED DISTRIBUTION.

There has been a very much larger demand for samples of grass seed during the past season than in any former year; fortunately the crop on the Experimental Farm was larger than usual. Seventeen hundred and fifty-one pound bags were sent out in the free distribution, and forty-two lots of about fifteen pounds each were sold.

MILLETS.

Five varieties of millets were tested during the past season, they were all sown on summer fallow in drills 7 inches apart.

Some of the plots suffered more than others from the severe winds of May, and for that reason the experiment as a comparative test of varieties can not be considered conclusive.

Hungarian Grass has generally given the best results on this farm, and it was one of the most productive this year.

Size of plots one-twentieth of an acre, soil rich black loam; all were sown on 27th May.

Name of Variety.	When Sown.	Size of Plot.	When Headed.	Kind of Head.	Height of Straw.	Yield per Acre.	
		Acre.			Inch.	Tons.	Lbs.
Japanese	May 27	1/20	....	Not headed	32	4	1,000
Hungarian	" 27	1/20	Aug. 20	Round	33	3	1,800
Golden Wonder	" 27	1/20	" 15	"	30	3	800
New Manitoba	" 27	1/20	" 1	Branching	44	2	....
New Siberian	" 27	1/20	" 20	Round	31	1	1,800
Golden Millet	" 27	1/20	" 11	"	30	1	....
*Holy Terror	.....	.....	....	....	.....	....	....

* Destroyed by wind, &c.

CATTLE.

The herd of cattle on this farm now consists of 20 head; all have been perfectly healthy during the year.

Since the outbreak of tuberculosis in 1894 all animals have been tested with tuberculin before being admitted into the regular cattle buildings. The whole herd has been tested again this fall, and none of the animals have reacted.

The following is a list of the names, breed, age and weight of the animals:—

Name of Animal.	Breed.	Age.	Weight.
			Lbs.
Qu'Appelle Red Knight, bull	Shorthorn	4 years	2,165
Brandon Fashion, cow	"	4 "	1,265
Rideau Chief, bull	Ayrshire	4 "	1,570
Dandy, cow	"	8 "	1,200
Brandon Jock, bull calf	"	9 months	430
Princess Leda 2nd, cow	Holstein	8 years	1,545
Manitoba Prince, bull	"	4 "	2,170
Leda of Brandon, cow	"	3 "	1,235
Leda's Princess of Brandon, heifer	"	18 months	1,000
Brandon Monk, bull calf	"	10 "	785
Lady Jane Grey, cow	Grade	9 years	1,220
Topsy, cow	"	5 "	1,115
Daisy, cow	"	9 "	1,300
Pansy, cow	"	3 "	1,140
Fanny Fern, cow	"	2 "	1,135
Violet, heifer	"	21 months	875
Jennie, heifer	"	19 "	920
Black Prince, steer calf	"	2 years	1,290
Barney, steer calf	"	6 months	540
Spotty, steer calf	"	2 "	170

EXPERIMENTS IN FEEDING STEERS.

The exports of steers from this province have been much larger this year than during any previous year in the history of the province, but I regret that a large proportion were stockers sold probably at from fifty to seventy-five per cent less money than they would bring if stall fed and shipped to Great Britain; if it pays the Americans to purchase these stockers for fattening with the addition of a heavy import duty it would certainly pay our farmers to fatten them here.

In 1895 a test was made on this farm of the feeding value of native hay cut in the unbroken meadows, as compared with oat sheaves; this year native hay made from wheat grass (Elymus virginicus) but grown on cultivated land was fed in comparison with oat sheaves. For this purpose eight shorthorn grade steers two years old were purchased in December at 2½ cents per pound live weight and sold in May at 4 cents.

The steers were divided into two evenly matched groups of four each and fed all they would eat clean of the following ration.

First lot of four steers.

	Pounds.
Native hay cut (Elymus virginicus)	18
Turnips cut	30
Barley chopped	5
Oats "	2

Second lot of four steers.

	Pounds.
Oats sheaves cut (Banner)	18
Turnips cut	30
Barley chopped	5
Oats "	2

The actual amount and estimated value of the feed consumed during the feeding period of 93 days was as follows :—

First lot of four steers.

5,976 pounds native hay at $5 per ton	$14 94
128 bushels turnips at 5 cents per bushel	6 40
1,758 pounds barley chop at ½ cent per pound	8 79
700 pounds oats chop at ½ cent per pound	3 50
	$33 63

Second lot of four steers.

6,416 pounds oat sheaves at $5 per ton	$16 04
133 bushels turnips at 5 cents per bushel	6 65
1,840 pounds barley chop at ½ cent per pound	9 20
728 pounds oat chop at ½ cent per pound	3 64
	$35 53

Summary of Results.	First cost of Steers.	Value of Feed consumed.	Price sold for.	Profit per lot.	Daily gain of each Steer.
	$ c.	$ c.	$ c.	$ c.	Lbs. Oz.
First lot of four steers with hay	109 75	33 63	198 80	55 42	1 8
Second lot of four steers with oat sheaves	110 50	35 53	196 40	50 37	1 5

From the above it would appear that the cultivated native hay is worth rather more per ton than oat sheaves, for fattening purposes.

The yield of hay from this grass varies greatly from year to year, depending on the rainfall, but it averages somewhat less than the yield of oat sheaves, under the same conditions.

This grass succeeds remarkably well on dry uplands where an oat crop would give small returns; its roots are also very useful in preventing the drifting of soil.

EXPERIMENTS FOR THE PURPOSE OF MAINTAINING THE FLOW OF MILK DURING THE AUTUMN MONTHS.

Last year's report contained the particulars of an experiment with Awnless Brome Grass for the above purpose. During the past season the experiment was repeated with equally satisfactory results, and an additional test with fodder corn was undertaken.

Four cows were selected for this test, and, after several weeks of uniform feeding to ascertain the normal yield of milk, two were fed for three weeks commencing on fair native pasture, and the other two on the same pasture, with the average addition of 755 pounds of green fodder corn per week for the two.

The following table gives the details of the experiment.

First Week Aug. 22nd to 28th or Normal Yield.

How Fed.	Yield of Milk.
No. 1. Pasture alone	317 lbs.
No. 2. do	241 lbs.

Second Week.

How Fed.	Yield of Milk.	Gain over Normal.
No. 1. Pasture and 665 lbs. corn	343 lbs.	26 lbs. gain.
No. 2. Pasture alone	226 "	15 " loss.

Third Week.

How Fed.	Yield of Milk.	
No. 1. Pasture and 750 lbs. corn	330 lbs.	13 lbs. gain.
No. 2. Pasture alone	231 "	10 " loss.

Fourth Week.

How Fed.	Yield of Milk.	
No. 1. Pasture and 850 lbs. corn	319 lbs.	2 lbs. gain.
No. 2. Pasture alone	209 "	32 " loss.

Summary.

No. 1. Two cows with corn and pasture average weekly gain over normal 13 pounds.

No. 2. Two cows with pasture alone weekly loss below normal 19 pounds.

From the above it will be seen that the yield of milk from the two fed on pasture decreased at the average rate of 19 pounds per week while the two cows receiving the additional feed of corn made an average gain of 13 pounds per week for the three weeks, showing that this useful fodder plant can be utilized for the purpose of maintaining the flow of milk until severe frost, when the cows can be turned into Brome Grass aftermath; which is not affected by even severe frosts.

Brome Grass pasture in comparison with native grass pasture during the autumn months.

For this test the same cows were used as in the experiment just mentioned, but in this case the No. 1 group of two cows were fed on native pasture while the No. 2 group were kept on Brome Grass pasture.

The large gain made by the first two cows during the second week was no doubt owing to their having a somewhat larger range of pasture than before, the change evidently being a decided benefit at first.

The results given in the following table indicate the great value of the Awnless Brome Grass for this purpose.

First Week, Sept. 12th to 18th.

	How fed.	Yield of Milk.
No. 1.	Pasture and 850 lbs. green corn	319 lbs.
No. 2.	Pasture alone	209 "

Second Week.

	How fed.	Yield of Milk.	Gain over first week.
No. 1.	Native pasture	424 lbs.	105 lbs. gain.
No. 2.	Brome Grass	431 "	222 " "

Third Week.

No. 1.	Native pasture	230 lbs.	89 lbs. loss.
No. 2.	Brome Grass	227 "	18 " gain.

Fourth Week.

No. 1.	Native pasture	194 lbs.	125 lbs. loss.
No. 2.	Brome Grass	202 "	7 " "

Summary.

No. 1. Group. Native pasture lost a weekly average of 36 pounds of milk.
No. 2. " Brome Grass made a weekly average gain of 77 pounds of milk.

SWINE.

The herd of swine on the farm consists of :—

Name.	Breed.	Age.
Chrissie, sow	Berkshire	2 years.
Sir Richard, boar	"	1 "
Amber Belle, sow	Tamworth	2 "
Barrow (not named)	"	1 "
Dunrobin, boar	"	6 months.
Squire, boar	Chester, white	6 "

As it was impossible to procure young pigs for experimental purposes at a suitable time, no experiments were made with these animals during the year.

POULTRY.

The breeds of poultry kept on the farm during the past year consisted of White and Barred Plymouth Rocks and Black Minorcas. All were perfectly healthy and there has been no recurrence of the sore throat so troublesome last year.

As a thorough trial of the Barred Plymouth Rocks has been made during former years, it was thought advisable to discontinue keeping this breed and a change has been made to White Plymouth Rocks, for that reason no record of eggs has been kept during the year.

About sixty chickens about equally divided between White Plymouth Rock and Black Minorcas have been raised this summer without any loss whatever from sickness.

The White Plymouth Rock Cockerels being quite promising as table fowl their fitness for this purpose has been tested. A number of turkeys were also procured for the same purpose.

FATTENING POULTRY.

The importation into this province of dressed fowls reaches large dimensions each year, it is estimated that twenty thousand turkeys alone were imported into Winnipeg last season. This represents a large sum of money, all of which should be retained in the province. In addition the demand for dressed fowl in many other districts is large and increasing, much of which could be supplied from here.

Recognizing the importance of this subject, some attention has been paid during the past season to the fattening of poultry. Ten turkeys, five male and five female, hatched on a neighbouring farm in May, were purchased. Five of these were penned up and fed with a mixture composed of 50 per cent wheat, 25 per cent oats and 25 per cent barley. The ration was fed chopped and wet with milk in the morning and the whole grain fed for the evening meal.

The five running at large were allowed to gather the bulk of their food in the fields, only a very small quantity of grain being given them morning and evening to attract them to the roost.

The five penned birds were given all they would eat up clean twice a day.

In addition to the ten turkeys ten cockerels were selected for the same purpose, six of them being White Plymouth Rocks and four Black Minorcas. These were fed with the same kind of food and in the same manner as the turkeys.

The penned fowl both turkeys and chickens were, when dressed, much plumper and in every way more inviting than those which had been running at large, but the close confinement and heavy feeding appears to injure the chickens otherwise, the White Plymouth Rocks being badly "off their feet," while those running at large were quite healthy and active.

The turkeys were apparently more fond of oats than either barley or wheat, and towards the latter portion of the fattening period the proportion of this grain was increased with benefit.

RESULTS WITH TURKEYS.

		Lbs.	Oz.
Oct. 14.	Weight of 5 birds in pen	32	12
Nov. 25.	" "	53	00
	Gain	20	04

Amount of grain consumed 120 pounds, or 6 pounds of grain to 1 pound of increase.

		Lbs.	Oz.
Oct. 14.	Weight of 5 birds running at large	32	12
Nov. 25.	" " "	42	00
	Gain	9	04

CHICKENS.

		Lbs.	Oz.
Sept. 28.	Weight of 3 White Plymouth Rock Cockerels in pen	12	02
Nov. 26.	" " " "	21	07
	Gain	9	05

		Lbs.	Oz.
Sept. 28.	Weight of 3 White Plymouth Rock Cockerels at large	11	11
Nov. 26.	" " " "	17	13
	Gain	6	02

		Lbs.	Oz.
Sept. 28.	Weight of 2 Black Minorca Cockerels in pens	8	05
Nov. 26.	" " " "	10	02
	Gain	1	13

		Lbs.	Oz.
Sept. 28.	Weight of 2 Black Minorca Cockerels at large	7	04
Nov. 26.	" " " "	10	05
	Gain	3	01

Total amount of grain consumed by the 5 penned chickens 3 White Plymouth Rocks and 2 Black Minorcas was 57 pounds.

GAIN IN PERIODS.

	Lbs.	Oz.
5 turkeys penned, gained first three weeks	13	6
5 " " second "	6	14
3 White Plymouth Rock penned, gained first three weeks	5	5
3 " " at large "	2	11
3 " " penned, gained 2nd period of two weeks	2	7
3 " " at large " "	1	6
3 " " penned " 3rd period of three weeks	1	9
3 " " at large " "	2	1

Shrinkage between live and dressed weight.

5 turkeys penned, lost	25 per cent.
5 " at large "	30 "
3 White Plymouth Rocks penned, lost	34 "
3 " at large "	33 "
2 Black Minorcas penned "	34 "
2 " at large "	34 "

SUMMARY.

1st. The 5 penned turkeys gained in the 24 days 11 pounds more than the 5 running at large.

2nd. The 3 penned White Plymouth Rock Cockerels gained in the 59 days 3 pounds 3 ounces more than the 3 running at large.

3rd. The 2 penned Black Minorcas made a gain for the first two weeks over those running at large, but for the whole 59 days the birds running loose gained the most by 1 pound 4 ounces.

4th. Both turkeys and chickens made the largest increase during the first three weeks.

5th. After 6 weeks of close confinement chickens are probably kept at a loss.

6th. White Plymouth Rock chickens are better adapted for feeding in small pens than Black Minorcas.

7th. The White Plymouth Rocks were a better colour and more attractive when dressed than the Black Minorcas.

8th. Penned turkeys shrunk 5 per cent less in dressing than those running at large.

9th. Chickens whether penned or running at large lost practically the same in dressing, viz., 34 per cent.

Our climate is suitable, feed is abundant and there is no reason why this province should not be a large exporter rather than an importer of dressed fowl.

EXPERIMENTS WITH BEES.

WINTERING.

As mentioned in last year's annual report five hives of Italian Bees were placed in the cellar of one of the dwellings on the farm on 10th October, 1896, the room containing bees was the one usually devoted to vegetables and was separated by a wooden partition from the furnace, ventilation was given by means of a chimney opening in the cellar, the temperature during the winter as ascertained by a self registering thermometer remained steady between 40 and 50 degrees Fah.

The hives were placed six inches from the floor and protected with a piece of old woollen carpet placed under the wooden cover; when placed in the cellar each colony had 30 pounds honey which proved more than sufficient for the winter and all the hives wintered successfully.

They were placed on the summer stands on 30th April and commenced to work at once on native willows.

One hive was forwarded to the Indian Head Experimental Farm and the other four were worked through the season for extracted honey.

TO PREVENT EXCESSIVE SWARMING.

As some difficulty was experienced in 1896 with persistent swarming and a resulting weakness of the colonies, special efforts were made to prevent this by giving plenty of room; on 6th July most of the brood frames were filled with bees and a very large upper story 14 x 20 and 15 inches deep filled with wired foundations and without a queen excluder was added, and the frames extracted as required, this gave an abundance of room and no swarming whatever occurred and all the colonies became very strong before fall.

An average of forty-five pounds of extracted honey was taken from each hive which was readily sold at 10c. per pound wholesale.

BEES.

Following is a list of plants, trees and shrubs, on the flowers of which the bees were seen working during the summer, together with dates when first noticed. Gum Weed (Grindelia squarrosa), a native plant, apparently yielding the largest amount of honey :—

Date.	Botanical Name.	Common Name.
May 1..	Salix discolor	Native Willow.
" 12..	Amelanchier alnifolia	Saskatoon.
" 12..	Prunus Americana	Native Plum.
" 15..	Negundo aceroides	Ash Leaf Maple.
" 20..	Caragana arborescens	Siberian Pea Tree.
" 22..	Prunus Pensylvanica	Pin Cherry.
" 25..	Ribes rubrum, etc	Red Currants.
" 26..	Ribes aureum	Yellow Flowering Currant.
" 26..	Caragana pendula	Weeping Pea Tree.
" 27..	Caragana mollis glabra	Woolly Pea Tree.
June 1..	Asparagus officinalis	Garden Asparagus.
" 1..	Syringa Josikea	Josika's Lilac.
" 1..	Prunus pumila	Ground Cherry.
" 1..	Lonicera splendens	Honeysuckle.
" 3..	Populus tremuloides	Aspen-leaved Poplar.
" 5..	Lonicera gracilis	Graceful Honeysuckle.
" 9..	Lonicera Tatarica	Tartarian "
" 12..	Rheum hybridum	Rhubarb.
" 22..	Rosa blanda	Native Rose.
" 23..	Rubus	Raspberry.
" 25..	Vicia villosa	Winter Vetch.
" 25..	Trifolium repens	White Dutch Clover.
" 26..	Syringa villosa	Downy Lilac.
" 30..	Allium cepa	Garden Onion.
July 4..	Sinapis alba	White Mustard.
" 6..	Dianthus caryophyllus	Pinks.
" 6..	Trifolium hybridum	Alsike Clover.
" 9..	Melilotus alba	Bokhara Clover.
" 10..	Reseda odorata	Mignonette.
" 15..	Spiraea salicifolia	Willow-leaved Meadow Sweet.
" 17.	Trifolium pratense	Common Clover.
" 18..	Satureja hortensis	Summer Savory.
" 20..	Papaver (all types)	Garden Poppies.
" 20..	Rosa rugosa	Japan Rose.
" 28..	Grindelia squarrosa	Gum Weed.
" 30..	Borago officinalis	Borage.
" 30..	Cucumis sativus	Cucumber.
" 31..	Tropœolum minor	Dwarf Nasturtium.
Aug. 4..	Raphanus sativus	Radish.
" 4..	Linum perenne	Blue Flax.
" 11..	Ænothera biennis	Evening Primrose
" 12..	Cucurbita Pepo	Squash.
" 12..	Helianthus giganteus	Wild Sunflower.
" 13..	Antirrhinum majus nanum	Snapdragon.
" 14..	Salpiglossis variabilis	Beauty of Bolivia.
" 14..	Solidago rigida	Goldén Rod.
....	" Canadensis	"
....	" Missouriensis, and others	"
Aug. 14..	Liatris	
" 14..	Epilobium angustifolium	Great Willow Herb.
" 14..	Aster Lindleyanus, and others	Native Asters.
" 19..	Verbena hybrida	Garden Verbenas.
" 19..	Helichrysum monstrosum	Everlasting Flower.
" 19..	Zinnia elegans	Garden Zinnia.
" 19..	Dahlias	Garden Flower.
" 19..	Phlox Drummondii	Drummond's Phlox.
" 19..	Hollyhocks	Garden Flower.
" 19..	Mentha Canadensis	Wild Mint.
" 19..	Monarda fistulosa	Wild Bergamot.
" 19..	Portulaca grandiflora	Garden Portulaca.
" 20..	Gaillardia Lorenziana	Double Gaillardia.

From the experience gained in keeping bees for ten seasons in this country, I see no difficulty in keeping them in Manitoba with profit. Bees can be wintered in any fairly dry cellar if sufficiently warm to keep vegetables from freezing, and sufficient plants giving honey can be found near all well watered or wooded sections. The honey obtained from native plants is excellent in quality, and sufficiently plentiful to make the business both pleasant and profitable.

EXPERIMENTS WITH APPLES.

Although a very large number of so-called hardy varieties of apples have been tested here and all have been found too tender for this climate, we still think it is advisable to give any very promising kinds a trial.

Four standard apple trees—two Tonka and two Wealthy—were received from Mr. A. P. Stevenson, Nelson, Manitoba, in the spring of 1896. These were grafts of trees that have become acclimatized at the low altitude in which Nelson is situated, namely, 900 feet above sea level. They have so far proven hardy, and we trust that coming from this source, they may succeed even at this altitude—1,231 feet.

PYRUS BACCATA—WILD CRAB OF SIBERIA.

Specimens of this tree were sent here from the Central Experimental Farm at Ottawa in 1890, and they have proved perfectly hardy; additional varieties from the same source have been added from time to time, until at this date we have a very promising collection; the oldest trees, which are Pyrus Baccata-aurantiaca, produce a fair amount of fruit each season, and are found to be most useful for the making of jelly, the fruit being rich in pectin.

The number of trees in this block were increased last year by 100 very fine seedlings —25 Pyrus Prunifolia and 75 Pyrus Baccata Yellow. These were raised at the Central Experimental Farm, Ottawa, from selected seed, and many of them are expected to produce larger fruit than the varieties already fruited here.

The Yellow Siberian crab apple seedlings give great promise of future usefulness, 48 of which were raised from seed in 1893 are now vigorous trees, and, although growing in the open valley, have successfully stood the severity of four winters.

Many seedlings of the Transcendent Crab have been raised here this season from Manitoba grown seed, the fruit having been raised by Mr. A. P. Stevenson, of Nelson. These will be carefully transplanted in the spring, and we think that with trees from this source greater success may be had.

PLUMS.

In the spring of 1896, 72 trees of 36 varieties of improved native kinds were received from Charles Luedloff, Carver, Minnesota. Having been grown so near to Manitoba, it was hoped that these would all prove hardy here. They were all root grafts and the hardiest sorts have made a fine growth, and have wintered well while others have been killed to the ground by frost and are at present growing from below the graft. A list is given below with notes on their present condition.

PLUMS—Test of Varieties.

Name of Variety.	Number planted.	Number alive.	Number dead.	Remarks.
New Ulm	2	2	....	Healthy growth.
De Soto	2	2	....	
Clinton	2	2	....	Killed to ground, growing below graft.
Deep Creek	2	2	....	" " " "
Neill's	2	2	....	Slightly killed, healthy growth.
Van Buren	2	2	....	Half hardy "
Easter	2	2	....	Killed to snow line.
Missouri Apricot	2	2	....	" "
Gaylord	2	2	....	Slightly killed back.
Ocheeda	2	2	....	Killed to near ground.
Silas Wilson	2	2	....	Slightly winter-killed.
Irene	2	1	1	Killed to ground.
Weaver	2	2	....	Apparently hardy.
American Eagle	2	2	....	Killed to snow line.
Forest Rose	2	2	....	" near ground.
Emerson	2	2	....	" "
Hammer	2	2	....	" "
Illinois Ironclad	2	2	....	" "
Chas. Downing	2	2	....	" "
Van Deman	2	2	....	Slightly killed back.
Crescent City	2	1	1	Killed to snow line.
Wood	2	2	....	Slightly killed back.
Large Red Sweet	2	1	1	Killed to snow line.
Speer	2	1	1	Apparently hardy.
Dunlop Nut	2	2	....	" "
Colorado Queen	2	2	....	Killed to snow line.
Peffer's Premium	2	2	....	Apparently hardy, some bloom.
Cheney	2	2	....	" " "
Purple Yosemite	2	2	....	" " "
Cottrell	2	2	....	Apparently hardy.
Milton	2	2	....	Killed to snow line.
Yellow Sweet	2	2	....	Apparently hardy.
City	2	2	....	Killed to snow line.
Col. Wilder	2	2	....	" "
Richland	2	2	....	Slightly killed back.
Dr. Dennis	2	2	....	Killed back half.

The seedlings of Weaver, De Soto, Cheney, Voronesh 102, and Speer sent from the Central Farm which have now been growing here for three years, came through last winter in good condition, many of them blossoming for the first time, but owing to late spring frosts the fruit did not form.

A large consignment of seedlings of Cheney, Hungarian, Yosemite Yellow, Voronesh, Ida, Rollingston, Weaver, De Soto, Van Buren, Wolf, Yosemite Purple, Speer and American were received from the Central Experimental Farm, Ottawa, this spring. They arrived here in good condition and specimens of all were planted in permanent orchards.

The remainder were planted in nursery rows where they will be available for distribution for test in other parts of the province. With few exceptions they have become established and made healthy growth.

The native Manitoba plum, however is the variety on which our hopes are chiefly centered as a hardy sort for this province, and some of them transplanted from the river banks have already fruited here.

Many thousand trees have been raised from seeds of selected fruit from different parts of this province, and when these arrive at the fruiting stage, the work of selecting the best will be most interesting. Scions have been taken from the more promising types of those that have already borne fruit so that propagation by grafting may be accomplished.

CHERRIES.

With regard to the above fruit some attention has been given of late to the improvement of one of the native cherries, known as the Sand Cherry, *Prunus pumila*. Three varieties of wild cherries grow here, the pin cherry (Prunus Pennsylvanica), a verry small red cherry, very acid but which makes a good jelly. The choke cherry (P. Virginiana) somewhat larger but astringent and bitter. These latter do not appear to vary in character and hence much improvement by selection cannot be looked for. With the Sand Cherry, however, the variation is remarkable, almost every bush showing some distinct characteristics in size or quality from the small useless bitter sort scarcely eatable to a large pleasant eating cherry with very little astringency or bitterness. Several varieties of extra promise have been named and are being propagated as rapidly as possible.

In 1895 there were sent from the Central Experimental Farm 5 seedlings each of the following cultivated varieties: Bessarabian, Olivet; Montmorency, Carnation; Red Morella, and Wragg. These were planted under shelter of a thick hedge.

The seedlings of the first three named have so far proved hardy and grow from the tips each spring, seedlings of Carnation freeze back slightly each year and those from Wragg and Red Morella winter kill to near the ground.

RASPBERRIES.

The past season has more than ever shown the desirability of protecting raspberries during winter. Those lifted from their winter covering on 5th May were in splendid condition alive to the tips while a block of bushes which was purposely left unprotected was killed back to half the length of the canes.

The yield of fruit this year did not reach the average. All the varieties set a fair quantity and a large yield was expected, but prolonged dry weather in July followed as it invariably is by red spider greatly lessened the yield, but in the latter part of the season copious showers exterminated the red spider and revived the plants, so that a fair amount of late fruit was gathered. The new canes also made a vigorous growth and have been laid down this winter in fine condition.

Following is a list of new varieties which have become established, but have not yet fruited :—

Miller,	Palmer,	Kenyons Seedling,
London,	Kansas,	Gregg.
Parnell,	Niagara,	Heebner.
		Garfield.

Two varieties of blackberries, Agawam and Snyder, also are thus far promising as to hardiness.

CURRANTS.

This season currants of all kinds were more or less adversely affected by protracted spring frosts and dry weather, but notwithstanding this a very fair crop was harvested, and much valuable data was gathered respecting the frost and drought resisting capabilities of the many varieties undergoing test.

With the varieties of black currants previously reported on the Climax one of the new seedlings from the Central Farm and the Prince of Wales gave the best results. The Lee's Prolific and Black Champion (the standard varieties hitherto) are hard to beat for a favourable season, but they have not the frost and drought resisting powers of some of the newer kinds, especially the two above mentioned.

With the Red Currants, Red Grape gave the best results; this variety and the Raby Castle can be confidently recommended. They are vigorous growers and produce large crops of fine flavoured fruit.

With the White Currants the White Grape has not yet been superseded.

The following varieties fruited here for the first time this season :—

Variety.	Flavour.	Colour.	Size.	Earliness.	Productiveness.	Growth.
Ethel	Good	Black	Large	Late	Good	Vigorous.
Charmer	Acid	"	Small	Early	Poor	Not thrifty.
Perry	Poor	"	"	Medium	"	Fairly healthy.
Monarch	Very good	"	Large	Late	Good	Vigorous.
Standard	Good	"	Medium	Early	"	Very vigorous.
Climax	Excellent	"	Large	Very early	Very good	Very healthy.
Eagle	Woody	"	Small	Late	Poor	Fairly "
Ontario	Sweet	"	"	Medium	Fair	Healthy.
Beauty	Excellent	"	Very large	Late	Good	Vigorous.
Clipper	Sour	"	Medium	Early	Fair	"
Winona	Very good	"	Large	Late	Good	Very healthy.
Sterling	Sweet	"	Small	Early	Fair	Fairly "
Parker	Acid	"	Medium	"	Poor	Vigorous.

GOOSEBERRIES.

Six each of ten new varieties of gooseberries were received this spring. They arrived in good condition and most of them have made fine healthy growth. They will be reported on more fully when they have fruited here.

The five Manitoba sand hill gooseberries mentioned on page 355 of last year's report, have been increased largely by cuttings. Specimens will be planted in pemanent positions next season, we hope this may prove a valuable addition to the list of Manitoba fruits.

NOTES ON THE ARBORETUM.

This plantation of trees and shrubs improves in appearence every year and each season some objects of beauty are added.

The whole of the Arboretum was sown with grass seed in the fall of 1896, and has this year formed a fairly good sod; this adds greatly to the beauty of the appearance of the plantation. Circles sufficiently large to allow of root developement have been cut in the grass around each specimen, and the surface soil is kept cultivated and free from weeds so as to give favourable conditions for further growth and developement.

There is now in this plantation a succession of bloom during the growing season which makes this part of the farm most interesting and attractive.

Following are notes taken of some of the ornamental shrubs in this block in continuation of the list given on page 363 of last year's report.

BUFFALO BERRY (*Sheperdia argentea*).—A native shrub, useful as well as ornamental. The flowers are inconspicuous and the shrubs diæcious, that is, the male flowers are produced on one specimen and the female flowers on another. The pistillate trees bear a red acid fruit, useful for jellies. Shrubs nine years old are now ten feet high and five feet in spread of branches; flowers early in May.

ALBERT HONEYSUCKLE (*Lonicera Alberti*).—This beautiful floriferous shrub is worthy of all praise, but is not well enough known. Its pendulous branches, with its striped-leaved foliage and clusters of showy violet flowers of pleasing perfume, make it unique and very desirable. Height, 2 feet 6 inches; in full bloom on 4th June; readily propagated by layers or cuttings.

COMMON BARBERRY (*Berberis vulgaris*).—This is not thoroughly hardy, but is apparently becoming more so each year. Seed was gathered from it in 1896 and sown last spring, and many vigorous young seedlings are the result. It is expected that this second generation will withstand our winters. In bloom 7th June; pretty wax-like yellow flowers, succeeded by bright red berries in drooping clusters. They are acid and are said to be useful for jelly. One bush, nine years planted, is now five feet high; may be increased either by cuttings or seed.

RUSSIAN SOUTHERNWOOD (*Artemisia abrotanum Tobolskianum*) is an importation from Siberia. Its maximum height is about seven feet, and serves a very useful purpose where a rapid growing wind-break and snow collector is wanted on the open and often bleak prairies as a shelter for more valuable and less hardy trees. Cuttings seldom fail to strike. Too much stress cannot be placed on the necessity of clipping at least twice in the growing season; for, if allowed to ripen, their seed (which are produced on a terminal spike) they will scatter and grow and may become a nuisance. This shrub is recommended for hedges on high bleak plains.

OLD MAN (*Artemisia abrotanum*) is an English form of the above; has a much sweeter scent; it only attains the height of $1\frac{1}{2}$ to 2 feet; useful for a lawn or flower garden.

PURPLE CYTISUS (*Cytisus purpurea*).—A delicate free blooming little shrub, which, with slight winter protection, has proved hardy. In bloom 5th June; produces pretty pea-shaped purple flowers; grows readily from seed.

NATIVE HONEYSUCKLE (*Lonicera glauca var. Sulivanti*) is in flower on 25th June; a pretty, trumpet flowered, woody twiner, with rich, red, sweet-scented blossoms; they are found native in the shady ravines and bluffs of the country; should be grown in shade of a wall.

VIRGINIAN CREEPER (*Ampelopsis quinquefolia*).—This is indigenous to Manitoba, and is an ornamental climber of much merit, which thrives well and is perfectly hardy. This, when well rooted, soon covers a house with its rich foliage; is propagated quickly by cuttings. The flowers are inconspicuous.

WHITE VIRGIN'S BOWER (*Clematis flammula*).—Another pretty climber, which is very showy when in bloom, and is a desirable acquisition for the verandah or trellis. In full bloom in August. The roots of this clematis are hardy, but the stem dies back each year to the ground. It makes a rapid growth during the summer.

NEW FOREST TREES AND ORNAMENTAL SHRUBS.

The consignment of trees received from the Central Experimental Farm, Ottawa, in 1896, have now been tested for one winter and two summers.

Many of them have proven hardy and will increase the collection of hardy varieties materially. The more tender ones will be useful as specimens, the roots in many cases being perennial and the shoots making each season a good growth.

The Elders and Clematis coming under this category, after they have had the test of another winter, fuller particulars will be given regarding their hardiness and usefulness for this climate.

FOREST TREE SHELTER BELT.

Notwithstanding the dry season the forest tree shelter belt has made good progress, the trees having made a small but healthy growth. This belt has now become very dense, and with the accumulation of the leaves of several years' growth, to act as a natural mulch, the evaporation is reduced to a minimum.

Work in keeping down weeds by cultivation has been unnecessary in this block for the last two years, and it is now kept up without expense, except for occasional thinning.

In continuation of last year's report, descriptions are given of some of the most useful trees in this belt with average heights and spread of branches in the following notes:

Green Ash (Fraxinus viridis).—This is a native tree and grows readily from seed. It is not, however, a popular tree on account of the lateness of leafing in the spring and its slow growth.

Measurement of an average 9-year old tree was 2½ inches in diameter, 1 foot from the ground, and 10 feet high, the wood is valuable both for fuel and manufacturing purposes.

Balm of Gilead (Populus balsamifera).—This native tree is deserving of praise, it is a rapid grower attaining a large size and although the wood is not specially useful for lumber it makes fair firewood and is a desirable shade tree. An average tree (9 years old) measures 16 feet high, 12 feet spread of branches with a trunk 4 inches in diameter, 1 foot from the ground.

Native Aspen (Populus tremuloides).—This tree is found common in all parts of this province. The prairie fires are its greatest enemy; in tracts of country protected from fire for a few years, little bluffs grow up in profusion. It is the wood used almost exclusively for fuel in Manitoba and is excellent for that purpose, it is not specially desirable as a shade tree.

The measurements of a 9-year old tree are as follows:—16 feet high with 5 feet spread of branches and a trunk 4 inches in diameter at the base. This poplar can be propagated from cuttings.

Mossy-cup Oak (Quercus macrocarpa).—This is the native scrub oak. The maximum height of this tree is about 40 feet.

Its knarled trunk and brittle wood reduces its value for manufacturing purposes, but it is much valued as fuel. It is a very slow grower, average specimens grown from seed were measured at 8 years old and were 3 feet high with a trunk 1½ inches in diameter. Propagation is not difficult from the acorn.

White Willow (Salix Alba).—This was sent from the Central Farm in 1890. It has done remarkably well here, grows naturally in tree form to a large size. Its capability to withstand a bleak exposure makes it highly desirable for general culture. Height 20 feet, spread of branches 13 feet, diameter of trunk 6 inches, tree measured was 8 years old.

American Larch (Larix Americana).—This is indigenous to the province and is much sought after for fuel. It seems to thrive equally well on the upland prairie as in the lower valley lands, although it is usually found in the swamps in the vicinity of the sand hills, where young seedlings can be procured in abundance. A specimen planted 8 years ago now measures 10 feet high, 4 feet in spread of branches, with a trunk 4 inches in diameter 1 foot from the ground.

HEDGES.

The use and beauty of a well trimmed hedge is becoming more and more acknowledged each season, also the value of untrimmed or partially trimmed hedge inclosures for shelter, and many inquiries are made as to the varieties of trees and shrubs best adapted for these purposes.

As we now have growing on the farm many sample hedges of 50 feet each or more in length and several miles of hedge inclosures of various kinds planted in different ways we are able to give from experience some information on this question.

Test hedges to afford shelter for large inclosures were planted in 1890 at different distances apart in double and single rows to gain information as to the best method. So far our experience leads us to prefer the single rows, planted 18 inches apart.

Two year old trees should be used, those if kept clipped back for a year or two to encourage a good bottom growth make a very dense and attractive hedge.

The white spruce, cottonwood, ash-leaved maple, bereolensis poplar and sharp-leaved willow hedges planted in 1890 have made very fine growth and are much admired by the visiting public.

Appended is a list of hedges with date of planting and other particulars.

Name of Variety.	When planted.	Remarks.
Green Ash (Fraxinus viridis)	1890	A slow growing hedge; coming into leaf late in season.
Hawthorn (Cratægus coccinea var Sullivanti)	1897	Very slow growing.
White Spruce (Picea alba)	1893	One of the best hedge trees for this province.
Yellow Flowering Currant (Ribes aureum)	1897	Ornamental; not dense.
Ash-leaved Maple (Acer negundo)	1890	A splendid wind-break; loses its leaves early in the fall; readily grown.
Spiræa Opulifolia	1894	Ornamental; a good collector of snow.
" " aurea	1894	" " "
Native Aspen (Populus tremuloides)	1894	Fair wind-break; difficult to transplant.
Choke Cherry (Prunus pennslyvanica)	1894	Ornamental; a good shelter hedge.
Hazel Nut (Corylus Americana)	1894	Not a good hedge, too open.
Saskatoon (Amelanchier alnifolia)	1894	So far not promising.
Native Rose (Rosa Blanda)	1894	A pretty low dense hedge for ornamental purposes.
Native Meadow Sweet (Spiræa salicifolia)	1894	A beautiful little two-foot hedge useful for flower garden.
Snowberry (Symphoricarpus racemosus)	1894	A low ornamental hedge; suckers badly.
Bush Honeysuckle (Lonicera tatarica)	1897	A good wind-break and ornamental.
Cotoneaster vulgaris	1897	Hardy and ornamental.
Siberian Pea Tree (Caragana arborescens)	1893	A most useful and ornamental wind-break.
Red-leaved Rose (Rosa rubrifolia)	1897	A quick grower; suitable for lawn.
Yellow Willow (Salix aurea)	1894	Ornamental in winter; a fine snow collector and wind-break.
Wild Plum (Prunus Americana)	1897	A promising hedge.
French Laurel Willow (Salix)	1897	Liable to sun-scald.
European " (Salix laurifolia)	1897	Much admired; a useful wind-break.
Cottonwood (Populus monilifera)	1890	An attractive, fast-growing hedge.
Siberian Southernwood (Artemisia abrotanum var Tobolskianum)	1895	The quickest growing hedge; if kept clipped is almost evergreen.
Rosemary-leaved Willow (Salix rosmarinifolia)	1897	Not sufficiently tested.
Salix Britzensis	1896	Makes a fair wind-break.
Caragana Mollis glabra	1895	A low hedge; useful for lawn.
Breaking buckthorn (Rhamnus frangula)	1897	Ornamental.
Asiatic Maple (Acer ginnala)	1893	A low hedge; very pretty in fall, turning to a deep crimson.
American White Elm (Ulmus Americanus)	1891	A good wind-break; dense hedge.
Wolf Willow (Eleagnus argentea)	1894	A low hedge, with pretty silvery foliage; suckers badly.
Red Osier Dogwood (Cornus stolonifera)	1894	A native; makes a useful and ornamental hedge.
Common Lilac (Syringa vulgaris)	1894	A good hedge plant for ornament or shelter.
Old Man (Artemisia abrotanum)	1893	A low, sweet-scented, ornamental hedge easily propagated.
Populus Bereolensis	1890	A very fine hedge; suitable for high ground; retains its leaves late in the season.

SPRAYING FOR INSECT PESTS.

We have had an unusual visitation during the past season from insects of the Aphis family, this may probably be attributed to the climatic conditions of the season, different forms of these plant lice have attacked the Maples, Willows, Currants and other shrubs and trees. The pest was kept in subjection by the use of refuse tobacco soaked in water and the liquid applied with a spray pump; 6 pounds of tobacco was steeped for 6 hours in boiling water, then diluted with 25 gallons of water; each large maple tree required $1\frac{1}{4}$ gallon of the liquid at each spraying, from one to two sprayings each season was found sufficient.

NOTES ON TREE SEEDS.

Last fall many tree seeds such as plums, crab-apples and cherries were saved and were placed in boxes with alternate layers of sand. These were placed in a position where they were exposed to the action of frost and were found to be in excellent condition for planting in the spring, most of the hard shell pits having burst. These were sown as soon as the ground was in condition and some thousands of flourishing young seedlings are the result.

The advantage of sowing tree seeds on summer-fallow was well demonstrated this season. Two plots of Caragana seed being sown on 25th April. Plot one was summer-fallow, Plot 2 was spring ploughing, harrowed and rolled the same day as it was ploughed.

On the 18th May the seeds in Plot No. 1 had germinated and were well out of their seed leaf stage; on the other hand not one plant could be found in Plot No. 2; in fact they did not germinate until after heavy showers in the late summer. After the growing season trees on both plots were counted and measured, there were 25 per cent more plants on the summer-fallow and they were one foot higher and more vigorous.

FOREST TREE DISTRIBUTON.

Number of packages, trees distributed	906
" reports received	81
" received in good condition	74
" " in fair condition	2
" " in poor condition	5
" had good success	71
" had fair success	10
" failures	0

MAPLE SEED DISTRIBUTION.

Number of packages sent	385
" reports received	99
" very successful	58
" fairly successful	30
" failures	11

EXTRACTS FROM A FEW OF THE REPORTS ON FOREST TREE DISTRIBUTION, 1896.

Henry Smith, Chumah.—All made good growth, willows especially.

John M. Scott, Winnipeg.—All received from you made good growth.

D. D. Buchanan, Winnipeg.—Have distributed cuttings from plants sent me in 1895.

Rev. G. C. Hill, Boissevain.—All shrubs have grown splendidly.

A. Lawrence, Miami.—Received in first-class condition and have made good growth.

A. Laughlin, Cartwright.—Received in good condition. Had been put up with much greater care than some received from nurseries.

Wm. Allison, Burnbank.—Received in good condition, all I got are alive.

H. B. Perris, Fort Rouge.—Willows have made remarkable growth. Others nearly as good.

J. W. Irwin, Emerson.—Received in good condition, all plants lived.

Charles Cannon, Belmont.—Received in excellent condition. All growing but 3.

E. Pitman, Shrubland.—All did well, especially elm.

Wm. Hood, Sidney.—Received in good condition. All growing.

D. W. McDiarmid, Winnipeg.—I think there is no question, that the shrubs and trees coming from you, have given the best general satisfaction.

THE VEGETABLE GARDEN.

The past season was in many respects unfavourable for the successful production of vegetables. The spring opened propitiously, the garden being ready for the seed-drill about the middle of April, and we anticipated a long growing season. As soon as the seedlings were above ground, however, we experienced high winds, which, carrying the soil with them seriously cut the young plants, and left them an easy prey to the severe frosts in May and early June. Several varieties had to be re-sown, including carrots, beans, turnips and radishes, which threw those vegetables back considerably. We were partially compensated by the open fall, which allowed many varieties to attain maturity, which otherwise would not have done so, and the late crops, such as cabbage, cauliflower, beets, turnips, &c., were fully up to their usual standard of excellence. Following will be found a summary of the work done in this department, the main portion of which was devoted to testing as fully as possible the following ; pease, beans and squash.

PEASE.

Sixty varieties of this vegetable were sown, and all germinated with two exceptions, viz., "Anticipation" and "Laxton's Prolific Long Pod." During the early part of the season they suffered severely from drought, high winds and frost, being repeatedly cut back by the latter, and it appeared for a time that re-sowing would become imperative. On the approach of better weather, however, they rallied, and beyond being later than usual, in maturing, gave no cause for complaint, the yield and flavour being fully up to the average. All varieties ripened their seed, and enough of each was saved for samples, which will make an interesting addition to our sample-room. Following will be found arranged in tabular form the result of this test, together with a few notes on the more meritorious varieties. Sown with drill in rows 3 feet apart on 29th April.

PEASE.

Name of Variety.	Ready.	Ratio of Productiveness.	No. of Pease in Pod.	Length of Pod.	Length of Vine.	Character of Pea.
				Inches.	Inches.	
Philadelphia	July 8	7	5—6	2¼	24	Smooth.
French Canner	" 16	8	8—9	3⅛	30	"
American Wonder	" 17	8	5—6	2½	9	Wrinkled.
Blue Peter	" 18	12	4—5	2½	12	"
Ferry's First and Best	" 5	7	5—6	2¼	28	Smooth.
McLean's Little Gem	" 17	7	6—7	2¾	14	Wrinkled.
Long Island Mammoth	" 14	8	7—8	3¾	48	"
Hair's Dwarf Mammoth	" 30	11	7—8	3	24	"
Blue Beauty	" 8	9	6—7	2½	18	Smooth.
Horsford's Market Garden	" 20	10	9—10	4	24	Wrinkled.
Burpee's Profusion	" 24	15	6—7	3	24	"
John Bull	Aug. 1	12	8—9	4¼	24	"
Station	July 14	16	6—7	2½	14	"
Scorcher	" 1	6	4—5	2	18	Smooth.
Maud S	" 5	3	4—5	2	16	"
Exonion	" 12	10	5—6	2½	24	Wrinkled.
Rural New Yorker	" 7	8	5—6	2¼	22	Smooth.
Improved Alpha	" 16	7	4—5	2¼	14	Wrinkled.
Tom Thumb	" 12	12	6—7	2½	17	Round.
Lightning	" 8	6	4—5	2¼	28	Smooth.
Alaska	" 10	5	4—5	2	14	"
Admiral	" 18	5	7—8	2½	36	Wrinkled.
Chelsea	" 8	10	5—6	3	12	"
Carter's First Crop	" 12	10	5—6	2¼	15	Smooth.
Extra Early Tom Thumb	" 10	5	6—7	2¼	8	Round.
Kentish Invicta	" 14	7	6—7	2½	30	Smooth.
Wm. Hurst	" 14	9	5—6	2¾	10	Wrinkléd.
Premium Gem	" 10	8	5—6	2⅓	12	"
Heroine	" 26	10	9—10	4⅛	26	"
Rennie's New Queen	" 24	12	8—9	4¼	30	"
Improved Forty-Fold	" 20	15	7—8	3¼	48	"
Stanley	" 22	10	8—9	4	24	"
Abundance	" 20	10	6—7	2½	18	"
Nott's Excelsior	" 12	8	5—6	2½	9	"
Pride of the Market	" 20	8	8—9	3½	18	Smooth.
Dr. McLean	" 24	9	8—9	3¾	24	Wrinkled.
Daisy	" 23	9	8—9	3¾	18	"
Bliss' Everbearing	" 22	11	5—6	3	24	"
McLean's Advancer	" 20	12	6—7	2¾	24	"
Juno	" 26	10	7—8	4	24	"
Improved Stratagem	" 21	9	7—8	4¼	18	"
Telephone	" 19	10	6—7	4	36	"
Improved Fillbasket	" 21	10	8—9	4	26	Smooth.
Large White Marrowfat	" 20	13	6—7	3¾	48	"
Paragon	" 24	8	6—7	3¾	24	Wrinkled.
Black Eyed Marrowfat	" 22	15	7—8	3⅛	48	Smooth.
Duke of Albany	" 18	10	7—8	4	36	Wrinkled.
Laxton's Supreme	" 21	10	7—8	3¾	36	Smooth.
Telegraph	" 23	10	7—8	4	36	Wrinkled.
Sander's Marrow	" 24	12	8—9	4¼	18	"
Champion of England	" 22	13	7—8	3¾	48	"
Duke of York	" 22	8	9—10	4	36	"
Shropshire Hero	" 26	10	7—8	4	16	"
New Victory	" 26	12	7—8	4	36	"
Melting Sugar	" 14	12	7—8	4	36	Smooth.
Tall Scimitar	" 16	12	7—8	4	36	"
Crossbred, N. Q. 5	" 20	10	6—7	3	12	Wrinkled.
Crossbred N. A. 5	" 8	10	6—7	3	12	"

The following varieties are worthy of special mention :—

Chelsea.—Extra long pods, well filled with pease of fine flavour, and very productive for an early variety. Certainly an improvement on American Wonder, being earlier, more productive and of just as good flavour as that variety.

Wm. Hurst.—An early variety, of excellent flavour and very productive. This should rank as a first-class early pea.

French Canner.—A very productive variety, and, as its name implies, is a typical canner. The pods are long and gracefully formed and well filled. A fine sort for the market gardener.

Improved Forty-Fold.—One of the best main crop pease tested. Very productive and of excellent flavour.

Sander's Marrow.—The finest flavoured pea grown this season. Individual pease exceptionally large and sweet. A high class variety.

BEANS.

Forty-seven varieties of beans were sown on 20th May, and all germinated well. On the morning of June 4th the thermometer registered several degrees of frost, and in consequence this sowing was completely eradicated. A second sowing was made on 7th June, and, as in some instances all the seed had been sown on the first occasion, the list of available varieties was reduced to 43. Notwithstanding this drawback, all varieties did fairly well, and many of them ripened their seed. Below is given, in tabular form, the result of this test, coupled with some short notes on those kinds deemed worthy of special mention. Sown with Planet Junr. hand drill in rows 30 inches apart, and afterwards thinned to 6 inches apart in the row.

BEANS.

Name of Variety.	Ready.	No. of Beans in Pod.	Productiveness.	Length of Pod.	Colour.	Flavour.
				In.		
Yellow 6 weeks	Aug. 18	6	Fairly productive	5½	Light green	Fair.
Detroit Wax	" 11	4	" "	4½	Dark yellow	Good.
Boston Favorite	" 22	4	Very "	6	Dark green	Very good.
Refugee, or 1000 to 1	" 30	4	Fairly "	6	Light green	Fair.
New Stringless Green Pod	" 8	5	Very "	5½	"	Good.
Cylinder Ivory Pod	" 7	5	" "	5	Dark yellow	"
Wilson's Golden Eye	" 20	5	Fairly "	3½	Green	Poor.
Dwarf Triumph	" 12	4	Very "	4½	"	Good.
Marvel of Paris	" 17	5	Fairly "	5	"	"
Ne Plus Ultra	" 9	6	Very "	6	"	Very good.
Defiance	" 10	3	Not "	5	"	Good.
Pink Eyed Wax	" 12	4	Fairly "	4½	Light yellow	Fair.
Speckled Wax	" 20	4	" "	5	Dark "	Good.
Blue Podded Butter	" 20	5	Very "	5	Blue	"
Dwarf Lyonaise	" 23	4	" "	6	Dark green	"
Early Giant Wax	" 17	4	" "	6¼	Dark yellow	Very good
Davis' Wax	" 20	4	Fairly "	4½	Green	Fair.
Scarlet Flageolet Wax	" 13	5	Very "	7½	Dark yellow	Very good.
Golden Eyed Wax	" 14	4	Fairly "	4¾	Light "	Good.
Improved Navy	" 20	4	Very "	5	Green	Fair.
Best of All	" 15	4	Fairly "	5¼	"	Good.
California Pea	" 25	4	" "	4	"	Poor.
Early China	" 10	5	Very "	5⅛	"	Good.
White Field	" 15	5	" "	4½	"	Fair.
Canadian Wonder	" 10	5	" "	7	Dark yellow	Very good.
Early Golden Wax	" 11	4	Fairly "	4¼	"	"
Mohawk	" 9	5	Very "	5½	Green	"
Saddleback Wax	" 12	5	Fairly "	5	Light yellow	"
Black Eyed Wax	" 12	6	" "	5½	"	"
Dwarf Horticultural	" 10	5	Very "	4¾	Dark green	Fair.
Giant Yosemite Wax	" 12	4	" "	6¼	Light yellow	Very good.
Mexican Prolific Tree	Did not produce fruit.					

BEANS—*Continued.*

Name of Variety.	Ready.	No. of Beans in Pod.	Productiveness.	Length of Pod.	Colour.	Flavour.
				In.		
Nettle Leaved Bagnolet.......	Aug. 10..	4	Very productive.	6	Green.. ...	Very good.
White Valentine...............	" 15..	5	Fairly " .	5	Light green...	Fair.
Challenge, Black Wax........	" 10..	4	Very " .	4	Light yellow..	Good.
Round Podded.................	" 12..	4	" " .	4	Light green...	Fair.
Currie's Rust Proof...........	" 20..	5	" " .	5	Dark yellow..	Good.
White Kidney.................	Did not produce fruit.					
Large White Marrowfat.... .	"		"			
Keeney's Rustless Golden.....	Aug. 12..	4	Very " .	$4\frac{1}{4}$	Light yellow..	Good.
Burpee's Bush Lima....... ...	Did not produce fruit.					
Soya Bean	"		"			
Early, White-seeded Wax.....	Aug. 20..	4	Fairly " .	5	" ..	Fair.

The following varieties are worthy of special mention :—

Boston Favourite.—A green bean, with long pod, and very productive.

Ne Plus Ultra.—An extra early variety, having green, flat, fleshy pods, and exceedingly productive.

Blue Podded Butter.—Rather an oddity in beans. The pods, which are produced abundantly, are of a blush black colour. Flavour good.

Early Giant Wax.—A yellow bean, producing long pods, and very productive. A good variety for general purposes.

Scarlet Flageolet Wax.—A wax bean of large size, and very productive.

Canadian Wonder.—This was undoubtedly the best variety tested this season. Its long, yellow pods, of good flavour, are borne in profusion. An attractive market sort.

Mohawk.—A green podded bean, pods long, flat and straight. Very productive.

Giant Yosemite Wax.—Very large, yellow pods, abundantly produced, of excellent flavour.

Nettle Leaved, Bagnolet.—Straight long green pods. Very productive.

SQUASH AND PUMPKINS.

Fifty varieties of the above were sown on 21st May and germinated well, with four exceptions. viz. : *Mediterranean and Mammoth Whale Squash,* and *Tenessee Sweet Potato* and *White Cushaw Pumpkins.* The protracted spring frosts, cut the young plants badly, but as the seed was sown thickly, all varieties that had germinating power were found to be represented on the approach of settled weather. Owing to the dry season and our inability to irrigate, no heavy weights were recorded, but taking the above drawbacks into consideration, the growth and yield was remarkable, the many curious forms of this variable order proving a source of interest to visitors. The correctness of our previous views, with reference to the special adaptability of the bush forms of squash for this province, was again amply demonstrated, the compact form, and early setting propensities of these varieties making them very desirable. The seeds were sown outside in hills 8 feet apart each way, and the block was surrounded by a double row of corn to act as a windbreak. This precaution proved to be a good one, for it entirely prevented the usual damage occasioned to this class of plants, by the high winds experienced here. Following arranged in tabular form are the results of this test, together with a few notes on varieties specially suited for this climate.

Name of Variety.	Ready for Use.	Weight.	Colour of Flesh.	Outside Colour.	Shape.	Form.
		Lbs				
Delicata	Sept. 10	15	Light yellow	Green and yellow	Oblong	R.
Orange Marrow	Aug. 20	8	Orange "	Orange	Round, pointed at end	R.
Eureka	Sept. 15	10	Greenish "	Light yellow	Oblong	R.
Red China	" 1	5	Bright "	Orange	Round, flattish	R.
Large Yellow Chili	" 10	20	Orange "	Light yellow	Pumpkin-shaped	R.
Pineapple	Aug. 20	8	White	White	Scalloped	R.
Straight Neck	" 14	6	Light yellow	Orange yellow	Warted	B.
New Egg	" 12	10	Whitish yellow	Deep "	Long	B.
Valparaiso	Sept. 10	10	Greenish "	Light "	Field pumpkin type	R.
Bay State	Aug. 17	6	Dark "	Mottled green	Turban-shaped	R.
Der Wing	" 25	4	Greenish "	White	Warted	R.
*Mammoth Whale						
*Mediterranean						
Green Mountain	Sept. 5	15	Greenish yellow	Dark green	Elongated	R.
†Fordhook						
†Marble-Head						
†Cocoanut						
Italian Striped	Aug. 8	8	Cream yellow	Green and yellow striped	Oblong	B.
†Leonard's Golden Heart						
Sibley or Pike's Peak	Sept. 10	12	Greenish yellow	Slate colour	Oblong	R.
French Olive-shaped	Aug. 20	6	Yellow	Deep yellow	Round	R.
English Vegetable Marrow	" 20	7	Greenish white	Light cream	Oblong	R.
Rennie's Green Mammoth	" 25	60	Green and white marbled	Greenish yellow	"	R.
Golden Bush Scalloped	" 14	6	Light yellow	Deep orange	Scalloped	B.
Early White Bush Scalloped	" 14	6	Whitish	White	"	B.
Golden Custard	" 15	6	"	Deep yellow	"	B.
Cocozelle Bush	" 12	8	Yellowish white	Green and yellow striped	Long	B.
Long White Bush Marrow	" 8	10	White	Creamy white	"	B.
Turban or Turk's Cap	Sept. 10	12	Yellow	Deep orange	Turban	R.
Hubbard	" 18	10	Greenish yellow	" green	Oval	R.
†Perfect Gem						
†Faxon						
Early Crookneck	Aug. 20	6	Yellow	Deep orange	Crooked	B.
White Pineapple	" 14	7	Greenish yellow	White	Scalloped	B.
White Chestnut	Sept. 1	8	Whitish	Very white	Oval	R.
Warted Marrow	Aug. 14	7	Greenish white	White	Warted	R.
†Etampo (P)						
†Calhoun (P)						
Sweet or Sugar (P)	Sept. 1	10	Yellow	Deep yellow	Field pumpkin type	R.
Japanese Pie (P)	" 10	15	Greenish yellow	" green	Twisted	R.
Jumbo (P)	" 15	39	Light "	" yellow	Field pumpkin type	R.
Mammoth Prize (P)	Aug. 20	14	" "	" "	Flattish	R.
Mammoth Tours (P)	" 23	15	Greenish "	Gray	Field pumpkin type	R.
Nantucket or Negro (P)	Sept. 5	10	Light "	Dark	"	R.
Winter Luxury (P)	" 15	18	" "	Netted	"	R.
Large Field (P)	Aug. 25	25	Deep "	Deep orange	"	R.
*White Cushaw (P)						
*Tennessee Sweet Potato (P)						
Golden Oblong (P)	Sept. 10	17	Light yellow	Yellow	Oblong	R.
100 Weight (P)	" 15	15	Yellow	Deep yellow	Field pumpkin type	R.

* Did not germinate. † Did not produce fruit.

N.B.—P=Pumpkin. R. running foim B. bush form.

The following is a list of varieties that appear to be specially adapted to this province:—

Long White Bush Marrow.—This variety as usual heads the list. It is of bush form, producing in profusion its long, white and well-flavoured fruit at an early date. Always succeeds here.

Italian Striped Marrow.—A bush variety; fruit long, green, striped with yellow; of fine flavour and very early.

Cocozelle Bush.—Very similar to above.

New Egg Plant.—A very prolific bush form; fruit oblong and of fair flavour; early.

Extra Early Orange Marrow.—A running variety that should do well here. The fruit is very attractive, and fine for pies.

English Vegetable Marrow.—A running form which is highly prized in England. As a vegetable its flavour is delicious; fairly early.

Pumpkin, Sweet or Sugar.—A typical pie variety, of medium size and earliness.

Winter Luxury.—Apparently a good keeper; of good size and quality. When ripe the fruit is beautifully netted, making it very attractive.

LIST of Varieties specially suitable for

Pies.		Vegetables.	
Orange Marrow	S	Pine Apple	S
Red China	S	New Egg	S
Yellow Chili	S	Italian Striped	S
Bay State	S	English Veg., Marrow	S
Green Mountain	S	Cocozelle Bush	S
Olive shaped	S	Long white Bush Marrow	S
Turban or Turk's Cap	S	Early Bush Scalloped	S
Hubbard	S		
Etampes	P		
Sweet or sugar	P		
Japanesse Pie	P		
Jumbo	P		
Mammoth Prize	P		
Negro	P		
Winter Luxury	P		

N.B.—S. Squash. P. Pumpkin.

CUCUMBERS.

Four varieties of the above were sown outside in hills, on 21st May and three varieties in hotbeds (for inside culture) on 15th April. Although the former were badly cut by the frosts previously mentioned in my report, they eventually recovered and produced a fine crop of fruit. Following are the results:

OUTSIDE SOWING.

Variety.	Ready.	Colour.	Shape.	Flavour.	Weight.	Productiveness.	Length.
White Spine.....	Aug. 13.	Light green...	Short, spiny..	Good.....	9 oz..	Fairly productive.	8 inches..
Cool and Crisp...	" 20.	Dark green...	" " ..	"	8 " ..	" " ..	8 " ....
White Wonder...	" 10.	Creamy white.	" " ..	"	10 " .	Very " ..	8 " ....
Gherkins........	Sept. 1.	Light green...	Oval, spiny...	"	Small...	Poor.........	For pickling

INSIDE SOWING.

Variety.	Ready.	Colour.	Shape.	Flavour.	Weight.	Productiveness.	Length.
White Spine.....	July 3.	Light green...	Short, spiny..	Good.....	5 oz..	Fair.........	5 inches..
White Wonder...	" 15.	Creamy white.	" " ..	"	4 " ..	Poor.........	4½ " ....
Telegraph.......	" 7.	Dark green...	Long smooth .	Very good	24 " ..	Very.........	18 " ....

The "White Wonder," as a forcing variety, was a failure, while outside, it was the most productive variety, although not generally grown here, it has much to recommend it to market gardeners, viz. :—Earliness, productiveness and excellent flavour, and colour for pickling, it no doubt will soon work its way into public favour. "Telegraph" again demonstrated its superiority as a forcing variety. The "Gherkins" were late.

GARDEN LEMON OR VEGETABLE PEACH.

This was sown 21st May in hills outside, and ripened 10th September. It comes highly recommended from the seedsmen, but did not fulfil expectations. The fruit, when ripe, is of the size of a lemon, and similarly coloured, with a centre resembling a miniature musk-melon. Flavour of the flesh (which consists of a very narrow strip), sub-acid and disagreeably perfumed. It is credited with making a fine preserve, but we found it far inferior to the citron in this respect.

TOBACCO.

A sample of tobacco seed was received from the Department of the Interior for testing purposes. Sown in hotbed on 8th April, and transplanted into boxes on 23rd April, and planted outside on 16th June. Following is the result:

Variety.	Harvested.	Height of Plant.	Length of Leaf.	Width of Leaf.
Havana.....................	August 17th ...	3 feet.............	22 inches..........	10 inches.

Fearful of frost, which in previous tests have spoilt the leaf, this was harvested before it was properly ripened, although had it been allowed to stand, it would probably have ripened this season on account of the peculiarly open fall. The product was dried as carefully as possible, and a sample has been forwarded to an expert for examination, but has not yet been reported on. The average season does not appear to be long enough for the varieties that have been tested up to the present, to mature. The leaf grown this year would answer for tree spraying purposes, and it might be advisable to grow a small quantity each year, with that end in view.

MISCELLANEOUS VEGETABLES.

Representative varieties of the following vegetables were grown : onions, salsify, lettuce, broad beans, tomatoes, corn, carrots, savory herbs, radishes, celery, cabbage, cauliflower, turnips and beets, but (with the exception of the four latter) did not attain their usual standard. Asparagus of which we have four varieties represented here, was above the average, the cool spring greatly prolonging the production of edible shoots. It is worthy of remark, that in tomatoes, Early Ruby and Earliest of All, again proved themselves specially desirable varieties for Manitoba, the wisdom of severely pruning this vegetable, being also again apparent.

THE FLOWER GARDEN.

It was deemed advisable last season to change the site of the flower garden from the hill-side, to a more level situation in front of the superintendent's house, which has proved to be an advantage, as this location is entirely free from the annual spring wash, which was usually troublesome, in connection with the former site. Twenty varieties of annuals, and about sixty varieties of perennials were planted, and, during the summer, made a very creditable showing. It is pleasing to note the increased interest shown in this branch of work every year, many inquiries being made, especially with regard to the perennial flowers.

The following tabulated list gives particulars showing period of flowering, hardiness, etc., of the different varieties tested :—

ANNUALS.

Variety.	How Sown.	Date Sown.	Date Transplanted.	Planted Out.	Flowering Period.
Salpiglossis variabilis	Boxes in hotbed.	April 6..	April 19-25....	June 9-15..	June 20 to frost.
Gaillardia Lorenziana	" ..	" 6..	" 19-25....	" 9-15..	July 3 "
Phlox Drummondii	" ..	" 6..	" 19-25....	" 9-15..	" 20 "
Petunias, double	" ..	" 6..	" 19-25....	" 9-15..	" 15 "
" single	" ..	" 6..	" 19-25....	" 9-15..	" 12 "
Verbenas, mixed	" ..	" 6..	" 19-25....	" 9-15..	" 20 "
Asters, mixed types	" ..	" 6..	" 19-25....	" 9-15..	" 25 "
Antirrhinum, dwarf	" ..	" 6..	" 19-25....	" 9-15..	" 10 "
Nicotiana affinis	" ..	" 8..	" 19-25....	" 9-15..	" 1 "
Stocks, mixed types	" ..	" 6..	" 19-25....	" 9-15..	" 1 "
Zinnia elegans	" ..	" 6..	" 19-25....	" 9 15..	June 20 "
Marigolds, mixed	Outside	Self sown.	Not transplanted	....	July 1 "
Sweet pease, mixed	"	April 30..	" ..	....	" 1 "
Nasturtiums, dwarf	"	May 15..	" ..	....	June 20 "
Candytuft, mixed	"	" 15..	" ..	....	" 25 "
Larkspur, mixed	"	" 15..	" ..	....	Aug. 1 "
Poppy, paeony flowered	"	" 15..	" ..	....	June 25 fo Aug. 5.
" the Shirley	"	" 15..	" ..	....	" 23 "
Pyrethrum aureum	Boxes in hotbed.	April 6..	April 19-25....	June 9-15..	Foliage plant.
Lobelia compacta	" ..	" 6..	" 19-25....	" 9-15..	June 20 to frost.

Asters, usually so good here, were not a success this season. Nearly all the flowers were blighted and only partially expanded. The trouble was general in this district.

Stocks contained an exceptionally large amount of single flowers this year.

PERENNIALS.

Variety.	When Planted.	Flowering Period.	Hardiness.
Eryngium macrocarpa	1894	July 10 to Aug. 5	Very hardy.
Sedum medenezii	1894	" 1 to July 30	"
Hemerocallis fulva	1894	" 15 to Aug. 25	"
" flava	1894	" 20 to " 10	"
Aconitum Kusmalowi	1894	" 25 to frost	"
" Napellus	1894	Did not flower	Questionable.
Coreopsis lanceolata	1894	June 7 to Aug. 20	Very hardy.
Lychnis Chalcedonica	1893	" 27 to " 7	"
Salvia (variety ?)	1894	" 15 to July 10	"
" lavandulifolia	1894	" 20 to " 10	"
Delphinium grandiflorum	1894	July 10 to Aug. 20	"
" Dwarf	1894	" 19 to " 20	"
Campanula Grasseckii	1894	" 25 to " 15	"
Papaver orientale	1894	June 10 to June 30	"
" nudicaule	1894	May 20 to frost	"
Phlox (Perennial)	1894	Aug. 10 "	Fairly hardy.
Pæony Double	1893	June 28 to July 12	Very hardy.
Dictamnus fraxinella	1894	Did not flower	"
Anthemis coronaria	1894	July 5 to frost	"
Veronica salurgoides	1894	" 20 to Aug. 20	"
Gaillardia aristata	1894	June 28 to " 1	"
Linum perenne	1893	" 5 to July 10	"
Aquilegias (in variety)	1893	" 1 to " 25	"
Platycodon grandiflorum	1893	Did not flower	"
" " album	1893	July 20 to Aug. 10	"
Dielytra spectabilis	1893	June 15 to July 10	"
Lilium tigrinum	1893	Aug. 10 to frost	"
Convallaria majalis	1894	Did not flower	"
Grass Pinks	1894	June 23 to Aug. 1	"
Iris Germanica (in variety)	1893	" 18 to July 5	"
" sibirica "	1895	" 13 to June 30	"
" " alba	1894	Did not flower	Unhealthy.
" biglumis	1894	June 24 to July 6	Very hardy.
Thalictrum aquilegifolium	1894	Did not flower	"
Scilla sibirica	1893	May 1 to June 1	"
Tulips (in variety)	1893 to 1897	" 9 to " 30	"
Dahlias "	1894	Aug. 5 to frost	Lifted in fall.
Gladiolus "	1893 to 1897	" 14 "	"

The following varieties, have only survived one winter, and although very promising, their hardiness cannot as yet be positively stated :—

Name of Variety.	Whether flowered or not.
Lychnis Haageana Hybrid	Flowered.
Hemerocallis Flava fl. pl	"
" Fulva fol. var	"
" Kwanso fl. pl	"
" grandiflora	"
Hesperis matronalis	"
Hollyhocks Lorenz's Prize	"
Polemonium reptans	"
Baptisia australis	Did not flower.
Myosotis palustris	Flowered.
Orobus lathyroides	"
Salvia argentea	Did not flower.
Galega officinalis	Flowered.
" alba	"
Stachys lanata	Did not flower.
Gysophila paniculata	Flowered.
Iberis sempervirens	Did not flower.

Avenue of Box-elder trees, *Acer negundo*, at the Experimental Farm at Brandon, Manitoba, nine years planted.

The following varieties, have only survived one winter, &c.—*Concluded.*

Name of Variety.	Whether flowered or not.
Penstemon murrayanus	Flowered.
Glaucium luteum	"
Asclepias tuberosa	Did not flower.
Stenactis speciosa	Flowered.
Alyssum argenteum	"
Agrostemma coronaria	"
Fragaria indicia	"
Centaurea macrocephala	"
Iberis Gibraltarisa	"
Lychnis Chalcedonica alba	"
Saponaria ocymoides	"

ROSES.

As stated in last year's report, two varieties of roses were alive in the fall of 1896, viz., Mad. Bruant and Gem of the Prairies. The former came through the winter in very poor condition, and did not long survive its removal to permanent location. Gem of the Prairies made vigorous growth and flowered, and from all appearances promises to be a very hardy variety. The colour of the flower is a deep pink, and it is very sweetly scented. Another variety (the identity of which is in doubt) was received from a local grower and came through the winter of 1896 in fine condition without any protection. It flowered from 17th to 25th July, the bud being long, pointed and sweet scented. Twelve varieties were received from the Central Farm this season. These are named in the following list, and their condition described on the approach of winter.

Name of Variety.	Condition, Fall 1897.	Name of Variety.	Condition, Fall 1897.
Madame Geo. Bruant	Vigorous	Merveille de Lyon	Vigorous
" Victor Verdier	"	Marshal P. Wilder	"
" Plantier	"	Baron Prevost	"
" Gabriel Luizet	"	Francois Levet	Weak
Mlle Marie Rady	Weak	Caroline de Sansal	"
Crimson Rambler	"	Lady H. Stewart	Died soon after arrival.

The above were treated in the same manner as raspberry canes, being laid down, and covered with soil for winter protection. The result will be reported on next season.

HYACINTHS.

Last fall a test was made to ascertain if, by covering these bulbs very heavily, they could be brought through our severe winter. A piece of tar paper was first laid over the bed, extending four feet over each side, and on this was piled four feet of fresh manure. The covering was removed in the spring following, and the Hyacinths came up regularly and flowered well. From this it may be inferred that these most desirable bulbs, thus treated, may be grown here successfully.

COLLECTION OF PERENNIAL FLOWERING PLANTS.

A perennial bed has been commenced this fall, in which it is intended to have represented all the varieties of perennial flowers growing on the farm, and among them the best of our native perennials. There are at present 150 species and varieties represented in the collection, and additions will be made from time to time as plants are procurable.

DISTRIBUTION OF SEED GRAIN AND POTATOES.

The distribution of 3-pound samples of grain, etc., was larger this year than usual but owing to the limited supply of grain available we were only able to supply a fraction of the applications for 2-bushel lots of grain.

The following quantities were sent to applicants from this farm in spring :—

Wheat, 2 bushels or more	20
Oats " "	13
Barley " "	32
Pease " "	11
Grain of all kinds in 3-pound bags	357

From these many favourable reports have been received.

DISTRIBUTION OF POTATOES, ETC.

Potatoes in 3-pound bags	210
Maple seed, 1-pound bags	385
Flower seed, packages	488
Rhubarb " "	135
" roots "	130
Vegetable seed "	136
Perennial flowering plants, packages	94

The following reports have been received on the potatoes distributed :

Name of Variety.	No. Received.	No. Reporting Rot.	No. Reporting Scab.	Average Yield in lbs.	No. Reporting favourable.	No. Reporting unfavourable.
Everett	5	0	0	$59\frac{1}{5}$	5	0
Early Ohio	6	0	1	36	3	3
Pearce's Extra Early	5	0	1	$49\frac{4}{5}$	3	2
Lightning Express	1	0	0	31	1	0
Sharpe's Seedling	5	0	1	$34\frac{1}{5}$	4	1
Early Puritan	5	0	2	76	5	0
State of Maine	3	0	0	75	2	1
Daisy	6	1	2	55	4	2
Rural Blush	5	0	0	$54\frac{3}{5}$	5	0
Crown Jewel	3	0	1	89	3	0
Pearce's Prize Winner	2	0	1	40	2	0
Northern Spy C.E.F	1	0	0	92	1	0
Lee's Favourite	2	0	0	$42\frac{1}{2}$	1	1
I. X. L.	1	0	0	54	1	0
Beauty of Hebron	1	0	0	25	1	0
Early Sunrise	1	0	0	30	0	1

NEW BREAKING.

As mentioned in a former report the grass land in the valley on this farm reserved for pasture has become run out, the ground being occupied mainly by White Anemone, Artemisia and Sunflowers. Each year portions of this part of the farm are being broken up and cropped with the result that much larger returns of hay and pasture have been obtained from the portions cultivated.

During the past summer 37 additional acres were broken up, back set and also well disc-harrowed late in the fall, this has completely broken up the decayed sod and brought the soil into excellent condition, and will probably give good returns next year.

FENCING.

The wire and rail fencing erected in 1889 and 1890 on the outer boundaries of the farm have given good satisfaction, and no heaving of posts has taken place.

During the past season forty-five rods of additional fence has been built across the northern cattle pastures and 220 rods on the Assiniboine River banks at the extreme southern boundary of the farm, this latter fence has enabled us to utilize the 50 acres of pasture in this portion of the farm and the young stock have thriven well on the luxuriant pasture with the good water supply.

NEW BUILDINGS.

During the year a driving shed 72 x 20 feet, to be used for sheltering vehicles and implements has been built, this is open to the west and implements can be readily backed in when not in use.

A room has also been built in the superintendent's house over the office, providing accommodation much needed.

ROADS.

The roads laid out through the experimental farm here have proved very satisfactory, and the gravel has not been much cut up even with the heavy travel of the autumn months, and it is evident that good gravel properly applied is as suitable for rural roads in this province as it is in the east.

Nine hundred and ninety additional feet has been gravelled during the year, this is in addition to the repairs required to the roads already gravelled.

FARMERS' MEETINGS.

Since my last report addresses have been given at seventeen farmers' meetings. Nearly all of these were well attended and much interest taken in the work of the experimental farms.

The location and dates of the meetings are given below:—

January	4th,	1897,	Birtle.
"	11th	"	Elkhorn.
"	12th	"	Virden.
"	13th	"	Oak Lake.
"	14th	"	Douglas.
"	16th	"	Pipestone.
"	18th	"	Melita.
"	19th	"	Deloraine.
"	20th	"	Boissevain.
February	6th	"	Brandon.
"	15th	"	Stony Mountain.
"	16th	"	Manitoba Dairy Convention.
"	17th	"	Bird's Hill.
"	17th	"	Kildonan.
"	18th	"	Swine Breeders' Meeting, Winnipeg.
"	20th	"	Rosser.
December	4th	"	Brandon.

VISITORS.

It is evident, from the large increase of visitors each year, that the interest in the work of the farm is not abating.

During the past year 15,700 visited the farm, principally farmers and their families, many coming from distant parts of the province, and spending a day or two inspecting the various crops growing on the farm.

The month of July and the first two weeks in August is the most suitable time for this purpose, as the distinguishing features of the different varieties of grain, grasses, &c., can then be seen to the best advantage, and the trees and shrubs are also in full leaf.

METEOROLOGICAL RECORD.

Month.	Highest Temperature.	Lowest Temperature.	Total Rainfall.	Depth of Snowfall.	Total amount of Sunshine.
1896.			Inches.	Inches.	Hrs. Min.
November	30° above zero on 2nd.	40° below zero on 20th.	....	$23\frac{3}{4}$	62 6
December	39° " 10th.	33° " 1st..	....	10	71 9
1897.					
January	38° " 8th.	35° " 23rd.	....	$16\frac{1}{4}$	97 7
February................	31° " 4th.	39° " 26th.	....	$13\frac{1}{2}$	125 5
March................	40° " 31st.	41° " 14th..	....	12	145 8
April..................	74° " 17th.	10° above zero on 19th.	$\frac{4}{10}$	....	153 9
May	92° " 4th.	21° " 31st..	$\frac{3}{10}$	....	266
June	100° " 13th.	26° " 5th..	$\frac{6}{10}$	....	205 4
July	96° " 28th.	41° " 27th..	$1\frac{1}{2}$	....	230 3
August...	96° " 12th.	33° " 30th..	$2\frac{3}{10}$	....	236 3
September	94° " 8th.	25° " 16th..	$\frac{4}{10}$	....	237 3
October	80° " 6th.	6° " 9th..	1	....	140 9
	Total, 1897	....	$6\frac{1}{2}$	$75\frac{1}{2}$	1,968 6
	" 1896	....	$14\frac{9}{10}$	$65\frac{1}{4}$	1,951 18

CORRESPONDENCE.

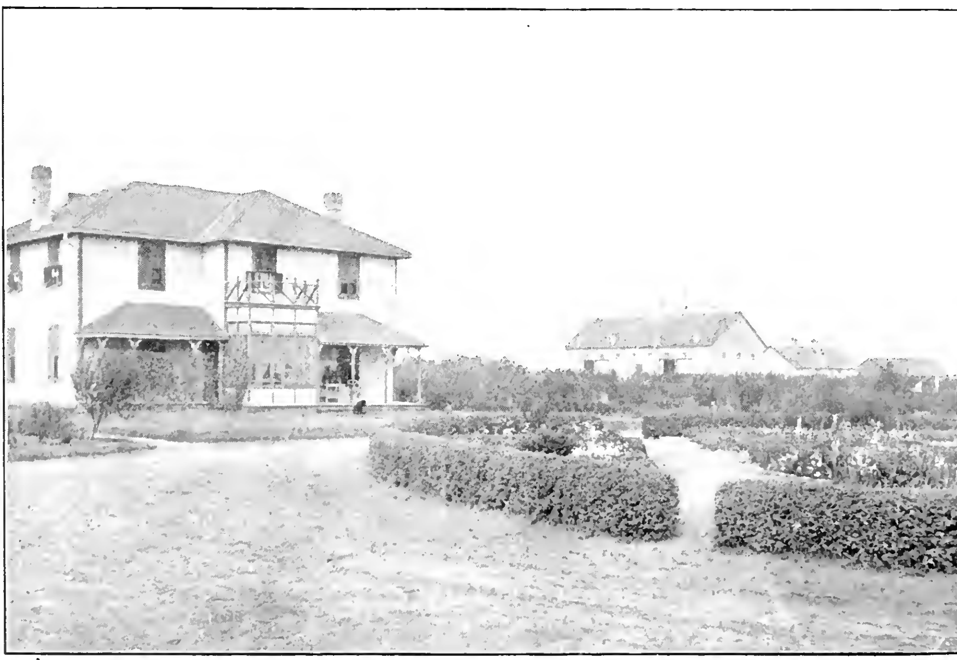
The correspondence from this office shows an increase each year, there were 2,900 letters received during the year and 3,060 despatched, this is irrespective of 1,558 circulars sent out.

I have the honour to remain, sir,

Your obedient servant,

S. A. BEDFORD, *Superintendent.*

Appearance of grounds surrounding house of Superintendent, Experimental Farm, Indian Head, N.W T., first year after building.



Appearance of grounds surrounding house of Superintendent, Experimental Farm Indian Head, N.W.T., seven years after planting

EXPERIMENTAL FARM FOR THE NORTH-WEST TERRITORIES.

REPORT OF ANGUS MACKAY, SUPERINTENDENT.

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.,
31st October, 1897.

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

SIR.—I have the honour to submit herewith to you the tenth annual report of the operations on the Experimental Farm for the North-west Territories at Indian Head, Assiniboia, during the year 1897.

The past season has, on the whole, been favourable over the greater portion of the Territories. In many districts the harvest has been very gratifying ; in other portions the yield of grain has not been large but it is of excellent quality, and in no part has there been a complete failure. In addition to the fair crop, the good price commanded by almost everything grown or raised in the Territories has placed the farmers in a better position than has heretofore been attained.

Perhaps no previous year has shown the results of good farming to better advantage than the past season.

Spring opened about the 15th April, after one of the finest winters ever experienced in the North-west Territories. Snow fell early in November and lay till April, during which time sleighing was good, and at no time was the cold excessive. For weeks together almost perfect winter weather was experienced.

Seeding commenced on the experimental farm on the 16th April and continued without intermission till completed. High and continuous winds were prevalent during the last week of April, the whole of May, and from 1st to 15th June, when a heavy rain put an end to the winds and drouth which were threatening destruction of the crops in many portions of the Territories.

The rainstorm which passed over the experimental farm and district of Indian Head from 15th to 18th June inclusive was almost a deluge. On the 15th rain fell from 9.30 to 19 o'clock to a depth of 6·6 inches ; on the 16th from 22 to 24 o'clock to a depth of 0·9 inch, and on the 18th from 13 to 19 o'clock to a depth of 2·5 inches—a total of 10 inches in four days. While the greater portion of this rain flowed over the land to the coulees, thence to the Qu'Appelle River, it ensured to the experimental farm and district an abundant crop of grain. Unfortunately the heavy rains extended over a small area, and in several districts the rain-fall was below the average. Nevertheless good farming in these districts caused a fair crop where in former years total failure would have been the result.

Smut caused little or no loss the past season. Where any took place, neglect in using bluestone as a preventive, or carelessness in the treatment of the seed was the sole cause.

Weeds, on the other hand, were very prevalent ; and the dangerous ones, such as Stink-weed and Hare's Ear Mustard, are fast spreading in many—if not in every—district in the Territories.

The harvest was the earliest on record in the North-west, and with the usual harvest weather in August and September, the grain was quickly secured. Threshing proceeded without delay and long before cold weather set in, was completed. It is safe to say that no previous harvest has been taken off and threshed with less delay or expense and with so much satisfaction to the farmer.

Protection from winds is one of the needs of the Territories, and as the soil becomes fine from working and cropping, the need becomes more apparent. For several years past the experimental farm has sustained considerable injury from winds. Last spring, however, the wind-breaks and hedges afforded protection to a large portion of the crop and on only a few fields was the grain injured. Other farms in the district, with no protection, suffered severely.

Barley was the most uniform and the best crop grown on the experimental farm the past season. A few one-tenth acre plots not protected were more or less damaged by wind, but on the whole the thirty-five varieties sown on large and small areas gave heavy yields of grain and straw.

Wheat tests of one-tenth acre each were not exposed to winds, and produced a large quantity of straw, with varied yields of grain, caused partially by dead heads in some parts and the excessive yield of straw in others. Winds swept continuously over the acre and larger plots causing lighter yields.

About one-half of the one-tenth acre plots of oats suffered more or less from winds, but on the whole the returns were satisfactory. The acre and field lots suffered a good deal and the yields were lighter. Where sown on stubble-land the crop was very poor.

Pease were the most surprising crop grown. Though repeatedly cut down by winds and frost up to 15th June, when the rains came nothing on the farm made more rapid progress, and the yields were very satisfactory. The sample surpasses any previously grown on the farm.

The hay crop on the farm was much better than it at one time promised. Before the rains came only low spots and margins of fields grew to any extent, but the rains made a wonderful change in a few weeks, and though parts, especially of fields sown four or five years ago, were light, the crop generally was good. Brome grass requires some moisture early in the spring to give it a start, and although it will grow with less than any other variety, May rains are worth a great deal to it.

The root crop was not at all satisfactory. Up to 15th June, when rains came, neither turnips, mangels, carrots, nor sugar-beets had appeared above ground. This also applies to corn and millets sown on the experimental farm, and to potatoes and vegetables generally in many portions of the Territories. July and August were dry months, and the growth was checked soon after starting, giving poor returns.

Potatoes and vegetables on the experimental farm, though late in starting, gave, in many cases, very fair results.

Small fruits, with the exception of strawberries, were a good crop. Wild fruits were a failure.

Trees and shrubs made a very satisfactory growth, and less of the new varieties died this year than ever before.

EXPERIMENTS WITH SPRING WHEAT.

Thirty-eight varieties of wheat were tested in $\frac{1}{10}$ acre plots, six of the same varieties again on plots of one acre each, and five sorts on five and ten acre fields. The $\frac{1}{10}$ acre plots were on a field protected by hedges from the prevailing winds, and did not suffer in the least. The acre plots and five and ten acre fields were more exposed and all sustained more or less injury.

RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

Red Fife and Stanley were used. The plots were $\frac{1}{10}$ acre each, and the soil a clay loam. The first plots were sown on the 17th of April, and six successive sowings were made a week apart, the last plots being sown on the 22nd of May. The plots came up and matured in the order sown. As will be seen, the three first seedings gave the best returns. There was no rust on any of the plots.

Seed sown by hoe-drill, on fallow at rate of 1½ bushel per acre.

WHEAT—Sown at Different Dates.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Length of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
				In.	In.	Lbs.	Bus.	Lbs.	Lbs.
Stanley	April 17.	Aug. 21.	126	48	3	5,590	37	40	61
"	" 24.	" 27.	125	48	3	4,700	36	40	61½
"	May 1.	" 27.	118	45	3	4,500	36	50	62
"	" 8.	" 31.	115	45	3	4,160	30	40	62
"	" 15.	Sept. 2.	110	42	3	3,850	31	40	63
"	" 22.	" 6.	107	39	2½	3,450	25	50	62
Red Fife	April 17.	Aug. 27.	132	45	3	5,650	39	10	62¼
"	" 24.	" 27.	125	45	3	4,540	37	40	62
"	May 1.	" 31.	122	45	3	4,270	35	30	62½
"	" 18.	Sept. 2.	117	45	3	4,170	34	40	63
"	" 15.	" 2.	110	45	3	4,450	35		62¼
"	" 22.	" 10.	111	45	3	5,250	33	20	62

TEST OF VARIETIES ON ONE-ACRE, FIVE-ACRE AND TEN-ACRE FIELDS.

In these tests the more promising varieties of wheat grown in previous years were sown, not only to test the grain on larger areas but for the purpose of obtaining seed in quantities for distribution or for sale for seed. The plots were exposed to winds and sustained more or less injury therefrom. The soil chosen for these tests was a clay loam. Most of the varieties were slightly rusted, but no smut was observed on any of them.

WHEAT—Field-lots.

Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.	
Sown on.	Acres.				In.	In.	Lbs.	Bush.	Lbs.
Red Fife, summer-fallowed	10	April 17..	Aug. 25..	130	42	3¼	3,500	33	50
" corn stubble, fall ploughed	3½	" 16..	" 27..	133	42	3	3,480	32	45
White Fife, summer-fallowed	2½	" 19..	" 25..	128	43	3	4,120	30	25
Wellman's Fife "	2½	" 19..	" 25..	128	44	3¼	3,360	28	41
Preston " "	5	" 20..	" 27..	129	45	3¼	3,700	28	8
Stanley " "	5	" 20..	" 25..	127	44	3	3,870	27	44

Acre Plots.

Hungarian, summer-fallowed	1	April 20..	Aug. 23 .	125	39	2½	4,340	30	45
Monarch "	1	" 20..	" 30..	132	44	3	4,050	30	7
Red Fern "	1	" 20..	" 23 .	125	45	3½	4,230	29	30
Emporium "	1	" 20	" 27..	129	40	3	3,250	27	40
White Russian "	1	" 20..	" 30..	132	44	3	2,940	24	10
Percy "	1	" 20..	" 23..	125	42	2½	3,120	23	57

SPRING WHEAT TEST OF VARIETIES.

Thirty-eight varieties were sown by hoe-drill on fallow on the 24th of April, at the rate of 1½ bushel per acre. The soil was a clay loam, and the plots, which measured one-tenth acre each, were protected from winds. Many of the varieties made a rank growth of straw but produced a poor sample of grain. No rust was observed on any of these plots.

WHEAT—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushl.
			In.		In.		Lbs.	Bus.	Lbs.	Lbs.
Hungarian	Aug. 21	119	39	Weak	2½	Bearded	4,630	42	..	63
Countess	" 21	119	32	"	2½	"	4,180	40	20	63¾
Admiral	" 21	119	45	Strong	3½	Bald	5,040	40	10	62¼
Vernon	" 27	125	39	Weak	3½	Bearded	4,810	39	..	61
Herisson Bearded	" 28	126	42	Strong	2	"	5,510	39	..	65
Percy	" 21	119	45	Weak	3	Bald	4,930	38	40	63
Red Fern	" 27	125	45	"	4	Bearded	6,240	38	30	63
Wellman's Fife	" 28	126	45	Strong	3½	Bald	4,580	37	50	62¼
Progress	" 21	119	48	Weak	2½	"	4,080	37	50	62½
Red Fife	" 27	125	45	Strong	3	"	4,380	37	50	63
Alpha	" 21	119	45	"	3	Bearded	5,710	37	20	62
Pringle's Champlain	" 21	119	42	Weak	3½	"	5,420	37	10	61
Huron	" 21	119	45	Strong	3¾	"	5,230	37	..	61½
Old Red River	" 28	126	45	"	3½	Bald	4,240	36	50	63
Emporium	" 28	126	48	"	3½	Bearded	4,400	36	40	63¾
Rideau	" 21	119	42	Weak	2½	Bald	3,680	36	10	62
Beaudry	" 30	128	48	Strong	3	Bearded	4,830	36	10	64
Captor	" 21	119	42	"	2½	Bald	4,690	36	..	62½
Preston	" 27	125	42	Weak	3½	Bearded	4,690	36	..	63½
Crown	" 21	119	45	Strong	3	"	4,710	35	40	62¼
White Fife	" 28	126	45	"	3	Bald	4,370	35	30	63
Monarch	" 27	125	45	"	2¾	"	4,430	35	20	62
White Connell	" 28	126	45	"	3	"	4,430	35	20	63
Dawn	" 21	119	32	Weak	3	"	4,150	35	..	62
Advance	" 27	125	42	"	3½	Bearded	4,820	33	50	63½
Beauty	" 21	119	48	"	3	Bald	4,350	33	20	60¼
Campbell's White Chaff	" 28	126	45	Strong	3	"	4,050	32	30	59
White Russian	" 28	126	42	"	3	"	3,740	31	50	61
Rio Grande	" 28	126	45	Weak	3	Bearded	4,550	31	40	62¼
Golden Drop	" 28	126	48	Strong	3	Bald	4,140	31	10	62
Stanley	" 24	122	45	"	3	"	4,440	31	..	60½
Black Sea	" 21	119	48	"	3	Bearded	4,810	30	40	61
Blenheim	" 28	126	48	"	3½	"	4,420	30	30	62
Dufferin	" 27	125	42	Weak	3	"	4,500	29	10	61½
Ladoga	" 30	128	48	Strong	3	"	3,930	28	40	62
Dion's	" 27	125	45	Weak	3½	"	6,210	27	20	63¼
Goose	" 27	125	42	"	3	"	4,820	27	10	63
Colorado	" 28	126	45	"	3	"	4,150	25	..	62

WHEAT—Test of Sowing Seed at different Depths.

Sown by hoe-drill, on fallow, on the 22nd April, on clay loam at rate of 1½ bushel per acre. A great difference will be observed between the different depths of seeding. Size of plots $\frac{1}{10}$ acre each.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.	Lbs.	Bus	Lbs	
Red Fife—1 inch deep	Aug. 23	123	45	Strong	3	5,600	40	..	62¼
" 2 "	" 23	123	45	"	3	5,560	40	40	62¼
" 3 "	" 23	123	42	"	3	4,820	33	50	62

YIELDS and average for past six years.

Name of Variety.	1892.		1893.		1894.		1895.		1896.		1897.		Average.	
	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.	Bus.	Lbs.
*Red Fife—1 inch deep	....	..	..	....	.....	.....	.....	.....	38	30	40		39	15
" 2 "	27	00	41	20	15	20	45	00	39	15	40	40	34	45
" 3 "	22	30	37	10	18		37	30	38	50	33	50	31	18

*Not tested previous to 1896.

WHEAT—Test of sowing different quantities of seed, per acre.

Sown on the 22nd April, by hoe-drill, on clay loam, summer-fallowed. Size of plots $\frac{1}{10}$ acre each.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.	Lbs	Bus.	Lbs.	Lbs.
Red Fife—1 bushel per acre	Aug. 25	125	45	Strong	3	5,440	38	30	62¼
" 1¼ "	" 25	125	42	"	3	5,720	38	50	62¼
" 1½ "	" 25	125	42	"	3	4,930	38	40	62

YIELDS and average for past six years.

Name of Variety.	1892.		1893.		1894.		1895.		1896.		1897.		Average.	
													Bus.	Lbs.
Red Fife—1 bushel per acre.	35	50	28	20	14	30	35	50	38	30	38	30	31	55
" 1¼ "	40	..	28	..	11	40	44	..	40	10	38	50	33	46
" 1½ "	39	40	26	30	13	20	42	20	38	20	38	40	33	8

WHEAT—Test of Press *vs.* Hoe-drill.

Sown on the 22nd April, on clay loam, summer-fallowed, at the rate of $1\frac{1}{2}$ bushel per acre. Size of plots $\frac{1}{10}$ acre each.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.	Lbs.	Bus.	Lbs.	Lbs.
Red Fife, sown press-drill	Aug. 21..	121	45	Strong....	3	5,190	41	..	$62\frac{1}{4}$
" "	" 21..	121	48	" ...	3	4,610	39	..	62

YIELDS and average for past six years.

Name of Variety.	1892.		1893.		1894.		1895.		1896.		1897.		Average.	
													Bus.	Lbs.
Red Fife, press-drill........	30	20	38	20	18	40	45	..	41	30	41	..	35	48
" hoe-drill...	24	..	36	18	17	50	44	..	40	40	39	..	33	38

BLUESTONE AS A REMEDY FOR SMUT IN SPRING WHEAT.

Seed used.	Treatment.	Good Heads on 25 Sq. Feet.	Smutty Heads on 25 Sq. Feet.
Red Fife, clean seed	Bluestoned, 1 pound to 10 bush.......	1,342	....
" "	Untreated	1,014	244
" smutty seed	Bluestoned, 1 pound to 8 bush.......	1,110	21
" "	Untreated...........	741	643

For the above tests bluestone was dissolved in water, in the proportion of one pound to two pailsful. In this solution the seed was dipped. The smutty seed used was quite black and totally unfit for any purpose whatever.

TEST OF FALLOW *vs.* SPRING AND FALL PLOUGHING FOR WHEAT.

1st. Ten acres of fallow-land was sown by hoe-drill at rate of $1\frac{1}{2}$ bushel per acre on 17th April.

2nd. Three acres of corn-stubble were ploughed in October, 1896 and harrowed. Sown by hoe-drill at rate of $1\frac{1}{2}$ bush. per acre on 16th April, and harrowed after seeding.

3rd. One acre of burnt stubble-land was ploughed, three inches deep by gang-plough on 29th April, 1897 ; then harrowed and sown by press-drill at the rate of $1\frac{1}{2}$ bush. per acre on same day.

4th. One acre of burnt stubble-land was sown by press drill without ploughing at the rate of $1\frac{1}{2}$ bushel per acre on 29th April, then rolled.

Following will be found return from each plot :—

Plot No.	No. of Acres.	Method of Cultivation.	Bushels per Acre.
1	10	Red Fife on fallow	33·50
2	3	" fall ploughing	32·45
3	1	" stubble, spring ploughed	24·33
4	1	" " not ploughed	26·07

The fallow-land was considerably blown while the others did not suffer from winds.

EXPERIMENTS WITH BARLEY.

Barley was the best crop on the farm the past season, and having no wind or rain storms after the crop headed out, the grain all stood up and was easily harvested. The straw, especially that of the six-rowed varieties, was extra fine. All varieties were cut back by wind-storm on 13th June, but rain coming two days after soon repaired the injury.

TEST OF EARLY, MEDIUM AND LATE SOWINGS.

Two varieties were used in this test, Canadian Thorpe, a two-rowed sort and Odessa, a six-rowed variety. The soil was a clay loam and the size of the plots $\frac{1}{10}$th acre each. The first plots were sown on 24th April, one week after the first seeding of wheat, and the sowings were continued on the same day each week for five weeks or until 29th May. The seed was sown on summer-fallowed land by hoe-drill at the rate of 2 bushels per acre. The twelve plots were protected by a wind-break and did not suffer from winds but six of them were frozen down on 13th May. All the plots ripened in the order sown but the early seedings gave much the better yields of grain and straw.

BARLEY—Test of Early, Medium and late Seeding.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.
Canadian Thorpe	April 24	Aug. 17	115	45	Strong	·3	4,310	58	6	$54\frac{1}{2}$
"	May 1	" 17	108	45	"	3	4,050	56	12	53
"	" 8	" 20	104	45	"	3	4,230	46	22	$54\frac{1}{4}$
"	" 15	" 20	97	45	"	3	3,920	44	18	$53\frac{3}{4}$
"	" 22	" 24	94	36	"	3	3,350	44	38	$51\frac{1}{4}$
"	" 29	" 30	93	36	"	3	3,000	43	6	$50\frac{1}{2}$
Odessa	April 24	" 13	111	39	"	$2\frac{1}{2}$	3,890	75	..	50
"	May 1	" 17	108	39	"	$2\frac{1}{2}$	4,210	77	4	$49\frac{1}{2}$
"	" 8	" 17	101	39	"	$2\frac{1}{2}$	4,450	64	18	50
"	" 15	" 17	94	39	"	$2\frac{1}{2}$	4,600	71	2	$49\frac{3}{4}$
"	" 22	" 20	90	39	"	$2\frac{1}{2}$	4,060	61	12	$49\frac{3}{4}$
"	" 29	" 28	91	39	"	$2\frac{1}{2}$	2,750	53	6	$49\frac{1}{2}$

BARLEY—Field Lots.

Seed sown from the 3rd to the 5th of May on summer-fallow, by hoe-drill at the rate of $1\frac{3}{4}$ bushels per acre, soil clay loam.

Name of Variety.	Size of Plot.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.	
				In.		In.		Bush.	Lbs.
Odessa	5 acres..	Aug. 13..	102	42	Strong ...	$2\frac{1}{2}$	6 rowed ..	56	40
Trooper	5 " ..	" 13..	102	40	" ..	3	6 " ..	54	20
Canadian Thorpe	5 " ..	" 17..	105	45	" ..	4	2 " .	45	6
Sidney	4 " ..	" 21..	108	45	" ..	$3\frac{1}{2}$	2 " ..	44	8

BARLEY—Acre Plots.

Six varieties were sown on the 5th of May on clay loam on plots of one acre each: two on corn stubble-ploughed six inches deep and harrowed and four on summer-fallow. Winds thinned the plots on summer-fallow. Seed sown by hoe-drill at rate of $1\frac{3}{4}$ bushel per acre.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.	
			In.		In.		Bush.	Lbs.
Baxter's—Corn stubble	Aug. 13..	100	42	Strong ...	3	6 rowed...	48	33
French Chevalier—Fallow	" 21..	108	40	" ...	$4\frac{1}{2}$	2 " ..	48	6
Bolton— "	" 18..	105	36	" ...	$3\frac{1}{2}$	2 " ..	45	32
Mensury— "	" 18..	105	36	" ..	3	6 " ..	44	29
Oderbruch—Corn stubble	" 13..	100	40	" ...	2	6 " ..	40	40
Beaver—Fallow	" 21..	108	40	" ...	$2\frac{1}{2}$	2 " ..	38	26

BARLEY—Test of Varieties.

In this test twenty varieties of six-rowed and fifteen varieties of two-rowed barley were sown.

A few plots were slightly injured by winds, and all were cut down by frost on the 13th of May, but speedily recovered after rain on the 15th of June, and gave heavy crops of grain and straw.

Seed was sown on the 5th of May on fallow by hoe-drill, at the rate of two bushels per acre. The soil was clay loam, and the size of the plots was one-tenth acre each. Baxter's and Phœnix both suffered somewhat from smut, all the other varieties were free from smut.

SIX-ROWED BARLEY—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.	Lbs.	Bus.	Lbs.	Lbs.
Common	Aug. 12	99	36	Strong	3	4,180	71	12	53¼
Oderbruch	″ 12	99	36	″	2½	3,690	71	2	53¼
Petschora	″ 12	99	36	″	2½	3,740	70	..	51¼
Odessa	″ 12	99	36	″	3	3,630	68	6	51½
Rennie's Improved	″ 13	100	36	″	3	3,780	68	6	53
Mensury	″ 12	99	39	″	3½	4,140	66	42	50
Baxter's	″ 12	99	36	″	2	3,750	66	32	53
Vanguard	″ 12	99	36	″	2¾	3,150	66	32	52¼
Blue	″ 13	100	33	Weak	3	4,540	65	40	46¼
Royal	″ 12	99	36	Strong	3	3,040	63	36	51
Stella	″ 12	99	36	″	3	4,150	58	16	50¾
Trooper	″ 12	99	33	″	2½	4,070	57	44	51½
Excelsior	″ 13	100	42	″	3	3,280	57	34	47¼
Nugent	″ 12	99	33	″	2	3,850	56	12	51¼
Summit	″ 12	99	33	″	2½	3,530	55	30	53¼
Surprise	″ 12	99	36	″	3	3,280	55	30	53
Champion	″ 13	100	44	″	4	3,140	54	18	48½
Success	″ 6	93	42	″	3	2,820	51	32	51
Phœnix	″ 13	100	39	″	3	3,340	51	12	50¾
Pioneer	″ 17	104	36	″	3	3,260	49	38	54½

TWO-ROWED BARLEY—Test of Varieties.

French Chevalier	Aug. 24	111	33	Strong	5	3,390	53	16	52¼
Canadian Thorpe	″ 21	108	33	″	4	4,300	53	6	54
Beaver	″ 24	111	33	″	3	3,430	52	24	54¼
Danish Chevalier	″ 24	111	30	″	5	3,250	52	4	53
Kinver Chevalier	″ 28	115	33	″	3	3,900	51	2	52
Newton	″ 20	107	36	″	3	3,550	51	2	53½
Rigid	″ 20	107	36	″	3	4,040	50	10	53½
Prize Prolific	″ 28	115	33	″	5	3,500	50	..	52¼
Nepean	″ 20	107	36	″	4	4,360	47	34	54¼
Bolton	″ 20	107	39	″	4	3,480	47	14	55¼
Victor	″ 20	107	36	″	3½	3,160	45	30	54¼
Thanet	″ 28	115	33	″	5	3,280	45	10	52
Sidney	″ 24	111	36	″	4	3,200	44	38	54
Pacer	″ 20	107	36	″	4	3,510	43	26	53
Monck	″ 24	111	36	″	4½	5,000	37	24	54¼

TEST OF BLUESTONE AS A REMEDY FOR SMUT IN BARLEY.

Variety of Seed.	Treatment.	Good Heads.	Smutty Heads.
		On 25 Square Feet.	
Canadian Thorpe	Bluestone, 1 lb. to 10 bushels	750	3
″ ″	Untreated	711	97

EXPERIMENTS WITH OATS.

TEST OF EARLY, MEDIUM AND LATE SOWINGS.

Banner and Abundance were used in this test. The sowings were one week apart, and continued from 24th April to 29th May. The last sowing of each variety gave a good crop of straw, but the yield of grain was small. The second seeding of Abundance was greatly injured by heavy rains in June, which washed away portions of the grain and soil. The plots were one-tenth acre each, and the soil a clay loam.

OATS—Test of Early, Medium and Late Seeding.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				Inches.		Lbs.	Bush.	Lbs.	Lbs.
Banner	April 24..	Aug. 18..	116	48	Strong	3,800	101	16	39
"	May 1..	" 21..	112	45	"	3,280	78	18	36
"	" 8..	" 21..	105	46	"	3,540	90		37¼
"	" 15..	" 21..	98	46	"	3,400	88	8	37
"	" 22..	" 30..	100	45	"	3,150	73	18	36¼
"	" 29..	Sept. 6..	100	42	"	3,660	49	24	33¼
Abundance	April 24..	Aug. 21..	119	43	"	3,830	78	18	39½
"	May 1..	" 23..	114	42	"	2,950	63	8	37½
"	" 8..	" 23..	107	43	"	3,440	91	16	39¼
"	" 15..	" 23..	100	45	"	3,680	84	14	39½
"	" 22..	" 30..	100	45	"	3,430	69	24	37
"	" 29..	Sept. 6..	100	42	"	3,150	58	28	37

OATS—Field-lots.

Sown on the 28th and 29th of April on summer-fallow by hoe-drill at the rate of 2¼ bushels per acre. The soil was clay loam. All the fields were injured by frosts and winds.

Name of Variety.	Size of Plot.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Kind of Head.	Weight of Straw.	Yield per Acre.	
				Inches.			Lbs.	Bush.	Lbs.
Banner	5	Aug. 26..	120	44	Strong	Branching..	3,060	69	30
Abundance	5	" 26..	120	42	"	"	3,670	65	12
Golden Beauty	5	" 26..	119	42	"	"	2,510	63	21
Improved Ligowo	2½	" 18..	111	40	"	"	2,480	63	2
Holstein Prolific	1¼	" 18..	111	38	"	"	2,300	40	..

OATS—One Acre Plots.

Sown 29th April on summer-fallow by hoe-drill at rate of 2¼ bushels seed per acre. All suffered from winds, being on a very exposed portion of the farm. The soil was clay loam.

Name of Variety.	Size of Plot	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Kind of Head.	Weight of Straw.	Yield per Acre.	
					In.		Lbs.	Bush.	Lbs.
Early Archangel	1 acre..	April 29	Aug. 27	120	44	Branching	3,130	63	12
Oderbruch	1 " ..	" 29	" 18	111	36	Sided.....	2,120	63	9
Bavarian	1 " ..	" 29	" 18	111	38	Branching	2,980	60	25
White Schonen	1 " ..	" 29	" 27	120	36	" ..	2,950	59	25
Early Golden Prolific	1 " ..	" 29	" 18	111	40	" ..	3,000	59	13
Flying Scotchman	1 " ..	" 29	" 27	120	36	" ..	2,960	56	24
American Beauty	1 " ..	" 29	" 26	119	44	" ..	2,340	56	6
Columbus	1 " ..	" 29	" 27	120	39	" .	3,100	53	8
Wallis	1 " ..	" 29	" 26	119	45	" ..	2,630	52	14
Wide-Awake	1 " ..	" 29	" 30	123	40	" ..	2,230	40	

The following were all sown on the same date, 3rd May, on clay loam, summer-fallowed. The size of the plots was, in most instances, one-tenth acre each. The seed was sown by hoe-drill at the rate of 2¼ bushels per acre.

OATS—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw	Character of Straw.	Kind of Head.	Weight of Straw	Yield per Acre.		Weight per Bushel.
			In.			Lbs.	Bush.	Lbs.	Lbs.
Abyssinia	Aug. 30..	119	45	Strong	Sided.	3,490	87	2	39
Improved American	" 30..	119	48	"	Branching..	3,200	86	26	38
Siberian O.A.C	" 20..	109	48	"	"	4,800	86	16	37¼
Columbus	" 20..	109	45	"	"	4,080	86	30	37¼
Olive	" 30..	119	48	"	Sided....	4,360	85		37½
Rosedale	" 30..	119	46	"	"	3,650	83	28	40½
Hazlett's Seizure	" 20..	109	48	"	Branching..	4,550	82	12	42¼
Early Gothland	" 20..	109	45	"	Sided. ...	4,050	82	12	39
Early Golden Prolific	" 23..	112	43	"	Branching.	2,370	80	10	35
Golden Giant	" 30..	119	48	"	"	3,920	80	10	34
Mennonite	" 30..	119	45	"	"	3,130	80		38
Holstein Prolific	" 23..	112	42	"	"	2,560	80		37
Flying Scotchman	" 23..	112	44	"	" ...	3,540	79	24	40
Buckbee's Illinois	" 28.	117	46	"	" ..	3,660	79	4	38
Early Blossom	" 30..	119	48	"	Sided.......	3,660	79	4	39
Early Maine	" 30..	119	46	"	Branching..	2,990	78	8	38¼
Oxford	" 28..	117	45	" ..	" ...	3,160	77	22	38¼
American Beauty	" 20..	109	36	"	" ...	2,770	75	30	38
Early Archangel	" 20..	109	45	" ...	"	3,820	75	30	39¼
Finland Black, No. 1	" 23..	112	42	" ...	"	3,310	74	24	36
Wide Awake	" 20..	109	42	"	" ...	3,570	74	14	40
Cromwell	" 23..	112	45	"	"	3,200	73	30	36
Wallis	" 28..	117	46	"	"	3,440	73	28	37
Lincoln	" 20..	109	42	"	"	3,240	73	28	39¼
Medal	" 30..	119	43	"	"	2,840	73	28	39
Poland	" 27..	106	42	"	"	3,460	73	8	41¼

OATS—Test of Varieties—*Continued.*

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.			Lbs.	Bush.	Lbs.	Lbs.
Miller	Aug. 30	119	43	Strong	Branching	2,410	73	8	38
Improved Ligowo	" 20	109	43	"	"	1,870	72	32	39
Black Beauty	" 28	117	36	"	"	2,570	72	32	36
White Schonen	" 28	117	45	"	"	3,500	72	2	35
Bavarian	" 20	109	42	"	"	3,200	72	2	34¼
Early Etampes	" 23	112	32	"	"	3,380	71	16	37
White Russian	" 20	109	42	"	"	3,890	71	12	40¼
Welcome	" 17	106	45	"	"	3,590	71	12	43¼
White Monarch	" 30	119	42	"	"	3,060	70	10	39
Prize Cluster	" 17	106	45	"	"	3,490	69	14	43½
Russell	" 23	112	42	"	"	3,000	69	4	37¼
California Prolific Black	" 23	112	46	"	Sided	3,410	68	28	36¼
Pense	" 23	112	43	"	"	4,110	68	28	37½
Winter Grey	" 17	106	42	"	Branching	3,220	68	18	42¼
Master	" 28	117	46	"	"	3,270	68	18	37¼
Bonanza	" 17	106	45	"	"	3,060	67	12	41¼
Scottish Chief	" 20	109	42	"	"	3,260	67	12	41½
Oderbruch	" 20	109	45	"	Sided	1,860	67	12	38
Imported Irish	" 17	106	45	"	Branching	3,170	67	2	42¼
King	" 17	106	42	"	"	2,880	66	26	34¼
Rennie's Prize	" 17	106	42	"	"	2,800	66	6	42¼
White Wonder	" 17	106	46	"	"	3,100	66	6	42¼
Cream Egyptian	" 20	109	45	"	"	3,420	65	20	42¼
Doncaster Prize	" 30	119	42	"	"	3,620	65	20	39¼
Siberian	" 30	119	48	"	Sided	4,120	65	20	35¼
Golden Tartarian	" 28	117	42	"	"	2,540	63	18	34¼
Mortgage Lifter	" 17	106	45	"	Branching	2,350	63	8	41
Abundance	" 28	117	45	"	"	3,520	62	22	35
Golden Beauty	" 20	109	42	"	Sided	2,340	61	16	35
Prolific Black Tartarian	" 28	117	36	"	Branching	3,190	60	20	38
American Triumph	" 20	109	45	"	...	2,220	59	24	35
Newmarket	" 23	112	42	"	Branching	1,800	58	28	39
Coulommiers	" 28	117	36	"	"	3,000	57	22	37¼
Scotch Hopetoun	" 28	117	45	"	"	3,290	57	22	34¼
Joanette	" 23	112	32	"	"	2,520	56	16	37
Finland Black, No. 2	" 20	109	40	"	"	2,520	55	10	33¼
Brandon	" 28	117	43	"	Sided	2,420	52	12	35
Banner	" 28	117	36	"	Branching	3,330	52	2	31
*Victoria Prize	" 28	117	45	"	"	3,040	50	10	41¼

* Blown out; resown 14th June.

EXPERIMENTS WITH PEASE.

The yield of pease from the different varieties was, on the whole, satisfactory Early in the season winds and frost several times apparently ruined the plots, but after the rains came in June nothing on the farm made such rapid progress or, considering the thinning out the pease had sustained, gave better returns. The plots protected by trees gave larger returns of grain and straw than those in more exposed positions. A finer sample of all the varieties was never grown on the farm.

TEST OF EARLY, MEDIUM AND LATE SOWINGS.

In this test, Mummy, a large and Golden Vine a small variety were used. Commencing on 24th April the sorts were sown each week till 29th May. The three plots of Golden Vine giving the larger yields were entirely under the protection of a wind break. The other plots were all more or less injured.

The soil was a clay loam and the size of the plots one-tenth of an acre. The land was summer-fallow and the seed sown at the rate of 2½ bushels small pease and 3½ bushels large pease per acre.

PEASE—Test of Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Character of Growth.	Length of Straw.	Weight of Straw.	Size of Pea.	Yield per Acre.		Weight per Bushel.
					In.	Lbs.		Bush.	Lbs.	Lbs.
Mummy	April 24	Aug. 23	121	Rank	36	3,110	Large	30		65¼
"	May 1	" 23	114	"	36	3,740	"	27	30	65¼
"	" 8	" 23	107	"	36	3,300	"	28	20	66¼
"	" 15	" 23	100	Medium	35	3,320	"	28		67
"	" 22	" 25	95	Weak	36	3,200	"	33		67
"	" 29	Sept. 1	95	"	26	2,400	"	19	20	66
Golden Vine	April 24	Aug. 23	121	Very rank	48	4,890	Small	51	10	65
"	May 1	" 23	114	Rank	40	4,000	"	42	50	65¼
"	" 8	" 23	107	"	36	3,900	"	41	10	65¼
"	" 15	" 23	100	"	36	3,650	"	34		65¼
"	" 22	" 25	95	"	36	3,320	"	31	20	65
"	" 29	Sept. 1	95	Medium	28	2,550	"	22	50	65

PEASE—Test of Varieties.

Forty-one varieties were sown on summer-fallowed land on the same date, the 6th of May, on a clay loam, and the size of the plots, in most instances, was one-tenth of an acre. The seed was sown by hoe drill at the rate of 2½ bushels per acre for the small varieties and 3½ bushels for the larger sorts.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Character of Growth.	Length of Straw.	Weight of Straw.	Size of Pea.	Yield per Acre.		Weight per Bushel.
				In.	Lbs.		Bush.	Lbs.	Lbs.
Potter	Aug. 24	110	Rank	34	4,280	Large	45	10	64
Bright	" 26	112	"	32	4,200	"	40		65
Centennial	" 25	111	"	32	4,850	"	35	40	65½
Prince Albert	" 24	110	"	36	3,620	Small	34	40	65¼
Golden Vine	" 24	110	"	32	3,750	"	34	10	65
Daniel O'Rourke	" 21	107	Medium	30	3,610	"	34	10	66
Arthur	" 23	109	Rank	32	3,920	"	34	10	66
New Potter	" 26	112	Medium	30	3,900	Large	33	20	64
Victoria	" 24	110	Rank	32	3,625	"	33		66½
Crown	" 24	110	"	32	3,530	Small	32	50	66¼
Macoun	" 26	112	"	30	3,030	Medium	32	20	66¼
White Marrowfat	" 26	112	"	36	4,120	Large	31	50	65
Trilby	" 24	110	Medium	28	3,200	Medium	31	50	65
Vincent	" 24	110	"	30	3,330	"	31	40	65¼
Creeper	" 25	111	"	30	3,620	Small	30	50	65
Carleton	" 24	110	Rank	34	3,790	Medium	30	40	66¼
Alma	" 23	109	Medium	30	3,050	Large	30	30	65¾
White Wonder	" 20	106	Rank	30	3,820	"	30	10	67
Multiplier	" 25	111	Medium	30	4,150	Small	30		66
Pride	" 23	109	Rank	33	3,910	Large	29	50	65¼

PEASE—Test of Varieties—*Continued.*

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Character of Growth.	Length of Straw.	Weight of Straw.	Size of Pea.	Yield per Acre.		Weight per Bushel.
				In.	Lbs.		Bush.	Lbs.	Lbs.
Nelson	Aug. 19	105	Weak	30	3,560	Large	29	40	65½
Perth	" 23	109	Rank	27	3,500	"	29	30	65¼
Paragon	" 24	110	"	28	3,740	"	29	30	64½
Canadian Beauty	" 25	111	"	32	3,650	"	29		65
Black Eyed Marrowfat	" 25	111	"	32	3,330	"	28	50	64½
Mummy	" 24	110	"	33	3,620	"	28	50	65¼
Chancellor	" 17	103	Medium	30	3,510	Small	28	40	65¾
King	" 25	111	"	30	3,520	Large	28	40	65¼
Duke	" 23	109	Weak	24	2,610	"	28	30	65
Early Britain	" 19	105	Rank	36	3,720	"	28		64½
Prince	" 25	111	Medium	28	3,340	"	27	30	66
Bedford	" 26	112	Rank	32	3,300	Small	27	20	66½
Bruce	" 24	110	Medium	28	3,000	"	27	10	65
Oddfellow	" 19	115	Rank	34	3,680	Medium	27		68½
Kent	" 24	110	Medium	27	3,110	"	26	20	65¾
Archer	" 25	111	"	28	3,150	"	26	10	65¼
Elephant Blue	" 19	105	"	30	3,310	Large	25	50	64¼
Agnes	" 23	109	"	29	3,040	"	24	50	65
Prussian Blue	" 24	110	"	31	3,320	"	24	30	65¼
Mackay	" 24	110	Rank	30	3,400	"	23	20	65¼
Harrison's Glory	" 19	105	Weak	24	2,780	"	22		64¼

MIXED GRAIN FOR FODDER.

Four grain mixtures were sown on one-tenth acre plots on summer-fallow on 26th April and cut by binder on 18th August. All the plots were allowed to partially mature before being cut.

	Mixture.	Seed sown per acre.	Weight per acre. Dry.	
			Tons.	Lbs.
1	Barley—Odessa	1 bush.	4	200
	Oats—Banner	1 "		
2	Wheat—Red Fife	1 bush.	4	...
	Barley—Odessa	1 "		
	Rye—Spring	1 "		
3	Oats—Banner	1 bush.	3	650
	Pease—Golden Vine	1 "		
4	Wheat—Red Fife	1 bush.	3	500
	Pease—Golden Vine	1 "		

EXPERIMENTS WITH INDIAN CORN.

Thirty varieties were tested. All were planted on the 19th of May in hills, three feet apart each way and twenty-seven of the same varieties were sown by hoe-drill in rows three feet apart. The land was clay loam, fallowed in 1896. Two rows of sixty-six feet each were cut from each variety and from this the yield per acre was computed. As will be seen the corn sown in rows gave better returns than the same varieties planted in hills. This is accounted for by the seed in the rows germinating shortly after being sown which was caused by deep seeding—3 inches; whereas that planted in hills was ten days later in germinating and the plants never overtook those grown in rows.

INDIAN CORN—Test of Varieties.

Test of Variety.	Character of Growth.	Height.	When Tasselled.	In Silk.	Early Milk.	Condition when cut.	Weight per Acre grown in rows.		Weight per Acre grown in hills.	
		In.					Tons.	Lbs.	Tons.	Lbs.
Giant Prolific Ensilage	Strong	84	Aug. 17.	Sept. 3.	....	Silk	16	450	11	1,650
Sanford	"	60	" 12.	Aug. 26.	....	"	15	1,900	14	1,600
Cuban Giant	"	96	" 14.	" 28.	....	"	15	250	12	1,190
Cloud's Early Yellow	"	84	" 15.	" 21.	Sept. 4.	Early milk	14	50	11	1,320
Early Butler	"	72	" 11.	" 29.	....	Silk	13	1,170	10	1,230
Pride of the North Dent	"	72	" 17.	Sept. 3.	....	"	13	950	11	1,650
North Dakota White	"	72	" 14.	Aug. 24.	Sept. 4	Early milk	13	400	11	1,430
Mammoth Sweet Fodder	Fair	54	" 5.	" 16.	" 3.	"	12	1,850	9	700
Canada White Flint	Strong	72	" 12.	" 24.	.....	Silk	12	1,850	12	750
Red Cob Ensilage	"	78	" 17.	Sept. 1.	....	"	12	1,300	13	950
Mitchell's Extra Early	"	48	" 5.	Aug. 25.	Sept. 1.	Early milk	12	1,300	11	....
Kendall's Giant	Fair	48	" 5	" 12.	Aug. 28.	Late milk.	12	1,300	9	1,030
Mammoth Eight-rowed Flint	Strong	72	" 11.	" 28.	....	Silk	12	1,200	11	870
Mammoth Yellow Flint	"	72	" 10.	" 28.	....	"	12	860	12	640
Burpee's First of All	Fair	48	" 3.	" 12.	Sept. 1.	Early milk	12	750	7	960
North Dakota Yellow	"	72	" 10.	" 20.	....	Silk	12	1,200	11	1,100
Pearce's Prolific	"	54	" 12.	Sept. 1.	....	"	12	1,200	6	1,200
Longfellow	"	60	" 12.	Aug. 28.	....	Silk	12	1,200	9	1,140
Compton's Early	"	60	" 12.	" 24.	Sept. 4.	Early milk	11	1,870	12	1,850
Ninety-day	"	72	" 17	" 26.	" 4.	"	11	1,650	8	1,930
Champion White Pearl	"	84	" 17	Sept. 1.	....	Silk	11	1,650	11	1,650
New White Cap Yellow Dent	"	78	" 17.	Aug. 26.	Sept. 4.	Early milk	11	1,100	12	1,750
Wisconsin White Dent	"	76	" 11.	" 26.	" 3.	"	11	1,100	..	.....
Wisconsin Yellow Dent	"	80	" 12.	" 26.	" 4.	"	11	960	..	....
Extra Early Huron Dent	"	74	" 12.	" 26.	" 4.	"	11	900	.	.....
King of the Earliest	"	72	" 11.	Sept. 1.	....	Silk	11	...	10	240
Selected Leaming	"	78	" 17.	Aug. 30.	....	"	10	1,450	9	1,800
Angel of Midnight	"	54	" 12.	" 26.	Sept. 4.	Early milk	10	900	11	.....
Thoroughbred White Flint	Weak	60	" 17.	Sept. 1.	" 4.	"	8	1,600	6	1,200
Country Gentleman	"	48	" 15.	" 4.	....	Silk	8	500	5	1,220

FIELD CORN—SOWN FOR ENSILAGE.

North Dakota flint corn was sown on a five acre field for ensilage. The land had produced a crop of oats the year previous, was ploughed in the spring seven inches deep, well harrowed and rolled and the seed sown by grain drill, in rows three feet apart. The corn was sown on 20th May, but on account of dry weather did not germinate till 20th June. Twenty-one tons fifteen hundred pounds was the yield from the 5 acres.

Two acres of Mitchell's Extra Early corn were also sown for ensilage. The land produced a crop of flax and millet in 1896, and was deeply ploughed in the spring before seeding with corn. Corn was sown by drill in rows three feet apart on 21st May. The plants on one of the two acres were thinned out to one every 12 inches in the row; the other acre was left as it came up.

The yield from the acre thinned was 8 tons, 260 pounds; from the acre not thinned, 7 tons 1,140 pounds. Both lots of Mitchell's Extra Early and the five acres of North Dakota flint were cut on 6th September by binder, left in the field to wilt for two days, then drawn and cut by ensilage cutter and put in silo. The ensilage is being used now and is in excellent condition.

The above varieties are early in maturing, and though less productive are used in preference to the later and larger yielding sorts.

EXPERIMENTS WITH FLAX.

Seed sown at Rate of	Date of Seeding.	Date of Cutting.	Days to Mature.	Length of Straw.	Weight of Straw per Acre.	Yield per Acre.	
				Inches.	Lbs.	Bush.	Lbs.
40 lbs. per acre...	May 11.....	Aug. 18 ...	99	24	820	6	30
80 " ..	" 11.....	" 18....	99	24	1,380	10	20
40 " ..	" 18.....	" 18....	92	24	1,370	12	30
80 " ..	" 18.....	" 18....	92	24	1,390	13	10
40 " ..	" 25.....	" 18....	85	22	1,470	13	30
80 " ..	" 25.....	" 18....	85	22	2,400	13	
40 " ..	" 29.....	" 18....	81	20	1,230	9	20
80 " ..	" 29.....	" 18 ..	81	20	1,890	13	10

EXPERIMENTS WITH MILLETS AND HUNGARIAN GRASS.

Variety.	Size of Plot.	Date Sown.	Date Cut.	Days to Mature.	Length of Straw.	Yield per Acre.	
	Acre.				Inches.	Tons.	Lbs.
New Siberian Millet......	$\frac{1}{10}$	May 8.....	Aug. 27....	111	36	2	400
Manitoba "	$\frac{1}{10}$	" 7.....	" 27....	112	32	1	150
Japanese "	$\frac{1}{10}$	" 7.....	" 27....	112	31	1	100
Hungarian Grass.........	$\frac{1}{10}$	" 7.....	" 27.. .	112	27	1	1,400
Manitoba Millet..........	$\frac{1}{20}$	" 12.....	" 27....	107	32	2	200
Garden "	$\frac{1}{20}$	" 12.....	" 27...	107	32	1	1,350
New Siberian "	$\frac{1}{20}$	" 12	" 27....	107	36	1	1,100
Holy Terror "	$\frac{1}{20}$	" 12.....	" 27...	107	30	1	700

EXPERIMENT WITH CANARY GRASS.

One-tenth acre was sown on 7th May. Ripe, 23rd Aug.. Yield per acre, 26 bushels seed, 3,250 pounds straw.

EXPERIMENT WITH BUCKWHEAT.

One-tenth acre was sown 7th May. Ripe, 27th Aug. Matured in 112 days. Height. 27 inches. Weight of straw per acre, 3,240 pounds. Yield of grain per acre, 22·24 bushels,

EXPERIMENT WITH TARES.

One plot of $\frac{1}{40}$ acre was sown for feed and another of the same size for seed.

Variety.	Size of Plot.	Date Sown.	Date Cut.	Length of Straw.	Weight of Straw. Per Acre.	Yield Per Acre.
For Feed.	Acres.			Feet.	*Green.*	Bush. Lbs.
Black Tares..........	$\frac{1}{40}$	May 7...	Aug. 9..	4½	17,540	
For Seed.					*Dry.*	
Black Tares......	$\frac{1}{40}$	May 7...	Aug. 28..	4½	3,410	33 30

EXPERIMENT WITH SPRING RYE.

One-tenth acre sown on 26th April, and cut for seed 6th Sept.; 75 inches high; 4,200 pounds straw per acre; 50·50 bushels grain per acre.

EXPERIMENTS WITH GRASSES

In the spring of 1896, five varieties of grass, viz., Awnless Brome Grass, Timothy, Meadow Fescue, Agropyrum Tenerum and Agropyrum Caninum were sown, also, Alsike, Red and Mammoth Clovers.

Awnless Brome Grass, Agropyrum Tenerum and Agropyrum Caninum were sown separately; the others mixed and sown together. Red Clover was entirely killed, Alsike was also killed, except near protection, where snow lay till spring opened. Mammoth Clover was very thin and little or no Timothy appeared. Meadow Fescue was a fair crop, near the protection of the western wind-break, the yield was large; away from it only fair. The yield of the mixed grasses was from 2¾ acres, 3 tons 300 pounds, or 1 ton 290 pounds, per acre.

Agropyrum Tenerum and Agropyrum Caninum. Both produced a good crop the past season, but neither variety is eaten by stock as readily as Awnless Brome Grass. Absence of leaves on the stalks is probably the reason for this. The varieties were sown very thin, and during the season of 1896 gave little promise of yielding a crop this year, but thin seeding proved an advantage during the dry weather in May, and a good crop resulted. Seed of Agropyrum Tenerum has been saved, and further experiments will be made with this grass. The following yields were obtained:

Agropyrum Tenerum—1¼ acre: 3 tons, 1,205 pounds, or 2 tons 1,764 pounds per acre.

Agropyrum Caninum—1¼ acre: 3 tons, or 2 tons 400 pounds per acre.

AWNLESS BROME GRASS (Bromus Inermis).

As stated in the report for 1896, a large area was sown with Brome Grass that spring. The grass made a good catch and growth, and gave excellent pasture up to the time snow fell last fall or about 1st November.

This spring a fair start was made about 20th April, but dry weather set in shortly after, and very little progress was made, except in low places or margins of the fields till 20th June. The rains a few days before this date made a rapid change and insured, on the whole, a fair yield, but not so good as would have been caused by an earlier rain. Parts of the fields were extra heavy, while other portions on knolls were short.

Thirty-two tons of the grass were saved for seed, but it is not in a very satisfactory condition, in so far as a large yield of seed is concerned. Throughout the field reserved for seed, the early growth was ripe while the growth caused by the June rains was quite green, consequently much of the early seed was lost. On account of the large amount of green growth at the bottom, the mower instead of the binder was used in cutting the crop for seed. This makes threshing more difficult, but gives a very fine lot of fodder, as good in fact, as if cut for hay.

The older fields of Brome Grass gave light crops, several portions being very short and hardly worth cutting. Being an early grass to start, the past spring was greatly against a good crop, especially on fields from which several crops had been cut.

From several years' experience with Brome Grass, it appears, to obtain the best results in hay that two crops should be taken from the field, which should then be ploughed up unless required for pasture. While this will necessitate a little more work in sowing a fresh field or a few acres each spring and ploughing up the same amount of old grass land, various advantages will arise from the adoption of this course, 1st, good fodder will be supplied each year by the newly seeded land ; 2nd, there being a first crop of hay each year, it is likely to be a good one; 3rd, Brome sod is easily ploughed after the second crop, but is very tough after the fourth or fifth ; 4th, the roots of the grass when ploughed up afford protection from winds and in this respect are equal, so far as experience shows, to the native sod; this being the case it is evident that it will be a great advantage to other crops to treat old worked land in this way.

Without the heavy rain which fell on the farm in June last, it is probable that from the fields on which two crops had been previously cut, there would not have been one-half ton of hay per acre.

On 18th, 19th and 20th May, several acres of Brome sod were ploughed up. One portion was ploughed six inches deep; a second, three inches deep, and a third one and one-half inch deep. The deep ploughing was sown with pease, harrowed well and rolled. The other portions rolled down, and on 23rd and 28th July backset five inches deep. The pease did not germinate till after rains on 15th and 18th June, and were caught by frost before maturing. There was, however, a good crop of straw and grain, the pods being well filled. Except where the first two furrows met no Brome Grass roots survived.

On the other portions some roots were still alive when the plots were backset, but at this date all seem to be dead.

Considering the large amount of rain which fell on 15th to 18th June, and the favourable growing weather for several weeks after, the growth on the land ploughed was very small indeed, and with our ordinary June rainfall there will not be the least difficulty in killing the roots of this grass by breaking and backsetting. One acre of sod five years old has, this fall, been ploughed four inches deep as a further experiment in getting rid of Brome Grass.

For information regarding sowing the following is quoted from the report for 1896:

"This grass is better sown alone; at least it should not be sown with a grain crop. The grain takes too much moisture from the young grass-plants, only the most vigorous of which will survive the dry weather in September; whereas, if sown alone all the plants have an equal chance.

"It is also advisable to sow the seed on soil that does not blow. Summer-fallow would be the best preparation, but on account of its liability to drift it is not safe in many parts of the Territories to use this kind of land. Stubble land ploughed three or four inches deep in April or May, and well harrowed after the seed is sown, is found to be quite safe from winds as the stubble harrowed on top prevents all drifting.

"Fifteen to eighteen pounds of seed is required per acre. More seed will give a better crop the first year, but less afterwards as the roots thicken up each year and in three or four years makes better pasture than hay.

"The seed being light, long and thin, seeding by hand is the only practicable method. To seed properly a calm day should be chosen, so that all parts of the land may be evenly sown.

"While the plants are young, weeds are sure to make great headway and it is necessary to keep them, at least from going to seed. The quickest way to accomplish this is to go over the field with a mower, cutting just above the grass-plants. If this operation has to be repeated it will be necessary to cut the tops of the grass, but this will not injure the plants, in fact it is an advantage in the way of giving the roots a better hold.

"The first crop of hay can be cut the next year after seeding, and will, in ordinary years be ready early in July. Eight or ten days after being ready to cut for hay it will be fit to cut for seed if so desired.

"On this farm it has always been cut in first blossom for hay and ten days from this time it is considered in proper state to cut for seed.

"In cutting for seed a binder is used and the grass is cut, tied and stooked the same as wheat or other grain. In a week or ten days after cutting it is ready to thresh or store away as deemed best.

"For threshing small quantities the old-fashioned flail is suitable, but for large lots a threshing machine should be used on which the wind has been closed off as much as practicable. From three to six hundred pounds of seed may be expected from an acre."

YIELDS.

Twenty acres from fields which have been cut 3, 4 or 5 times, 52,100 pounds or 1 ton 605 pounds per acre.

Twenty-two acres new crop 79,555 pounds or 1 ton 1,616 pounds per acre. (One acre of this field yielded 3 tons 1,000 pounds.)

EXPERIMENTS WITH ROOTS.

The root crop was very light the past season. No seeds germinated until the middle of June, nearly one month later than usual, and excessive rains for three days in June hardened the land to such an extent that it was in very bad condition to stand the dry weather which set in early in July and continued, with the exception of two or three days upon which showers fell, to the time the roots were taken up. The roots were on clay loam summer-fallowed land, which was ploughed before the seeds were sown.

Following will be found yields of two seedings each of turnips, mangels, carrots and sugar beets. The yield per acre, in each case, has been calculated from the weight of roots obtained from two rows each, 66 feet long.

TURNIPS—Test of Varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Are.—1st Plot. Tons.	Lbs.	Yield per Acre.—1st Plot. Bush.	Lbs.	Yield per Acre.—2nd Plot. Tons.	Lbs.	Yield per Acre.—2nd Plot. Bush.	Lbs.
Hartley's Bronze........	May 18	May 28	Oct. 5	Oct. 5	9	1,548	325	48	10	856	347	36
Aberdeen Purple Top....	" 18	" 28	" 5	" 5	9	1,140	319	..	13	1,894	466	24
Hall's Westbury........	" 18	" 28	" 5	" 5	8	1,424	290	24	10	268	337	48
Shamrock Purple Top...	" 18	" 28	" 5	" 5	8	596	276	36	10	460	341	..
Perfection Swede.. . ..	" 18	" 28	" 5	" 5	7	1,048	250	48	10	64	334	24
Selected Purple Top.....	" 18	" 28	" 5	" 5	7	520	242	..	9	348	305	48
Sutton's Champion.....	" 18	" 28	" 5	" 5	7	256	237	36	8	1,820	297	..
Skirving's.	" 18	" 28	" 5	" 5	6	1,464	224	24	9	1,932	332	12
Prize Winner	" 18	" 28	" 5	" 5	6	1,332	222	12	7	1,180	253	..
Marquis of Lorne........	" 18	" 28	" 5	" 5	6	672	211	12	6	1,860	231	..
East Lothian............	" 18	" 28	" 5	" 5	6	408	206	48	7	1,576	259	36
Jumbo or Monarch	" 18	" 28	" 5	" 5	6	408	206	48	8	896	281	36
Carter's Elephant..	" 18	" 28	" 5	" 5	5	1,352	198	12	7	1,312	255	12
Selected Champion......	" 18	" 28	" 5	" 5	5	560	176	..	6	1,992	233	12
Improved Greystone.....	" 18	" 28	" 5	" 5	5	332	172	12	5	1,880	198	..
Bangholm Selected	" 18	" 28	" 5	" 5	4	1,768	162	48	6	1,464	224	24
Mammoth Clyde........	" 18	" 28	" 5	" 5	4	1,504	158	24	6	1,464	224	24
Prize Purple Top........	" 18	" 28	" 5	" 5	4	1,372	156	12	10	1,648	360	48
Halewood's Bronze Top..	" 18	" 28	" 5	" 5	4	316	138	36	8	1,160	286	..
Giant King.	" 18	" 28	" 5	" 5	3	468	107	48	7	338	239	48

MANGELS—Test of Varieties.

Gate-post...............	May 18	May 28	Oct. 4	Oct. 4	12	420	407	..	13	1,984	466	24
Norbitan Giant	" 18	" 28	" 4	" 4	11	1,760	396	..	12	420	407	..
Giant Yellow Globe.....	" 18	" 28	" 4	" 4	11	1,628	393	48	13	1,324	455	24
Giant Yellow half-long..	" 18	" 28	" 4	" 4	10	1,912	365	12	14	1,568	492	48
Champion Yellow Globe.	" 18	" 28	" 4	" 4	10	1,912	365	12	12	1,476	424	36
Yellow Intermediate	" 18	" 28	" 4	" 4	10	1,912	365	12	15	1,944	532	24
Mammoth Long Red.. .	" 18	" 28	" 4	" 4	10	1,780	363	..	13	268	437	48
Giant Yellow Intermediate, Steele	" 18	" 28	" 4	" 4	10	1,120	352	..	13	1,852	464	12
Selected Mammoth Long Red	" 18	" 28	" 4	" 4	10	1,120	352	..	12	1,476	424	36
Prize Mammoth Long Red	" 18	" 28	" 4	" 4	10	988	349	48	13	1,456	457	36
Golden Fleshed Tankard.	" 18	" 28	" 4	" 4	9	1,404	323	24	13	1,852	464	12
Ward's Long oval-shaped.	" 18	" 28	" 4	" 4	9	480	308	..	13	268	437	48
Red Fleshed Globe	" 18	" 28	" 4	" 4	9	216	303	36	10	460	341	..
Giant Yellow Intermediate, Pearce...........	" 18	" 28	" 4	" 4	9	216	303	36	13	664	444	24
Golden Tankard.........	" 18	" 28	" 4	" 4	8	1,820	297	..	12	684	411	24
Warden's Orange Globe..	" 18	" 28	" 4	" 4	8	896	281	36	11	1,628	393	48
Canadian Giant..........	" 18	" 28	" 4	" 4	7	388	239	48	11	176	369	36
Red Fleshed Tankard ...	" 18	" 28	" 4	" 4	6	1,728	228	48	8	92	268	12

CARROTS—Test of Varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
					Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Improved Short White...	May 14	May 27	Oct. 6	Oct. 6	3	1,524	125	24	3	468	107	48
Mammoth White Intermediate......... ..	" 14	" 27	" 6	" 6	3	1,128	118	48	3	1,128	118	48
Iverson's Champion	" 14	" 27	" 6	" 6	3	996	116	36	4	448	140	48
White Belgian	" 14	" 27	" 6	" 6	3	852	114	12	3	1,392	123	12
Green-top White Orthe..	" 14	" 27	" 6	" 6	3	600	110	..	2	1,016	83	36
Guerande or Oxheart....	" 14	" 27	" 6	" 6	3	600	110	..	3	204	103	24
Half-long White	" 14	" 27	" 6	" 6	3	204	103	24	3	864	114	24
Half-long Chantenay....	" 14	" 27	" 6	" 6	3	72	101	12	3	1,524	125	24
Giant White Vosges.....	" 14	" 27	" 6	" 6	2	1,544	92	24	3	1,392	123	12
Early Gem..............	" 14	" 27	" 6	" 6	2	1,412	90	12	2	1,808	96	48
Carter's Orange Giant....	" 14	" 27	" 6	" 6	2	1,016	83	36	3	76	101	12
Scarlet Intermediate.....	" 14	" 27	" 6	" 6	2	1,016	83	36	2	352	72	36
Yellow Intermediate	" 14	" 27	" 6	" 6	2	1,016	83	36	2	1,676	94	36
Long Orange or Surrey..	" 14	" 27	" 6	" 6	2	752	79	12	2	620	77	..
Long Scarlet Altringham.	" 14	" 27	" 6	" 6	1	1,960	66	..	1	1,036	50	36

SUGAR-BEETS—Test of Varieties.

Danish Improved..	May 18	May 28	Oct. 4	Oct. 4	10	1,252	354	12	11	308	371	48
Danish Red-top.........	" 18	" 28	" 4	" 4	9	1,932	332	12	12	1,740	429	..
Improved Imperial	" 18	" 28	" 4	" 4	9	1,140	319	..	8	1,292	288	12
Wanzleben	" 18	" 28	" 4	" 4	8	632	277	12	11	704	378	24
Vilmorin's Improved....	" 18	" 28	" 4	" 4	7	1,180	253	..	7	1,120	257	..
Red Top Sugar.........	" 18	" 28	" 4	" 4	6	1,452	224	12	8	1,028	283	48

POTATOES.

One hundred and fifteen varieties of potatoes were tested.

One hundred of these were in uniform test plots and were planted on a piece of land which was afterwards nearly submerged by the rains of 15th–18th June, and out of the hundred varieties twenty-eight were entirely destroyed. The varieties giving the larger yields were on a high part of the plot and were not put back or injured by the water, on this account, the results reported on this year cannot be regarded as a reliable test of the relative productions of the different sorts planted. Many of the varieties were scabby and a great many small tubers were found in all the sorts. There were no rotten potatoes in any of the plots.

The potatoes were planted in rows thirty inches apart and twelve inches apart in the rows. The soil was a clay loam and the yield per acre has been calculated from the product of two rows each 66 feet long.

POTATOES—Test of Varieties.

Name of Variety.	Planted.	Dug.	Character of Growth.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.	
				Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Lee's Favourite	May 17.	Oct. 4.	Fair	530	24	387	12	143	12
Northern Spy	" 17.	" 4.	"	530	24	387	12	143	12
Carman No. 3	" 17.	" 4.	"	451	..	396	..	55	..
Vick's Extra Early	" 17.	" 4.	"	389	24	264	..	125	24
World's Fair	" 17.	" 4.	"	387	12	290	24	96	48
Early White Prize	" 17.	" 4.	"	363	..	277	12	85	48
Brownell's Winner	" 17.	" 4.	"	330	..	290	24	39	36
Clarke's No. 1	" 17.	" 4.	"	330	..	246	24	83	36
White Beauty	" 17.	" 4.	"	325	36	228	48	96	48
Ohio Junior	" 17.	" 4.	"	321	12	246	24	74	48
I. X. L.	" 17.	" 4.	"	316	48	184	48	132	..
Seedling No. 230	" 17.	" 4.	"	314	36	224	24	90	12
Flemish Beauty Seedling	" 17.	" 4.	"	310	..	255	..	55	..
Dakota Red	" 17.	" 4.	"	305	48	279	24	26	24
New Variety No. 1	" 17.	" 4.	"	301	24	253	..	48	24
Seedling No. 7	" 17.	" 4.	"	292	36	246	24	46	12
American Wonder	" 17.	" 4.	"	290	24	176	..	114	24
State of Maine	" 17.	" 4.	"	290	24	242	..	48	24
Early Sunrise	" 17.	" 4.	"	288	12	222	12	66	..
Charles Downing	" 17.	" 4.	"	286	..	169	24	116	36
Lizzie's Pride	" 17.	" 4.	Weak	283	48	255	12	28	36
Early Norther	" 17.	" 4.	"	277	12	237	36	39	36
Quaker City	" 17.	" 4.	"	272	48	211	12	61	36
Polaris	" 17.	" 4.	Rank	268	24	239	48	28	36
Dreer's Standard	" 17.	" 4.	Weak	266	12	226	36	39	36
Irish Daisy	" 17.	" 4.	"	262	..	233	24	28	36
Victor Rose	" 17.	" 4.	"	257	24	215	36	41	48
Holborn Abundance	" 17.	" 4.	"	255	12	176	..	79	12
Early Gem	" 17.	" 4.	"	248	12	193	12	55	..
Early Puritan	" 17.	" 4.	"	246	24	182	36	63	48
Prize-taker	" 17.	" 4.	"	246	24	206	48	39	36
Rural Blush	" 17.	" 4.	"	231	24	194	..	37	24
Reeve's Rose	" 17.	" 4.	"	231	..	195	48	35	12
Maggie Murphy	" 17.	" 4.	"	226	36	193	36	33	..
Holton Rose	" 17.	" 4.	"	226	..	176	..	50	..
Columbus	" 17.	" 4.	"	224	24	204	36	19	48
Algoma, No. 1	" 17.	" 4.	"	224	24	180	24	44	..
McKenzie	" 17.	" 4.	"	222	12	176	..	46	12
Pride of the Market	" 17.	" 4.	"	220	..	191	24	28	36
Daisy	" 17.	" 4.	"	217	48	156	12	61	36
Wonder of the World	" 17.	" 4.	"	215	36	158	24	57	12
Empire State	" 17.	" 4.	"	213	24	184	48	28	36
Satisfaction	" 17.	" 4.	"	211	12	176	..	35	12
Record	" 17.	" 4.	"	211	12	140	48	70	24
Hale's Champion	" 17.	" 4.	"	207	..	156	24	50	36
Stourbridge Glory	" 17.	" 4.	"	204	36	173	48	30	48
Fillbasket	" 17.	" 4.	"	198	..	143	..	55	..
Early Rose	" 17.	" 4.	"	198	..	171	36	26	24
Seedling No. 314	" 17.	" 4.	"	197	..	135	..	62	..
Russell Seedling	" 17.	" 4.	"	180	..	120	..	60	..
Vanier	" 17.	" 4.	"	173	48	138	36	35	12
Late Puritan	" 17.	" 4.	"	169	24	105	48	63	36
Harbinger	" 17.	" 4.	"	169	24	147	24	22	..
Reading Giant	" 17.	" 4	"	160	36	118	48	41	48
Early Harvest	" 17.	" 4.	"	158	24	123	12	35	12
Irish Cobbler	" 17.	" 4.	"	156	12	105	36	50	36
Sharpe's Seedling	" 17.	" 4.	"	156	12	127	36	28	36
Delaware	" 17.	" 4.	"	151	48	112	12	39	36
Crown Jewel	" 17.	" 4.	"	145	12	110	..	35	12
Orphan's	" 17.	" 4.	"	138	36	94	36	44	..
Early Ohio	" 17.	" 4.	"	134	12	110	..	24	12
Everett	" 17.	" 4.	"	129	48	116	36	13	12
Seattle	" 17.	" 4.	"	129	48	101	12	28	36
Burpee's Extra Early	" 17.	" 4.	"	129	48	101	12	28	36

POTATOES.—Test of Varieties.—*Continued.*

Name of Variety.	Planted.	Dug.	Character of Growth.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.	
				Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Carman No. 1	May 17.	Oct. 4.	Weak	129	48	105	36	24	12
Rose No. 9	" 17.	" 4.	"	127	36	99	..	28	36
Beauty of Hebron	" 17.	" 4.	"	127	36	118	48	8	48
Hopeful	" 17.	" 4.	"	125	24	77	..	48	24
Good News	" 17.	" 4.	"	123	12	96	48	26	24
Burnaby Seedling	" 17.	" 4.	"	105	36	....		105	36
Troy Seedling	" 17.	" 4.	"	100	..	66	..	34	..
Table King	" 17.	" 4.	"	92	24	68	12	24	12
King of the Roses	" 17.	" 4.	"	79	..	52	48	26	12
Bill Nye	" 17.	" 4.	"	77	..	61	36	15	24
Honeoye Rose	" 17.	" 4.	"	48	24	35	12	13	12
Brown's Rot-proof	" 17.	Killed out by water.							
Clay Rose	" 17.	Killed out by water.							
American Giant	" 17.	Killed out by water.							
Chicago Market	" 17.	Killed out by water.							
Early Market	" 17.	Killed out by water.							
Earliest of all	" 17.	Killed out by water.							
Early Six-weeks	" 17.	Killed out by water.							
Freeman	" 17.	Killed out by water.							
Great Divide	" 17.	Killed out by water.							
General Gordon	" 17.	Killed out by water.							
Green Mountain	" 17.	Killed out by water.							
Irish Beauty	" 17.	Killed out by water.							
Ideal	" 17	Killed out by water.							
Lightning Express	" 17.	Killed out by water.							
London	" 17.	Killed out by water.							
Monroe County	" 17.	Killed out by water.							
Money-maker	" 17.	Killed out by water.							
Peerless Junior	" 17.	Killed out by water.							
Pride of the Table	" 17.	Killed out by water.							
Pearce's Extra Early	" 17.	Killed out by water.							
Pearce's Prize Winner	" 17.	Killed out by water.							
New Queen	" 17.	Killed out by water.							
Queen of the Valley	" 17.	Killed out by water.							
Rochester Rose	" 17.	Killed out by water.							
Rural No. 2	" 17.	Killed out by water.							
Thorburn	" 17.	Killed out by water.							
Toronto Queen	May 17.	Oct. 4.	Fair	431	12	378	24	52	48
Great Northern	" 17.	" 4.	"	330	..	264	..	66	..
Uncle Sam	" 17.	" 4.	"	323	24	264	..	59	24
American Giant	" 17.	" 4.	"	297	..	242	..	55	..
Sir Walter Raleigh	" 17.	" 4.	Weak	264	..	193	36	70	24
Clarke's Extra Early	" 17.	" 4.	"	228	48	206	48	22	..
Maule's Thoroughbred	" 17.	" 4.	"	189	12	162	48	26	24
Puritan No. 1	" 17.	" 4.	"	187	..	171	36	15	24
Early London	" 17.	" 4.	"	173	48	149	36	24	12
Early Summer	" 17.	" 4.	"	171	36	132	..	39	36
She	" 17.	" 4.	"	162	48	99	..	63	48
Bovee	" 17.	" 4.	"	162	48	107	48	55	..
Wonderful Clayrose	" 17.	" 4.	"	134	12	114	24	19	48
Primrose	" 17.	" 4.	"	116	..	106	..	10	..

VEGETABLE GARDEN.

The spring being very dry during the whole of the month of May and the first half of June, was unfavourable for the vegetable garden. In places where snow banks had collected during the winter, and when melted left moisture, the vegetable seeds germinated quickly and gave good returns, but where there was little or no moisture from this source the seeds remained till 20th June before starting, and as a rule the returns were small. The season was favourable for anything started in the hot beds. Attention is drawn to the difference between onions started in the hot beds and those grown in the garden, details of which will be found following. The season was also very favourable for tomatoes, the weather both during the day and at night being warm for a longer period than is usual.

ASPARAGUS.

Three varieties were grown in beds planted in 1893 and 1891. These were Conover's Colossal, Barr's Mammoth and Donald's Elmira.

Donald's Elmira produced the largest stalks, but Conover's Colossal was the earliest and gave the best average cuttings. First cut 1st May, continued in use till 1st July.

BEANS.

Eleven varieties were tested.
Early Valentine Wax was fit for use on July 20.
Pearce's Golden Beauty " " 24.
Kenny's Rust Proof " " 24.
Wardwell's Kidney Wax " " 24.
Golden Eye Wax " " 24.
Challenge Black Wax " " 24.
Yellow Six-weeks " " 24.
Detroit Wax " " 30.
Lima Wax " " 30.
German White Wax " " 30.
All ripe on 8th September.
Broad Windsor beans came up slowly but did not ripen.
Wardwell's Kidney Wax had the best pods and was the finest bean.

BEETS.

Nine varieties were sown on 23rd April. Came up well, but were killed by wind on 22nd May. Re-sown 25th May. Grew well and were lifted on 25th September.

Name of Variety.	Fit for use.	Bushels per acre.	Remarks.
Arlington Favourite Blood Turnip	July 10..	1,000	Very good.
Dewar's Half-long	" 20..	980	Good.
Detroit	" 2..	980	Very good.
Long Smooth Blood	" 20..	960	Good.
Simmer's Extra Early	" 2..	880	Very good.
Columbia	" 10..	780	Poor quality.
Edmund's Blood Turnip	" 10..	770	Very good.
Bousecour's Market	" 20..	680	"
Covent Garden	" 10..	580	Small; good.

CARROTS.

Nine varieties were sown on 23rd April, but on account of dry weather were a complete failure.

CABBAGE.

Sown in hot-bed, 6th April. Transplanted into frames, 6th May. Transplanted into garden, 4th June.

Name of Variety.	Fit for use.	Weight of Heads.	Remarks.
		Lbs.	
Luxemburgh	Sept. 1..	8	Fair.
Vaughan's Allhead	Aug. 13..	14	Extra good.
Early Standard	" 10..	10	Good.
Burpee's Allhead	" 13..	16	Extra good.
First and Best	" 13..	11	Good.
Bruce's Winter	Sept. 1..	13	"
The Lupton	Aug. 20..	8	Poor.
Brunswick Short Stem	Sept. 1..	10	Fair.
Matchless Flat Dutch	" 1..	10	Good.
Brunswick	" 1..	15	Extra good.
Fielder	" 1..	5	Poor.
Mammoth Red Rock	" 1..	3	"
Earliest Dwarf Red	" 1..	2	"
Improved Pickling	" 1..	2	"
Dwarf Early Savoy	" 1..	..	"
Lorenz's Favourite Savoy	" 1..	..	"
Brunswick Savoy	" 1..	..	"
Surehead	" 1..	10	Good.
Vandergaw	" 1..	13	Extra good.

Cabbage, sown in cold frame and transplanted direct to garden.

Seed sown in cold frame 29th April. Plants set out in garden 10th June.

Name of Variety.	Fit to use.	Weight of Head.	Remarks.
		Lbs.	
Burpee's All-head	Aug. 20..	14	Extra good.
Vaughan's First and Best	" 20 .	11	"
Early Summer	" 20..	7	"

The above were just as good as the same varieties sown in hot beds, transplanted to cold-frames, thence to garden and were a great deal less trouble. Only second-early varieties should, however, be grown in this way.

CAULIFLOWER.

Nine varieties were sown in hot bed on 6th April, and again on 12th April, but only about 40 plants came up. The varieties were again sown very thick in cold-frame on 29th April, and from the plants which grew one of the best crops ever raised on the farm was produced. Autumn King was the only variety which came up in the hot bed but it is too late for the North-west Territories.

Name of Variety.	Transplanted to Garden.	Fit for use.	Remarks.
Earliest Dwarf Erfurt	June 10	Aug. 13	Very good.
X X X Erfurt	" 10	" 13	"
Extra Early Whitehead	" 10	" 13	Large and good.
Henderson's Early Snowball	" 10	" 15	Very good.
World's Best Snowball	" 10	" 15	Good.
High Grade Dwarf Erfurt	" 10	" 13	Very good.
Gilt Edge	" 10	" 15	Good.
Autumn King	" 10	Sept. 1	Cut one head.
Selected Early Erfurt—Bruce	" 10	Aug. 15	Extra good.

CELERY.

Seven varieties were sown in hod-beds on 6th April, transplanted to cold-frame 6th May, transplanted to trenches 2nd July, and fit for use 10th September, and lifted 15th October.

Giant Pascal—very good.
Red Pascal—one of the best.
White Plume—very good.
Paris Golden Yellow—very good.
Dwarf White Golden-heart—very good.
Pink Plume—very good.
New Dwarf Red—small.

Some celery seed was also sown in the open ground but the plants did not grow to any size.

CUCUMBERS.

Eleven varieties were sown in pots in the hot-bed on 15th April, and planted out in frames in garden on 20th May.

Swan Neck—none grew.
Peerless White Spine—in use 12th July. Very fine.
Pride of Canada—none grew.
Cool and Crisp—in use 12th July. Very fine.
Giant White Perfection—none grew.
White Wonder—In use 8th July. Small, but good crop.
New Giant Pera—in use 12th July. Good crop.
Livingstone's Emerald—in use 12th July. Very fine.
White Wonder (Simmer's)—in use 8th July. Very fine.
Paris Pickling—in use 12th July. Extra good.
New Siberian—in use 1st July. Good.

These varieties were again sown on 15th May in the garden, under protection of small frames. They gave a fair crop, but were neither as early nor as prolific as those which were forced in the hot-bed.

CORN.

The following seven varieties were planted on 20th May, but on account of dry weather did not germinate until after rain on 15th June:—Ford's Sugar, Early Market, Early Cory, First of All, Minnesota, Mitchell's Extra Early and Squaw. All except Squaw, which did not grow, were fit to use on 1st September. No corn of any variety ripened during 1897.

CITRONS.

Colorado Preserving was sown 19th April, planted out on 20th May, and gave a very good crop of large citrons.

LETTUCE—2 SEEDINGS.

1st seeding, sown 27th April—fit for use 25th June.
2nd seeding, sown 1st June—fit for use through September.
Early Curled Simpson—did not make close heads, but was large and of excellent quality.
St. Louis—fine large heads.
New Asparagus—poor, long, narrow leaves.
Silver Ball—extra fine, large heads.
Denver Market—fine large heads.
Toronto Gem—fair.

MELONS.

Newport, Earliest of All and Emerald Gem musk melons were sown in pots in a hot bed on 19th April and put out in frames in the gardens on 20th May. All bore a large quantity of fruit but only four Earliest of All and one Emerald Gem ripened, quality good.

Black Spanish water-melon was sown but did not ripen.

MARROWS AND SQUASH.

Bush Marrows were sown 15th May in frames in garden and produced a large crop of small marrows.

Scallop Squash sown 15th May in frames in garden, produced a fair crop.

KALE.

Scotch and Lorenz's finest garnishing, sown in hot-bed 6th April; transplanted to cold frames 6th May; to garden 4th June. Both very fine.

BRUSSEL'S SPROUTS.

New Giant and Improved Exhibition sown 6th April. Transplanted 6th May. Did not do well.

ONIONS—Sown in Hot-bed and Transplanted.

Name of Variety.	Sown in Hot-bed.	Trans-planted in Garden.	Taken up.	Bushels per Acre.	Remarks.
Red Victor	April 6	June 7	Sept. 16	480	Very large.
Prize Taker	" 6	" 7	" 16	440	Early; fine shape.
Yellow Dutch Setts	" 16	" 7	" 16	440	Very large.
Red Globe	" 6	" 7	" 16	400	Large and coarse.
Large Yellow Danvers	" 6	" 7	" 16	380	Extra fine.
White Globe	" 6	" 7	" 16	320	"
Red Globe (Exp. Farm seed)	" 6	" 7	" 16	320	Very large.

The above were much larger than the same varieties sown in the open ground but they did not ripen as well nor will they keep as long.

ONIONS.—Sown in the open ground.

Name of Variety.	Sown.	Taken up.	Bushels per Acre.	Remarks.
Large Yellow Danvers	April 16..	Sept. 16..	380	Very fine.
World-beater Wethersfield	" 16..	" 16..	360	"
Red Globe	" 16..	" 16..	280	"
Large Red Wethersfield	" 16..	" 16..	280	"
Red Globe (Ex. Farm seed)	" 16 .	" 16..	240	"
White Globe	" 16..	" 16..	200	"
New Queen	" 16..	" 16..	180	Extra fine pickling
White Silver Skin	" 16..	" 16..	100	"

The above were rather small but were of excellent quality and ripened well. One bed of Large Red Wethersfield sown the fall of 1896, came up on the same day as those sown in the spring and no difference could be seen between them all season.

PEASE.

Ten varieties were sown on 24th April, and nine varieties on 5th May. With the exception of a few feet on one end of each row of those sown on 24th April, none came up till after rain on 15th June. The crop was consequently very late.

Name of Variety.	Sown.	Fit for use.	Ripe.	Remarks.
Wm. Hurst	April 24..	July 12..	Aug. 31..	Extra good.
Daisy	" 24..	" 24 .	Sept. 10..	One of the best.
American Wonder	" 24..	" 12 .	Aug. 31..	Good.
Laxton's Alpha	" 24..	" 12..	" 31..	"
Eclipse	" 24..	" 10..	" 31..	"
Shropshire Hero	" 24..	" 24..	Sept. 10..	" but late.
Yorkshire Hero	" 24..	" 24..	" 10..	" "
Telephone	" 24..	" 24..	" 10..	Extra good ; large pods.
Stratagem	" 24..	" 20..	" 10..	"
Heroine	" 24..	" 24..	" 10..	Large and prolific.
New Queen	May 5..	" 24..	" 10..	Good ; late variety.
Alaska	" 5..	" 12..	Aug. 31..	Early ; small.
Nott's Excelsior	" 5..	" 12..	" 31..	Good.
Horsford's Market Garden	" 5..	Aug. 10..	....	Did not ripen ; very prolific.
Burpee's Profusion	" 5..	" 10..	....	" "
S. B. M. Extra Early	" 5..	July 12..	Aug. 31..	Small.
Little Giant	" 5..	" 12..	" 31..	Extra good.
Champion of England	" 5..	Aug. 30..	....	Did not ripen.
C.P.R.	" 5..	Sept. 1..	....	Frozen ; too late.

PUMPKINS.

Connecticut Field, Jumbo and Prize were sown on 15th May. Protected by boxes, provided with light 12 x 12 glass. Connecticut Field was very fine ; of good size and all ripened. Jumbo and Prize were larger but did not quite mature.

PARSNIPS.

Magnum Bonum, Hollow Crown and New Intermediate were sown 17th April. All came up well but the crop was poor and the roots very small.

RADISHES.

Nine varieties were sown on 27th April. All came up well but were frozen down. Resown 10th May, and again on 1st June. All were fit to use six weeks after seeding.

Olive Gem ; good.
Rosy Gem ; good.
In & Out ; very good ; ready in 40 days.
Early Eclipse ; poor crop.
Ne plus ultra ; poor crop.
Long White Vienna ; good.
Scarlet Turnip ; poor.
Earliest White ; poor.
Colorado Glass ; extra good.

RHUBARB.

The old beds of Linnæus, Victoria and Tottle's Improved did well, but some of the plants have died although all the crowns were sprayed with Bordeaux mixture. A new bed 2 years old of Victoria and Large Green made a strong growth.

PEPPERS.

Sweet Spanish and Red Bell were sown. Both set a good crop, but did not ripen.

HERBS.

Moss Curled Parsley, Sage, Summer Savory and Borage were sown on 26th April, and all did well.

EGG PLANTS.

Early Purple and White Pearl were sown. The former had two to four good sized fruits on each plant. White Pearl did not set any fruit.

TOMATOES.

Seven varieties were tested and all did well except Livingstone's Honor-Bright, which never seemed healthy. All the others bore a large crop of ripe fruit before frozen. The night before frost came, the vines were covered with frames and a further crop of ripe fruit was the result.

Name of Variety.	Sown.	Potted.	Trans-planted.	Ripe.	Remarks.
Canada	April 5	May 17	June 9	Sept. 1	Extra fine, late.
Imperial	" 5	" 17	" 9	" 1	" "
Earliest of All	" 5	" 17	" 9	Aug. 7	Fair, early.
Early Atlantic	" 5	" 17	" 9	" 20	Extra fine.
Everbearing	" 5	" 17	" 9	" 25	Prolific.
Yellow Plum	" 5	" 17	" 9	" 21	Fine.
Honor-Bright	" 5	" 17	" 9	Sept. 1	Poor crop.

TOBACCO.

Sown in hot-bed, 20th April; planted out, 4th June. Suckers and flower-buds were trimmed off. Cut 9th September, and seemed fairly well matured.

FLOWER GARDEN.

As in preceding years as many varieties as possible were tested. On the whole the season was not favourable for the culture of flowers and many varieties did not do as well as formerly.

ANNUALS.

Grown in hot-bed and transplanted

Name of Variety.	Sown in Hot-bed.	Trans-planted to Garden.	In bloom. From	In bloom. Till	Remarks.
Asters, 10 varieties	April 6..	June 23..	Aug. 20..	Sept. 9..	Very poor this year.
Carnation Marguerite	" 6..	" 23..	Sept. 1..	Frozen...	Good show.
Dianthus, 10 varieties	" 6..	" 23..	Aug. 1..	"	Extra fine.
Stocks, 4 "	" 6..	" 23..	July 24..	"	Flowers fair.
Pansies, 12 "	" 6..	" 23..	" 24..	Nov'r	Did well.
Antirrhinum	" 6..	" 23..	Aug. 10..	Frozen....	Good show.
Petunia, Double	" 6..	" 23..	" 10..	" ...	Very few double.
Verbena	" 6..	" 23..	" 10..	"	Good.
Brachycome	" 6..	" 23..	" 10..	"	Showy.
Amaranthus	" 6..	" 23..	" 10..	"	Only one plant. Fine.
Linum Scarlet	" 6..	" 23..	" 10..	"	Good show.
Calliopsis	" 6..	" 23..	" 10..	"	Very poor.
Zinnia Elegans	" 6..	" 23..	" 10..	"	Extra fine.
Phlox Drummondi	" 6..	" 23..	" 10..	"	Good show.
Sunflower, Double	" 6..	" 8..	" 1..	"	Very fine.
Marigold, Eldorado	" 6..	" 20..	" 1..	"	"
Nicotiana Affinis	" 6.	" 20..	" 1..	"	Very fine, morning and evening but does not look well during the day.

ANNUALS SOWN IN THE OPEN GROUND.

Sweet Pea—Eckford's finest, sown 17th April; came up and grew well until heavy rains in June, when more than one-half the plants died; the remainder flowered well until frozen. Eight varieties were sown on 20th April, and all did well.

Dwarf Nasturtium—Sown 17th May. Made a good border and flowered freely until frozen.

Sweet Alyssum—Sown 17th May. Flowered freely all season.

Escholtzia—Sown 17th May. Did well; in flower all season. One of the best hardy annuals.

Phlox Drummondii—Sown 17th May; in bloom 1st July. Made a good show all season.

Candytuft—Sown 1st May. Did not do as well as in former years.

Mignonette—Four kinds were sown on 17th May. All did extra well.

Poppy—Sown 17th May. Made a good show.

Godetia—Sown 25th May. Made a good show all season.

Salpiglossis—Sown 25th May. Late in flowering, but flowers were very fine.

Convolvulus Minor—Sown 17th May. Made good bed.

Japanese Morning Glory—Sown 17th May. Made good growth of vine, but did not flower.

Larkspur—Sown 17th May. Flowers very fine, but late.

PERENNIALS.

Pæony—In bloom 20th June ; very fine.

Scarlet Lychnis—In bloom 5th June ; made a good show.

Veronica—Did not blossom.

Yellow Flax—Very fine ; one of the best perennials.

Platycodon grandiflora—White and blue. In bloom 1st July ; very fine.

Rudbeckia—Golden Glow—Very strong grower ; made a good show.

Sweet William—In bloom 5th June ; one of the best.

Columbine—In bloom 1st June ; very fine.

Delphinium grandiflorum—In bloom 1st June ; very fine.

Garden Pink—Did not do well.

Everlasting Pea—Did not do well.

Iceland Poppy—In bloom 24th May ; very showy.

Perennial Flax—Did not do as well as usual.

Spiræa Ulmaria, Filipendula and *Palmata Elegans*—All very fine.

BULBS.

Tulips—A large collection planted last fall did well this year. They were in bloom from 20th May to 20th June. Thirty-two varieties, 16 bulbs each, were planted this autumn.

Crocuses—A number were planted last fall but did not bloom this year. More were planted this season.

Hyacinths—Planted in garden last fall ; all died. Potted in house ; did well.

Narcissus—Four varieties planted last fall. Did not flower this year. Three varieties were planted this autumn for further test.

Scilla sibirica—Planted fall 1896 ; did well ; in bloom 1st May. Forty more were planted this season.

Scilla bifolia—Planted fall 1896 ; did not do well. Twenty more were planted this autumn.

Lilies—Four Lilium Candidissima were planted last fall and lived through the winter, but did not flower.

Iris—A large number of different varieties of Iris planted last fall lived through the winter and did well this season. A further supply was received and planted this autumn.

Hemerocallis—Three varieties were planted last fall, and again this spring, but the plants have not done well.

FRUIT TREES AND BUSHES.

The past season was very unfavourable for any kind of small fruit with the exception of currants.

Native fruits were almost an entire failure in many districts, while in others a fair crop was produced.

Lists are submitted giving details of the growth and fruiting of all varieties of large and small fruits growing on the Indian Head Experimental Farm.

APPLES.

A few trees of the berried crab (Pyrus baccata) blossomed, but the frost in May destroyed them; and there was no fruit.

PYRUS PLANTED, 1896.

In the following list will be found particulars of the condition of the different varieties of Pyrus planted in the spring of 1896 :—

RECEIVED from Central Experimental Farm Ottawa.

Name of Variety.	Number planted, Spring 1896.	Number living, Fall 1897.	Notes on Growth.
Pyrus Baccata Edulis	4	4	Strong growth.
" Sanguinea	8	7	"
" Flava	1	1	"
" Conocarpa	1	1	"
" Macrocarpa	3	2	" 1 died, 1896.
" Aurantiaca	2	2	"
" Cerasiformis	7	6	" "
" Lutea Regel	2	1	" "
" Genuina	5	5	"
Pyrus Prunifolia	4	4	"
" Xanthocarpa	4	4	"
" Intermedia	4	4	"
Pyrus Alnifolia	5	5	"
" Spuria	4	0	4 died, winter 1896-97.
" Intermedia	4	0	" "
Seedlings raised at Indian Head.			
Pyrus Prunifolia	19	19	Strong growth.
" Baccata Macrocarpa	8	8	"
" " Genuina	8	8	"
" " Cerasiformis	13	13	"
" " Sanguinea	5	5	"

SEEDLING PLUM AND PYRUS ORCHARD, 1897

An orchard containing four plots each 210 x 250 feet has been this year laid out west of the superintendent's house.

Plot No. 1 is partially planted as follows :—

Row 1.—4 Pyrus prunifolia.
" 1.—16 " baccata yellow.
" 2, 3, 4, 5 and 6.—96 Pyrus baccata yellow.
" 7, 8.—40 seedlings of Siberian crab.

Leaving 16 rows vacant.

Plot No. 2.

Row 1, 2, 3, 4, 5 and 6.—120 seedlings of native plums.
" 7, 8, 9, 10, 11.—100 seedlings of Hungarian plum.
" 12.—20 seedlings of Speer plum.
" 13, 14, 15, 16, 17.—100 seedlings of Weaver plum.
" 18, 19, 20, 21.—80 seedlings of De Soto plum.
" 22.—20 seedlings of Yosemite yellow "
" 23.—20 seedlings of Ida plum.
" 24.—20 seedlings of seedling No. 3 plum.

Plot No. 3.

Row	1, 2.—40	seedlings	of	Speer plum.
"	3, 4.—40	"	"	Wolf "
"	5, 6.—40	"	"	Purple Yosemite plum.
"	7, 8.—40	"	"	Van Buren plum.
"	9, 10.—40	"	"	Hungarian "
"	11, 12.—40	"	"	Weaver "
"	13, 14.—40	"	"	American "
"	15.—20	"	"	Yosemite Yellow plum.
"	16.—20	"	"	Cheney plum.
"	17.—20	"	"	Rollingston plum.

" 18, 19, 20.—60 seedlings of Ida plum.
" 21, 22, 23.—60 " " De Soto plum.
" 24.—20 seedlings of Voronesh plum.

Plot No. 4.

Rows 1 to 24.—Vacant.

Eighty-five per cent of the above have lived and made fair to strong growth and are in good condition for the winter. In the spring of 1898 some of the blanks will be filled with new varieties of crosses between Pyrus baccata and some of the larger varieties of apples which have been recently originated at Ottawa.

Plots No. 1 and 2 are inclosed by a hedge of seedling *Lilacs* raised from seed of *Syringa Vulgaris Chas. X.*, 18 inches high, set out 3 feet apart. Plots No. 3 and 4 by seedlings of *Caragana Arborescens*, 18 inches high, planted 30 inches apart.

These plantations when completely filled will accommodate 1,920 trees.

PLUMS.

Seedlings of Weaver.—Eighty trees were planted in the spring of 1894. Sixty-eight were living in the autumn of 1897. These have made a strong growth and appear to be hardy. One tree bore three plums this year, but they did not ripen.

Seedlings of Hungarian.—Twenty of these were planted in the spring of 1894. Five were living in the autumn of 1897. They have made strong growth and appear to be hardy. No fruit has yet been borne on any of this variety, but the trees were covered with blossoms this year; which were however frozen in May.

Seedlings of Speer.—Four of these were planted in the spring of 1895 and were all living in the autumn of 1897. They have made strong growth and appear to be hardy, but have not yet borne fruit.

Seedlings of De Soto.—Eight were planted in the spring of 1895, and 6 were living in the autumn of 1897. They have made a strong growth and seem hardy, but have as yet borne no fruit.

Seedlings of Voronesh.—Four of these were planted in the spring of 1897, and 4 were living in the autumn. They have made strong growth.

Seedlings of Imperial Blue.—Five were planted in the spring of 1895, and one was living in the autumn of 1897. This has made strong growth, but this variety does not seem sufficiently hardy to stand the climate here.

PLUMS FROM CHAS. LUEDLOFF, COLOGNE, MINN.

In the spring of 1896, 38 varieties of plums were ordered by the Director from the above nursery and when received they were planted in an inclosure. In the following list will be found the names, number planted and notes on the condition of the trees in the fall of 1897.

Name of Variety.	Number Planted.	Notes on Condition and Growth, 1897.
Purple Yosemite	2	Strong growth.
Clinton	2	1 fair growth, 1 dead.
Missouri Apricot	2	2 fair growth.
Deep Creek	2	2 strong growth.
Irene	2	2 fair growth ; kills back.
Milton	2	1 strong growth, 1 dead.
Anthony	2	2 "
Cottrell	2	2 fair growth.
Emerson	2	2 strong growth.
Weaver	2	2 fair growth ; partly winter killed.
Van Buren	2	2 "
Reed	2	2 " partly winter killed.
Esther	2	1 " 1 strong growth.
Forest Rose	2	2 " partly winter killed.
Dr. Dennis	2	2 " "
New William	2	2 "
Newman	2	2 strong growth.
Van Deman	2	2 "
Yellow Sweet	2	1 fair growth, 1 strong growth.
Chas. Downing	2	1 " "
Ocheeda	2	2 strong growth.
Speer	2	1 " 1 dead.
American Eagle	2	2 fair growth.
Col. Wilder	2	2 "
Pepper's Puritan	2	2 "
Dunlop No. 1	2	1 strong growth, 1 broken.
Wood	2	1 " 1 dead.
Illinois Iron-clad	2	1 fair growth, 1 dead.
Crescent City	2	2 strong growth.
Large Red Sweet	2	2 "
Hammer	2	1 " 1 fair growth.
Silas Wilson	2	2 "
City	2	2 fair growth.
Richland	2	1 " 1 dead.
Gaylord	2	1 " "
Moldavka	2	2 "
Neil's	2	1 " "
Hawkeye	2	2 "

PLUMS FROM THE CENTRAL EXPERIMENTAL FARM, OTTAWA, PLANTED 1897.

De Soto	2	
Aikin	1	
Hoskin	1	

MANITOBA NATIVE PLUM.

Planted 1895, and grown from seed planted on this farm.

Three trees grown from seed planted on the Experimental Farm, Indian Head, bore fruit this season. The crop was not large but the fruit was of fair size and quality.

The following trees (from Stonewall, Man.) were planted in 1895. These have not yet borne fruit, but those living will probably do so in 1898 :—

Variety No.	No. Planted.	Notes on Growth, 1897.
No. 60	2	1 strong growth, 1 dead.
" 27	3	2 " 1 "
" 7	2	2 fair growth.
" 12	1	Dead.
" 32	1	"
" 29	2	1 strong growth, 1 weak growth.
" 47	3	1 " 2 dead.
" 59	1	1 "
" 63	1	1 "
" 23	1	Dead.
" 53	1	1 strong growth.
" 22	2	1 fair growth, 1 dead.
" 84	2	1 strong growth, 1 dead.
" 64	2	2 strong growth.
" 46	2	2 dead.
" 31	2	2 strong growth.
" 21	3	2 " 1 dead.
" 94	1	Dead.
" 14	1	"
" 52	1	"
" 36	3	2 strong growth, 1 dead.
" 15	1	1 fair growth.
" 27	1	Dead.
" 63	1	"
" 88	1	Strong growth.
" 79	1	Dead.
" 12	1	"
" 11	1	"
" 91	2	2 strong growth.
" 65	2	"
" 71	1	Dead.
" 56	2	1 fair growth, 1 dead.
" 67	2	2 strong growth.
" 26	2	1 strong growth, 1 dead.
" 69	1	1 "
" 40	1	1 "
" 51	1	1 "
" 30	2	1 " 1 dead.
" 61	2	1 " 1 "
" 86	1	1 "
" 85	1	1 "
" 89	2	2 "
" 57	2	2 "
" 76	2	2 dead.
" 81	1	1 strong growth.
" 41	1	1 "
" 68	2	2 "
" 39	1	1 "
" 67	2	2 "

CHERRIES.

Mahaleb.—One tree planted, 1897. Fair growth.

Seedlings of Carnation.—Five were planted in the spring of 1894, and one was living in the autumn of 1897. This tree has made fair growth.

Seedlings of Lithauer Weichsel.—Twenty of these were planted in the spring of 1894, and six were living in the autumn of 1897. These have made fair growth.

Seedlings of Olivet.—Four were planted in the spring of 1895, and all have since died.

Seedlings of Minnesota Ostheim.—Thirty-five of these were planted in the spring of 1895, and 11 were living in the autumn of 1897. These have made strong growth.

Rocky Mountain Cherry.—Fourteen were planted in the spring of 1895, and 12 were living in the autumn of 1897. Some of these fruited this year and made strong growth. The fruit was good.

Wild Cherry from Nebraska.—Four of these were planted in the spring of 1896, and 3 were living in the autumn of 1897. They appear to be hardy and have made strong growth.

Sand Cherry.—One hundred and eighty were planted in the spring of 1894, 168 are now living. These appear to be hardy and have made strong growth and 12 of them have borne fruit.

APRICOTS.

Two Apricots from Turkestan were planted last spring and have made fair growth.

PEARS.

One Longworth pear was planted last season and has made fair progress.

GRAPES.

Gibb.—Five were planted in the spring of 1895. All are living but have made slow growth.

Bacchus.—Five were planted in the spring of 1895. All are living and have made fair growth.

Manitoba Native Wild Grape.—Three were planted in the spring of 1895. All are living and have made strong growth, but none of them have yet borne fruit.

SMALL FRUITS.

The currants planted previous to 1896; both white and red produced a good crop last season, but the black currants were small and the crop light.

White.

White Grape,	3 planted,	1896;	fair growth,	no fruit.
White Imperial,	3 "	1897	"	"

Red.

PLANTED, 1896.

Raby Castle,	3 trees;	strong	growth,	few berries.
Victoria,	3 "	fair	"	no fruit.
Red Dutch,	2 "	"	"	few berries.
Versillaise,	4 "	"	"	very large, fine.
Fertile d'Angers,	3 "	weak	"	no fruit.
Fay's Prolific,	2 "	fair	"	very fine.
Cherry,	4 "	"	"	few good bunches.
Prince Albert,	3 "	strong	"	"
Red Dutch,	4 "	"	"	"
2/2	4 "	"	"	no fruit.
Dakota Tree Currant,	2 "	"	"	no fruit.

Section of part of shelter belt chiefly Box-elder, eight years planted, 100 feet wide, extending about $1\frac{3}{4}$ mile along west and north boundaries of Experimental Farm, Indian Head, N.W.T.

Shelter belt of Aspen or Tremulous Poplar, *Populus tremuloides*, at the Experimental Farm at Indian Head, N.W.T., nine years planted.

PLANTED, 1897.

North Star,	3 trees ;	strong growth.	
Pomona,	3 "	fair "	

BLACK CURRANTS, PLANTED, 1896.

Lewis,	3 trees ;	fair	growth,	no fruit.
Oxford,	2 "	"	"	"
Winona,	3 "	strong	"	few fair berries.
Perth,	1 "	weak	"	no fruit.
Ethel	4 "	strong	"	"
Eclipse,	4 "	"	"	few on one bush.
Kerry,	3 "	"	"	no fruit.
Madoc,	3 "	fair	"	"
Star,	4 "	"	"	"
Sterling,	4 "	strong	"	1 bush good crop, 3 none
Orton,	4 "	"	"	no fruit.
Standard,	3 "	"	"	few berries.
Perry,	3 "	"	"	no fruit.
Eagle,	4 "	fair	"	1 bush good fruit, 3 none.
Monarch,	4 "	"	"	no fruit.
Charmer,	4 "	strong	"	few good berries.
Beauty,	4 "	"	"	fair crop, fine fruit.
Ontario,	4 "	"	"	a few berries.
Stewart,	4 "	"	"	no fruit.
Clipper,	4 "	"	"	small crop, fair size.
Climax,	4 "	"	"	no fruit.
Star,	4 "	"	"	a few good berries.

PLANTED 1897.

Victoria,	3 trees ;	weak growth.	
Crandall,	3 "	strong "	

RASPBERRIES.

Planted 1893.

Dr. Reider.—Fair crop fine flavoured berries.
Philadelphia.—Small crop.
Turner.—Fair crop of small berries.
Caroline.—Winter killed. No fruit.
Golden Queen.—Winter killed. No fruit.

Planted, Spring 1897.

Garfield	6	planted.—	3 dead, 3 strong growth.
Craig	8	"	8 fair growth.
Muriel	6	"	1 dead, 5 fair growth.
Percy	2	"	2 dead.
Caroline	2	"	1 dead, 1 strong growth.
Lady Ann	3	"	3 fair growth.
Sir John	2	"	1 dead, 1 strong growth.
Sharpe	6	"	5 " 1 fair growth.
R. B. Whyte	2	"	2 "

Empire	3	planted.—2 dead,	1 fair growth.			
Carleton	2	"	2	"		
Sarah	12	"	10	"	2 "	"
Miller	6	"	3	"	3 "	"
Kenyon	12	"	9	"	3 "	"

Saunders' Large Red 2 planted 1 dead, 1 weak growth.

BLACK AND PURPLE CAP RASPBERRIES.

Planted 1893.

Schaffers' Colossal and Early Ohio bore fruit. Berries small and of medium quality.

Planted 1897.

12 Older.—All dead, fall 1897.
12 Progress.— " " "
1 Charles.—Fair growth.
1 Royal.— " "

GOOSEBERRIES.

Planted 1893.

Smith's Improved	45	trees	planted,	38	living.	Fair crop.
Lancashire Lad	2	"	"	1	"	" "
Governess	2	"	"	1	"	No fruit.
Columbus	2	"	"	2	"	Few, very large.
Houghton	25	"	"	23	"	Fair crop.
Native	5	"	"	2	"	Small.

Planted 1897.

Golden Prolific	3	planted,	2	dead, 1 weak growth.
Red Jacket	3	"	3	"
Keepsake	3	"	3	weak growth.
Pearl	4	"	2	dead, 2 weak growth.

STRAWBERRIES.

Planted 1895.

Windsor Chief, New Dominion and Pine Apple bore a small crop of poor fruit.

Planted 1896.

13 Mitchell's Early	All dead, spring 1897.
13 Timbrell	" " "
13 Hilton Gem	" " "
13 Brandywine	" " "
12 Mrs. Cleveland	" " "
13 Marshall	2 living, spring 1897.

Planted 1897.

On 15th August the following plants were received from the Central Experimental Farm, Ottawa, and planted in cold frame. In spring of 1898 they will be set out in beds in garden.

25 Scarlet Queen.
25 Brandywine.
25 Gem, P.
25 Paris King.
25 Wm. Belt.
25 H. W. Becher.
20 Alpine No. 5.

FOREST TREES.

Since tree culture on the farm commenced, trees have never made more satisfactory progress than during the past season.

The spring being unfavourable for early growth, no set backs in the way of April or May frosts were encountered, and the trees, when the growth did start, made excellent progress during the entire season. Single trees, hedges and wind breaks all did well, and only one tree was lost on the avenues of the farm.

Among the trees transplanted last spring, losses occurred with the Norway Spruce. A good many were transplanted during the second week of May when the weather was dry and windy, and after that date and on 21st and 22nd May a strong windstorm which lasted for 48 hours killed all that had not become firmly rooted.

The planting of hedges around fields for protection from winds was continued last spring. Those set out in 1896 have done very well. Next spring planting will complete the hedges around every field on the farm with the exception of the pasture inclosure. The trees used for this purpose are principally native maple (*Acer negundo*) 2 or 3 years old.

In the spring of 1895, five one-half acre plots of trees were planted at different distances apart, for the purpose of ascertaining the cost of planting and keeping clean and in a thriving condition until the trees shade the ground sufficiently to prevent the growth of weeds, and hence need no further cultivation. These trees were planted as follows:—

Plot No. 1.	Box Elder.	Set out $2\frac{1}{2}$ feet apart each way.
" 2	"	" 3	"
" 3	"	" $3\frac{1}{2}$	"
" 4	"	" 4	"
and " 5	Green Ash	" $2\frac{1}{2}$	"

In addition to these were

Plot No. 6, $\frac{1}{2}$ acre Box Elder seed, sown in rows $2\frac{1}{2}$ feet apart, and plot No. 7, $\frac{1}{2}$ acre Green Ash seed, sown in rows $2\frac{1}{2}$ feet apart.

Following will be found the cost of taking care of these trees for the 1st, 2nd and 3rd years.

Plot No. 1.—$\frac{1}{2}$ Acre.

1st year cost of planting,	15 hours	$2 25
" scruffling, etc.,	12 "	1 80
2nd year "	10 "	1 50
3rd year "	6 "	0 90
		$6 45

Plot No. 2.—$\frac{1}{2}$ Acre.

1st year cost of planting,	12 hours	$1 80
" scruffling, etc.,	15 "	2 25
2nd year "	13 "	1 95
3rd year "	5 "	0 75
		$6 75

Plot No. 3.—$\frac{1}{2}$ Acre.

1st year cost of planting,	9 hours	$1 35
" scruffling, etc.,	11 "	1 65
2nd year "	12 "	1 80
3rd year "	4 "	0 60
		$5 40

Plot No. 4.—½ Acre.

1st year cost of planting,	9 hours	.....	$1 35
" scruffling, etc.,	10 "	.....	1 50
2nd year "	14 "	.....	2 10
3rd year "	3 "	.....	0 45
			$5 40

Plot No. 5.—½ Acre.

1st year cost of planting,	18 hours	.....	$2 50
" scruffling, etc.,	11 "	.....	1 65
2nd year "	9 "	.....	1 35
3rd year "	5 "	.....	0 75
			$6 25

Plot No. 6.—½ Acre.

1st year cost of making drills,	2 hours	.....	$0 30
" " sowing seed	4 "	.....	0 60
" " covering seed	6 "	.....	0 90
" scruffling, etc.,	11½ "	.....	1 72
2nd year "	10 "	.....	1 50
3rd year "	5 "	.....	0 75
			$5 77

Plot No. 7.—½ Acre.

1st year cost of making drills,	2 hours	.....	$0 30
" " sowing seed,	4 "	.....	0 60
" " covering seed,	6 "	.....	0 90
" scruffling, etc.,	10½ "	.....	1 57
2nd year "	9½ "	.....	1 42
3rd year "	12 "	.....	1 80
			$6 59
Taking up trees for five plots,	22½ hours	.....	$3 38

Plots No. 1 and 2 will require little or no work in future as the trees, especially in plot No. 1 entirely shade the grounds.

Plots No. 3 and 4 will require two years further growth and care to place them in the same position. Plot No. 5 although planted only 2½ feet apart each way, being ash which is of slower growth, is very far behind the box elder in the matter of shade.

Next spring it is proposed to continue this work and mix the plantations with ground shading varieties of trees such as sand cherry.

ARBORETUM.

The arboretum now contains 173 species and varieties of trees and shrubs which have been planted as follows:—In 1895, 41 varieties; in 1896, 65 varieties. 6 of which replace deaths of 1895; and in 1897, 75 varieties, two of which replace deaths of 1896.

The varieties added in 1897 are:—

Acer monspessulanum.
" dasycarpum.
" saccharinum (from Minnesota).
" spicatum.
Arbor vitæ. Meehan's Golden.
Berberis ilicifolia.
" vulgaris.
" Asiatica.
" vulgaris violacea.
Betula dahurica.
" populifolia.
" pendula youngii.
Cornus white-leaved.
" sanguinea.
" sibirica variegata.
" sanguinea variegata.
" sericea.
Cytisus hirsutus.
" trifolium.
" purpureus.
Celtis occidentalis.
Cratægus sanguinea.
" sibirica.
" coccinea.
" edulis.
Deutzia?
Diervilla Lutea.
Euonymus Americana.
Fraxinus Lutea.
" Berlanderiana.
" quadrangulata.
Gleditschia triacanthos.
Hydrangea paniculata grandiflora.
Juniperus Virginiana.
Lonicera sibirica.
" phylomela.
Ligustrum Stauntoni.
Populus Bolleana.
" Argentea.
Pinus Montana.
" ponderosa.
Ptelea trifoliata aurea.
Philadelphus Deutziflorus.
" coronarius.
" inodorus.
Ribes Gordonianum.
Rhus coriaria.
Spiræa callosa superba.
" bumalda.
" callosa alba.
" ulmifolia.
" variegata.
" Van Houttei.
" callosa rosea.
" Billardi rosea.
" Billardi alba.
Sorbus domestica.
Sambucus heterophyllus.
" variegata argentea.
" nigra.
" canadensis.
" variegata aurea,
" aurea nova.
Syringa purpurea.
" Emodi variegata.
Salix Villarsiana.
" aurea pendula.
" Salamoni.
" alba.
" purpurea pendula.
" capræa.
Thuya, Hoveyi Golden.
Tilia americana.
Ulmus sibirica.
Viburnum lantana.

SAMPLE HEDGES.

Ten varieties of trees and shrubs were, this spring, added to the list of sample hedges, viz.:—

Rhamnus frangula.
Lonicera grandiflora.
Rosa rubrifolia.
Salix voronesh.
Salix Laurifolia.
Cotoneaster vulgaris.
Seedling plum (native).
Picea pungens.
Betula papyrifera.
Betula lutea.

The two latter were killed by drought but the others have made satisfactory progress and are in good condition for winter.

Of the hedges set out in 1895 and 1896, Salix acutifolia, Populus monilifera, Acer ginnala, Caragana arborescens, Artemisia abrotanum var. Tob. and Negundo aceroides continue to do well and to these may be added Syringa vulgaris, Populus balsamifera, Elæagnus angustifolia and Symphoricarpus racemosus.

TREES AND SHRUBS PLANTED 1897.

The following trees and shrubs were received in May from the Central Experimental Farm, Ottawa, and planted in nursery rows.

300 Acer ginnala.
20 American hornbeam.
22 Betula populifolia.
30 Acer spicatum.
10 Betula rubra.
2 Enonymus Americana.
18 Populus fastigiata.
15 Acer saccharinum.
8 Celtis occidentalis.
2 Cornus white-leaved.
1 Salix regalis.
1 Populus frigilea.
4 Acer saccharinum, No. 2 (Minn.)
9 Eleagnus angustifolia.
1 Thuya pumila.
2 Arbor-vitæ. Douglas Golden.
2 Juniperius virginiana.
7 Abies balsamea.
1 Rhus coriaria.
11 Celastrus scandens.

ROSES.

In May, 12 varieties of roses were received from the Central Experimental Farm, Ottawa, and planted in one of the garden inclosures.

Following will be found a list of varieties and notes on their progress during the past season :

Mashall P. Wilder—Grew well and flowered.
Mme. Marie Rady—Died.
Merveille de Lyon—Strong growth, flowered.

Baron Prevost—	do	flowered profusely.
Caroline de Sansal	do	did not flower
François Levet	do	flowered.
Lady Helen Stewart	do	do
Crimson Rambler	do	did not flower.
Mme. Victor Verdier	do	do
Mme. Plantier	do	do
Mme. Geo. Bruant	do	flowered.
Mme. Gabriel Luizet	do	do

This fall the plants were surrounded by frames and covered with 8 or 10 inches of dry leaves, which it is hoped will afford sufficient protection during the winter.

LIVE STOCK—CATTLE.

At present the herd consists of fifty-one animals, as follows :—
Shorthorns—2 males, 6 females.
Holsteins—4 males, 11 females.
Polled Angus—1 female.
Ayrshire—1 male.
Grades—5 cows, 5 heifers and 16 steers.

In grade steers, are included 10 animals recently purchased for use in feeding tests to be carried on during the winter of 1897-98.

All the animals are in good condition and apparently healthy.

FEEDING TEST.

Twelve head were divided into three lots of four each and fed from 1st December, 1896, to 31st March 1897. The lots consisted of eleven $2\frac{1}{2}$ year old steers and one cow; the twelfth steer not being procurable at the time the test commenced.

Lot No. 1 was fed wheat-chaff.

Lot No. 2 was fed cut oat sheaves, and

Lot No. 3 was fed cut Brome hay.

To each of the animals fed as above was given the same ration of meal and ensilage. The rations were in the proportion of 2 pounds ensilage to each pound of dry fodder, and 6 pounds of meal per day (consisting of ground barley, 2 parts, ground wheat, 1 part) to each animal for the first two months of the test.—During the last two months each animal received 8 instead of 6 pounds of meal per day. The animals were fed three times a day and were fed for two weeks on a uniform ration before the test commenced.

Appended will be found the monthly and total gains of each lot:—

Lot.	Principal ration.	December.	January.	February.	March.	Total.
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Lot No. 1....	Wheat-chaff..........	324	264	211	226	1,025
" 2....	Oat sheaves	235	262	248	165	910
" 3....	Brome hay..............	320	277	290	128	1,015

It will be noticed that the principal gains were made during the first two months when only 6 pounds of meal was fed per day to each animal.

Lot No. 2 did not do as well as Lots Nos. 1 and 3.

PROFIT IN FEEDING STEERS.

Six of the eleven steers used in this feeding test were purchased in the fall of 1896 and sold 5th May, 1897.

Weight when Purchased.	At	\$ cts.	Weight when Sold.	Less Shrinkage	Net Weight.	At	\$ cts.
6,260....................	\$ 2 00	125 20	7,770........	$388\frac{1}{2}$	$7,381\frac{1}{2}$	\$ 3 60	265 72
Net gain............	....	140 52	....	....	....	....	.. ..
		265 72					265 72

Or a net gain per animal of \$23.43 from which must be deducted the cost of feed and labour.

Five steers bred on Experimental Farm, when sold realized as follows:—

Weight December 1st.	Weight when Sold.	Less Shrinkage	Net Weight.	At	\$ cts.
5,035 Lbs. or \$43·$\frac{05}{100}$ for each animal..............	6,295	$314\frac{3}{4}$	$5,980\frac{1}{4}$	\$ 3 60	215 28

SWINE.

The herd on the farm at present consists of 42 animals as follows:—

Chester White	1	Boar.
Berkshire	2	" 2 sows.
Large Yorkshire	4	" 3 barrows, 8 sows.
Tamworth	8	" 9 sows.
Grades (Berkshire)	2	Barrows, 3 sows.

Since my last report, 1 Berkshire boar, 1 Large Yorkshire boar, 3 Large Yorkshire sows, 4 Tamworth sows and 2 Berkshire sows have been sold to farmers.

POULTRY.

Four breeds are kept, Barred Plymouth Rocks, White Wyandottes, White Leghorns and Black Minorcas. The breeding pens were made up on 15th March, and eggs were gathered as follows:—

Breed.	2 wks. — Mch.	April.	May.	June.	July.	Aug.	Sept.	3 wks. — Oct.	Total.
Plymouth Rock	10	118	65	22	41	31	40	34	361
White Wyandotte	21	89	71	24	38	44	30	34	351
White Leghorn	24	126	89	59	51	48	55	35	487
Black Minorca	50	122	92	49	44	63	50	33	503

The hens were all allowed to run together after 20th October.

Twelve cockerels and twenty settings of eggs were sold to farmers during the year.

THE FLOCK NOW CONSISTS OF

Breed.	Cocks.	Hens.	Pullets.	Total.
Plymouth Rock	8	8	9	25
White Wyandotte	10	12	7	29
White Leghorn	14	11	14	39
Black Minorca	3	9	4	16

BEES.

As stated in my last report two hives of bees were last fall packed in chaff and put away in a room over the poultry house. Both swarms were dead when the hives were opened in the spring allthough a large quantity of honey was found in each.

In May last, one hive was obtained from Mr. S. A. Bedford, Superintendent, Experimental Farm, Brandon. From this three swarms have been secured. The first on 16th July; the second on 26th July, and the third on 28th July. The last swarm having lost its queen was put in with its predecessor. The three colonies had respectively 46, 44 and 47 pounds of honey when put away for the winter. No honey was taken from any of the colonies during the season as at no time was a hive filled. The bees worked principally on fruit-bushes, raspberries producing the greatest amount of honey.

The three hives have been stored for winter in an upper room of a dwelling house, where the temperature can be regulated as desired.

HOPS.

All varieties produced a poor crop.
From Washington—Did not mature and hops were badly rusted.
do British Columbia—Did not mature and hops were badly rusted.
Native—Poor crop, hops fair in quality.

WEEDS.

Weeds are increasing with great rapidity, in many sections of the North-west Territories and in no previous year have they been so hard to keep in check.

The three worst varieties that have up to the present become prominent are Stink weed, Hares Ear Mustard and Tumbling Mustard. The first and second varieties mentioned seem to be the most difficult to eradicate; while Tumbling Mustard spreads more rapidly from the ease with which it travels over the country and its habit of distributing seed along its path.

On the Experimental Farm, in former years the Tumbling Mustard gave an endless amount of labour, as each fall, fresh seed was blown in from neighbouring fields. During the season of 1896, these hot-beds for this weed were taken in charge by the municipal council and little or no seed allowed to ripen. The same course was followed this year, with the result that we are now almost entirely free from this weed, except in the outer windbreaks where some still exists.

Hare's Ear Mustard does not spread to any great extent, and with very little attention and trouble when it first appears can be eradicated or held in check. If, however, it is neglected for a few years, the soil becomes so full of the seeds that an endless amount of labour is entailed in bringing it to a clean state.

Stink weed is without doubt the worst weed in the Territories to-day, from the fact of its being able to stand the most severe winter and cultivation and ripen its seeds several times during each season. Besides this the habit of having blossoms and ripe seed at the same time makes it a most dangerous weed. It spreads invisibly, unlike Tumbling Mustard, it does not blow from the place it grew. Pulling by hand and burning is the only effectual way of killing this weed.

The bulletin on "weeds," issued by Dr. Fletcher, under your direction, is much appreciated by farmers in the Territories, and a copy should be in the hands of every one interested in agriculture.

ENSILAGE.

The corn ensilage of 1896 gave by far the greatest satisfaction of any fed since the first of this valuable fodder was made on the farm. The corn in that year was in the glazed state when cut, and afforded good material for the preparation of ensilage. Feeding was started early in November last, and when the herd was turned out to pasture in June this year, a good deal of ensilage was still on hand. This year neither the supply nor quality equals that of 1896. No covering was put over the ensilage this year, and very little has spoiled, not over one inch on the top of the silo being unfit for use. In former years a covering of cut straw was put over the cut corn in the silo.

DISTRIBUTION OF SAMPLES OF GRAIN, POTATOES, FOREST-TREES, ETC.

During the months of March, April and May, the following distribution of products of the farm was made to applicants throughout Assiniboia, Alberta and Saskatchewan.

The number of applications for samples was largely in excess of our supply.

Samples Distributed.	Number.	Total.
Wheat, 3-lb. bags	253	
Oats "	401	
Barley "	259	
Pease "	233	
Rye "	18	
Flax "	2	
		1,166
Forest Trees—		
Artemisia Abrotanum, cuttings	6,200	
Caragana Arborescens, seedlings	1,920	
Willow, cuttings	2,120	
Poplar "	1,836	
Maple (Box Elder), seedlings	4,500	
Lilac "	70	
Ash "	150	
		16,796
Fruit Bushes—		
Raspberries, roots	2,680	
Currants, roots and cuttings	5,420	
Gooseberries, roots	210	
Plum seedlings	350	
		8,660
Garden seeds, packages	139	
Potatoes, 3-lb. bags	372	
Bromus Inermis Grass, 1-lb. bags	590	
Rhubarb, roots	348	
Ash, seed	570	
Maple, seed	570	
Caragana Arborescens, seed	320	
Strawberries	192	

SUMMARY.

Samples.	Bags and Packages.	Roots, Cuttings and Seedlings.
Grain	1,166	....
Forest trees	....	16,796
Fruit bushes	....	8,660
Garden seeds	139	....
Tree seeds	1,460	....
Bromus Inermis grass seed	590	....
Potatoes	372	....
Rhubarb	....	348
Strawberries	....	192
	3,727	25,996

IMPROVEMENTS.

The improvements consist, chiefly, of planting avenues of trees on the cross roads of the farm and in repairing dams or water reservoirs where washed out by the great rains of June last. Not only was the damage considerable, in so far as the amount of labour required to repair them was concerned, but from the loss of water, as from this source all the water supply for stock is obtained.

CORRESPONDENCE.

During the twelve months ending 31st October, 1897, 3,183 letters were received and 3,395 mailed from this office. In letters received, reports on grain and other samples, are not counted, and in letters mailed, circulars of instruction *re* grain and other samples are not included.

MEETINGS ATTENDED.

Agricultural and dairy meetings and exhibitions were attended during the year, at the following towns:—Fort Qu'Appelle, Moosejaw, Regina, Qu'Appelle Station, Wolseley, Grenfell, Moosomin and Indian Head.

VISITORS.

Visitors to the farm, chiefly from surrounding districts, were numerous during the months of June, July and August. Among those from a distance were Lord and Lady Kelvin and other distinguished members of the British Association.

METEOROLOGICAL.

Month.	Highest Temperature.		Lowest Temperature.		Snow-fall. inches.	Total Rainfall.		Total Hours of Sunshine.
	On	Degrees	On	Degrees		No. of Days.	Inches.	
1896.								
November	4	34	19	—38	14	0	0	70·
December	9	45	1	—33	4	0	0	65·5
1897.								
January	8	34	24	—38	3	0	0	95·1
February	5	30	26	—34	5	0	0	96·4
March	30	38	14	—48	3	0	0	140·9
April	17	78	28	15	0	0	0	130·6
May	4	91	13	20	0	0	0	290·9
June	13	92	28	5	0	5	11·2	213·6
July	27	91	30	39	0	6	1·52	261·1
August	11	91	30	34	0	2	1·3	235·3
September	6, 21, 22	87	16	22	0	2	·2	154·5
October	1	79	9	8	0	1	·4	113·6
					29	16	14·62	1,867·5

I have the honour to remain, sir,
Your obedient servant,

ANGUS MACKAY,
Superintendent.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA

REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

AGASSIZ, B.C., 30th November, 1897.

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

SIR,—I have the honour to submit herewith my ninth annual report of the work done on the Experimental Farm at Agassiz.

A cold wave struck the province in November, 1896, doing some damage to fruit trees which were yet growing, and catching some unharvested root crops, but the weather during the winter was mild. The lowest temperature recorded at this station being nine degrees above zero, on the 27th of November.

The spring opened fairly early, and the weather during seeding was favourable, followed by fine growing weather, with sufficient rainfall, and crops of all kinds throughout the province have been good.

Nearly nine acres of land have been cleared, and part of it cropped since my last report.

HEDGES.

The hedges have made a fine growth this year. Two of willows and one of beech were added last spring.

FOREST TREE PLANTATION.

The forest tree belt continues to make vigorous growth, and several of the Spanish chestnut trees planted in the belt bore fruit this year, producing nuts of large size.

ORNAMENTAL TREES AND SHRUBS.

The ornamental trees and shrubs on the lawn, and the bulb and flower beds have produced a profusion of bloom, from the last of March up to about the 15th of this month.

DISTRIBUTION OF SEED GRAINS AND POTATOES.

A considerable number of 3-pound bags of seed grain and potatoes have been distributed, and reports returned show that owing to the varying climatic conditions existing in British Columbia, grains or potatoes which do well in one locality, may not do so well in another.

A number of sample packages of small fruit plants were distributed, and so far as heard from, these have done well. Packages of tree seeds were also sent out, quite a number of maple and other forest trees having borne seed this year.

BEES.

The two swarms of bees wintered last winter, each threw off a swarm this season, both of which were hived, but one swarm abandoned its hive the next day.

AUSTRALIAN SALT BUSH.

The Australian salt bush mentioned in my last report, was entirely killed by the frost in November.

ACKNOWLEDGMENTS.

The following gentlemen, or firms, have kindly sent trees or scions of new fruits for testing :

Prof. Shinn, of Berkeley, California—Scions of apple and pear.
Prof. J. A. Balmer, of Pullman, Washington—Scions of apple and pear.
Mr. Alfred Woodroffe, of Auckland, N.Z.—Scions of apples.
Messrs. W. W. Walker, Salem, Oregon—Cherry and apple trees.
Oregon Wholesale Nursery Co., Salem, Oregon—Apple and cherry trees.
Mr. Hoskins, of Springbrook, Oregon—Scions of cherry.
Mr. H. Kipp, Chilliwhack, B.C.—Scions of seedling pear.
Mr. J. C. Mollet, Salt Spring Island—Scions of cherry.
Pears, 31 ; apples, 122=153.

A number of these are seedlings of merit not yet introduced, and a fair measure of success has attended the budding and grafting of all of them.

FALL WHEAT.

Twenty-eight varieties of fall wheat were sown early last October, and an even promising growth was made up to the November frost, which killed out most varieties entirely, and in none were more than a few plants left.

The ground was harrowed in the spring, and a mixed crop for green feed was sown.

EXPERIMENTS WITH SPRING WHEAT.

Thirty-eight varieties of spring wheat were tested this year. The land was loamy and fairly even throughout, and in a very fair condition as to fertility. The size of the plots was one-twentieth acre each, and all were sown on the 14th and 17th of April. There was very little smut, and no rust to injure the crop, and the quality of the grain is very good.

SPRING WHEAT—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.	
			Inches.		In.		Lbs.	Bush.	Lbs.
White Connell	Aug. 18..	126	48	Stiff & bright	3½	Bald	3,800	31	40
Wellman's Fife	" 17..	125	42 to 48	"	4	"	4.400	31	20
Preston	" 13..	121	50 to 54	"	3	Bearded	4,160	31	..
Captor	" 9..	117	52 to 56	"	3½	Bald	4,300	30	40
Monarch	" 17..	125	46 to 50	"	4	"	4,000	30	40
Alpha	" 13..	121	40 to 42	"	3	"	3,600	30	..
White Russian	" 13..	123	48 to 52	"	4	"	4,200	30	..
Red Fife	" 13..	121	44 to 48	"	3½	"	4,600	29	40
White Fife	" 18..	126	48 to 50	"	3½	"	4,000	29	20
Old Red River	" 18..	126	48 to 50	"	4½	"	3,540	29	20
Rideau	" 9..	117	34 to 38	"	3	"	3,900	29	..
Herisson Bearded	" 17..	125	40 to 42	"	2½	Bearded	4,200	[illegible]	40
Admiral	" 13..	121	52 to 56	"	3½	Bald	3,800	28	20
Vernon	" 18..	126	44 to 46	"	3	Bearded	3,900	28	20
Goose	" 18..	126	48 to 50	"	4	"	3,900	28	20
Progress	" 18..	126	44 to 48	"	4	Bald	4,100	28	..
Hungarian	" 18..	123	48 to 50	"	4	Bearded	4,000	28	..
Pringle's Champlain	" 18..	126	46 to 50	"	4	"	3,500	27	40
Advance	" 17..	125	48 to 50	"	3½	"	3,300	27	20
Huron	" 18..	126	46 to 48	"	3½	"	3,900	27	20
Countess	" 13..	121	42 to 46	"	3½	Bald	4,000	27	20
Blenheim	" 18..	126	46 to 50	"	3½–4	Bearded	3,800	27	20
Beaudry	" 13..	121	52 to 56	"	3	"	4,200	27	..
Golden Drop	" 9..	117	46 to 50	"	3	Bald	4,200	27	..
Percy	" 7..	115	48 to 52	"	4	"	3,800	27	..
Black Sea	" 7..	112	42 to 44	"	3½	Bearded	4,000	27	..
Campbell's White Chaff	" 13..	121	40 to 44	"	3	Bald	3,300	26	40
Dion's	" 18..	126	46 to 48	"	4¼	Bearded	3,800	26	40
Crown	" 18..	126	46 to 50	"	4½	"	3,800	26	..
Rio Grande	" 17..	125	45 to 48	"	4	"	4,000	26	..
Red Fern	" 17..	125	46 to 48	"	4	"	5,700	25	40
Stanley	" 13..	121	38 to 42	"	3	Bald	3,120	25	40
Ladoga	" 6..	114	36 to 40	"	3½	Bearded	3,120	25	20
Dawn	" 5 .	113	32 to 34	"	4	Bald	3,400	25	00
Beauty	" 7..	115	42 to 45	"	4	"	3,600	24	20
Emporium	" 18..	126	56 to 60	"	5	Bearded	3,100	24	20
Dufferin	" 13..	121	42 to 44	"	3	"	3,300	23	20
Colorado	" 18..	123	50 to 52	"	4	"	3,700	23	20

EXPERIMENTS WITH OATS.

Sixty-four varieties were sown on loamy soil on the 16th of April on plots of one-twentieth of an acre each.

These plots were sown in the apple orchard, on land that had been partly in corn and part of it in oats in 1896. The following varieties were injured by rust, especially: the White Russian, Mortgage Lifter, Olive, White Wonder, Victoria Prize, and Abundance; and some plots have suffered owing to the land on which they were sown having been dug to a depth of three or four feet in taking out fir stumps. In such cases it requires a number of years of cultivation to restore the land to a condition equal to that adjoining, which has not been grubbed to such a depth.

The growth of straw was very rank, but the weight of straw shown in the following table is greater than it would be but for the ferns, of which there were a good many in all the plots.

OATS—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.	
			In.		In.		Lbs.	Bush.	Lbs.
Early Maine	Aug. 12	117	66	Stiff & bright	10	Branching	6,200	92	32
Black Beauty	" 12	117	60	"	12	"	6,900	92	32
Golden Giant	" 11	116	68	"	12	Sided.	6,600	89	14
Lincoln	" 5	110	52	"	8½	Branching	6,640	87	22
Oderbruch	" 19	124	66	"	11	Half "	6,400	82	32
Early Blossom	" 16	121	66	"	12	" "	6,300	77	22
Improved American	" 16	121	65	"	11	Branching	5,600	77	22
Buckbee's Illinois	" 15	120	66	"	10	"	6,300	76	16
Bavarian	" 16	121	60	"	10½	"	6,400	75	30
American Beauty	" 14	119	60	"	10	"	6,200	74	24
Flying Scotchman	" 12	117	66	"	12	"	5,500	74	4
Columbus	" 4	109	58	"	9	"	6,200	73	18
Scottish Chief	" 17	122	63	"	10½	"	6,040	73	18
Wide Awake	" 17	122	60	"	10½	"	6,600	73	18
Coulommier's	" 18	123	60	"	11	"	6,100	72	32
Bonanza	" 12	117	66	"	10	"	5,600	71	26
Cromwell	" 12	117	60	"	12	"	6,000	71	26
King	" 17	122	60	Fair	10½	"	4,700	71	26
Cream Egyptian	" 17	122	68	Weak	11	"	6,400	70	20
Rosedale	" 17	122	66	"	10	Half sided	5,440	70	20
Doncaster Prize	" 3	108	62	Stiff	9½	Branching	6,500	70	10
Prolific Black Tartarian	" 16	121	66	Fair	12	Sided.	7,000	70	
White Russian	" 4	109	57	Stiff	9	Branching	5,700	70	
American Triumph	" 14	119	52	Fair	10	"	5,800	69	24
Golden Tartarian	" 12	117	66	"	11	Sided.	5,400	69	14
Wallis	" 16	121	60	"	11	Branching	6,600	69	4
White Schonen	" 4	109	56	Stiff	8½	"	5,680	68	28
Hazlett's Seizure	" 12	117	54	Medium	10	"	5,900	68	28
Miller	" 12	117	60	Weak	10	"	5,400	68	18
Brandon	" 12	117	72	"	12	"	6,500	68	8
Siberian	" 19	124	65	Fair	11½	Sided.	7,500	67	22
White Monarch	" 16	121	70	Weak	14	Branching	7,200	67	2
Golden Beauty	" 14	119	60	Medium	10½	"	6,200	66	26
Early Etampes	" 14	119	66	"	12	"	6,200	66	16
Early Archangel	" 12	117	66	Weak	10	"	6,900	66	16
Welcome	" 14	119	54	"	8½	"	5,000	66	12
Mortgage Lifter	" 5	110	57	Fair	8½	"	5,400	66	8
New Electric	" 11	115	60	"	10	"	5,200	65	30
Olive (Black)	" 16	121	66	Weak	12	Half sided	6,800	65	10
Early Golden Prolific	" 14	119	60	"	10	Branching	5,500	65	10
Scotch Hopetoun	" 16	121	60	"	10	"	6,400	64	24
Rennie's Prize White	" 13	118	66	Fair	11	"	6,000	64	24
Imported Irish	" 11	116	66	"	10	"	6,200	64	4
Banner	" 12	117	68	Strong	12	"	5,760	64	4
Improved Ligowo	" 12	117	64	Medium	10	"	5,600	63	18
Newmarket	" 17	122	62	Fair	9	"	5,200	62	32
Holstein Prolific	" 16	121	60	"	11	"	5,800	62	22
White Poland	" 3	108	60	"	10	"	5,200	62	17
Early Gothland	" 14	119	66	Weak	10	Half sided	5,600	62	12
Medal	" 12	117	72	"	12	Branching	6,200	62	2
Joanette	" 14	119	56	Fair	10	"	5,100	61	16
California Prolific Black	" 12	117	60	"	10	Sided.	4,700	61	8
Oxford	" 14	119	66	Medium	12	Branching	5,080	60	20
Siberian O.A.C.	" 17	122	60	"	10	Sided	5,000	60	10
Winter Grey	" 3	107	62	"	9	Branching	5,800	60	
Russell	" 16	121	63	"	12	Half sided	4,900	59	14
Abyssinia	" 14	118	60	Weak	10½	"	5,700	58	28
Prize Cluster	" 11	115	56	Fair	9½	Branching	5,000	58	28
White Wonder	" 16	121	66	Weak	12	"	5,600	58	18
Mennonite	" 3	107	53	Medium	9	"	4,400	57	32
Victoria Prize White	" 3	107	63	"	9½	"	5,920	52	32
Abundance	" 16	121	56	"	10	"	5,210	52	22
Master	" 11	115	67	Weak	11	"	4,600	52	12
Pense	" 16	121	54	Strong	10	Sided.	5,100	42	32

EXPERIMENTS WITH BARLEY.

Thirty-five varieties of barley have been grown in uniform test plots of one-twentieth acre each, fifteen of these were two-rowed sorts and twenty were six-rowed. They were all sown on loamy soil of fairly uniform character on the 17th of April. No injury was done by rust or smut.

BARLEY, TWO-ROWED—Test of Varieties.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.	
			Inches.		In.	Lbs.	Bush.	Lbs.
Kinver Chevalier	Aug. 14	119	36 to 38	Stiff	3¼	3,600	40	40
Canadian Thorpe	" 14	119	41 to 43	"	3½	3,200	37	4
French Chevalier	" 14	119	37 to 39	"	3	3,400	37	4
Nepean	" 14	119	43 to 45	Weak	3½	3,280	32	44
Prize Prolific	" 13	118	40 to 42	Fair	4	3,400	32	24
Newton	" 15	120	41 to 43	"	3½	2,900	31	12
Danish Chevalier	" 12	117	36 to 38	"	3	3,600	31	12
Thanet	" 14	119	34 to 36	"	3	3,200	31	12
Victor	" 16	121	44 to 46	"	3½	2,500	30	20
Pacer	" 9	114	34 to 36	"	3½	3,000	29	8
Beaver	" 13	118	43 to 45	Weak	3½	3,380	28	36
Monck	" 12	117	48 to 50	"	3½	2,900	28	16
Bolton	" 14	119	40 to 42	Fair	3	2,600	28	6
Sidney	" 11	116	33 to 35	Stiff	3	2,700	27	24
Rigid	" 10	115	43 to 45	"	3½	3,520	27	4

BARLEY, SIX-ROWED—Test of Varieties.

Blue	Aug. 7	112	38 to 40	Stiff & clean.	3½	3,900	42	24
Oderbruch	July 28	102	26 to 30	"	2½	3,600	40	20
Petschora	" 28	102	24 to 26	"	2	3,200	38	36
Mensury	Aug. 5	110	40 to 42	"	2½	3,700	38	16
Common 6-rowed	" 6	111	32 to 34	Fair	3	3,600	38	16
Vanguard	" 2	107	28 to 32	"	2½	3,740	37	24
Rennie's Improved	July 28	102	30 to 32	"	2½	3,900	37	24
Royal	Aug. 2	107	28 to 30	"	3	2,800	36	22
Pioneer	" 2	107	34 to 36	"	3	3,500	36	12
Nugent	" 7	112	40 to 42	"	2¾	2,840	35	20
Stella	" 7	112	33 to 35	"	3¼	3,700	34	8
Odessa	" 7	112	38 to 40	"	3¼	2,800	33	36
Champion	July 28	102	24 to 26	"	2½	3,100	33	16
Phœnix	" 28	102	25 to 28	"	2¼	3,300	33	16
Surprise	Aug. 7	112	38 to 40	Weak	3½	2,760	33	44
Summit	" 7	112	40 to 42	"	4	2,940	33	24
Trooper	" 6	111	40 to 41	"	3¼	2,740	32	30
Baxter's	" 3	108	34 to 36	Fair	3	2,500	32	30
Success	July 28	102	23 to 25	"	2½	3,000	32	10
Excelsior	Aug. 5	110	32 to 34	"	2½	2,400	30	00

EXPERIMENTS WITH PEASE.

These plots were sown on sandy loam, this land had been cleared and cropped for a number of years before the Experimental Farm was established and had got very weedy with sorrel, and in this soil and climate that is a very difficult weed to get rid of. The pease also suffered from mildew to a considerable extent. The size of the plots was one-twentieth of an acre each, and all were sown on the 1st of May.

PEASE—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Length of Straw.	Weight of Straw.		Length of Pod.	Size of Pea.	Yield per Acre.	
				Inches.	Tons.	Lbs.	Inches.		Bush.	Lbs.
King........	Aug. 16..	107	Medium...	50 to 55	1	1,600	2½ to 3	Large...	31	20
Bright.............	" 25..	116	"	50 to 60	1	1,500	2½ to 3	Medium..	30	20
Archer..............	" 14..	105	Rank	30 to 36	2	1,300	2 to 3	" ..	29	40
Nelson	" 25..	116	"	30 to 36	2	1,600	2 to 2½	" ..	29	20
Vincent.............	" 16..	107	Strong......	48 to 50	2	1,000	2 to 2½	Large....	28	40
Arthur.............	" 24..	115	Very strong.	55 to 60	2	1,800	2 to 2½	Medium..	28	20
Canadian Beauty ..	" 23..	114	Rank.......	36 to 40	3	300	2¾ to 3	Large....	27	20
Prince Albert..	" 23..	114	Strong......	36 to 40	2	1,400	2½ to 3	Small....	26	..
Creeper........... .	" 13..	105	"	30 to 34	2	980	2 to 2¼	"	25	20
Bedford.............	" 24..	115	Medium....	34 to 40	2	700	2½ to 3	Large....	25	20
Prussian Blue.....	" 23..	114	"	36 to 40	2	600	3 to 3½	Medium..	24	40
Kent........ ...	" 23..	114	"	30 to 34	2	900	3 to 3½	Large....	24	40
White Marrowfat....	" 25..	116	Strong......	32 to 36	2	1,800	2¼ to 2¾	" ...	24	40
Early Briton........	" 14..	106	Medium....	36 to 40	1	1,000	2 to 2½	"	24	20
Macoun.............	" 23..	114	Strong......	30 to 34	2	1,400	2½ to 3	"	24	..
Victoria............	" 10..	103	Medium....	24 to 28	2	400	1½ to 2	Small....	24	..
Duke..............	" 24..	115	Strong......	34 to 38	2	1,600	2¼ to 2¾	Large....	23	40
White Wonder .	" 14..	106	Medium....	22 to 26	1	900	2 to 2¼	Medium..	23	40
Elephant Blue.	" 25..	116	Strong......	34 to 36	2	900	2¼ to 2¾	....	23	20
Chancellor	" 25..	116	"	34 to 38	2	900	3 to 3¼	Small....	23	20
Carleton...........	" 24..	115	"	30 to 36	2	300	2½ to 2¾	Medium..	23	..
Perth	" 16..	108	Medium....	65 to 72	1	1,500	2½ to 3	Large....	23	..
Oddfellow..........	" 25..	116	Strong......	32 to 36	2	800	2¼ to 2¾	....	23	..
Bruce..............	" 23..	114	"	30 to 36	2	500	2½ to 3	Large....	22	40
Paragon...........	" 16..	108	"	30 to 34	2	700	2 to 2½	Medium..	22	40
Mummy..	" 14..	106	"	38 to 42	2	600	3 to 3½	" ..	22	..
Harrison's Glory.....	" 14..	106	"	24 to 28	2	...	3 to 3½	....	21	40
Alma	" 25..	116	"	34 to 38	2	900	2½ to 3	Small....	20	20
Golden Vine.........	" 14..	106	"	46 to 50	2	700	2¼ to 2¾	"	20	20
Prince......... ...	" 23..	114	"	36 to 40	2	300	2½ to 3	Large....	20	..
Trilby............ .	" 25..	116	"	28 to 32	2	100	2 to 2½	Medium..	20	..
New Potter.........	" 14..	106	"	36 to 40	2	400	2½ to 3	Large....	19	40
Centennial..........	" 23..	114	Medium....	32 to 36	1	1,800	2 to 2½	Medium..	17	40
Mackay............	" 23..	114	Strong......	28 to 32	2	1,900	2½ to 3	Large ..	17	40
Black Eye Marrowfat	" 23..	114	"	28 to 30	2	1,300	2 to 2½	"	16	40
Multiplier..........	" 23..	114	"	34 to 38	2	500	2½ to 3	Small....	16	20
Daniel O'Rourke.....	" 12..	104	"	18 to 22	2	500	1½ to 2	"	16	20
Pride..............	" 13..	105	"	28 to 32	1	1,700	2 to 2½	Large....	16	20
Agnes....	" 14..	106	Medium....	50 to 56	1	1,600	3 to 3½	"	14	40
Crown	" 16..	108	"	30 to 34	1	1,700	1½ to 2	Small....	13	20

RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

These plots were sown on loamy soil that had been under grain the previous year, part of it in oats and the remainder wheat. It was all ploughed early in spring and thoroughly harrowed when the first plots of the series were sown, and the unsown portion harrowed when each subsequent sowing was made. There was no smut, but rust on the oats and mildew on the pea vines lessened the yield of those grains. There was no rust on the wheat or barley plots. The size of the plots was one-twentieth acre each.

Oats—Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.	
				Inches.		Inches.		Lbs.	Bush.	Lbs.
Banner.........	April 8	Aug. 12	126	54 to 55	Strong growth	10	Branching	4,000	55	10
"	" 15	" 14	121	58 " 60	" "	10	" ..	4,120	62	12
"	" 22	" 14	114	58 " 60	" "	10	" ..	4,400	64	24
"	" 29	" 16	109	60 " 62	" "	10½	" ..	6,100	72	32
"	May 6	" 18	104	60 " 62	" "	10½	" ..	5,960	76	16
"	" 13	" 23	102	60 " 64	" "	10	" ..	6,300	73	18
Abundance.....	April 8	" 12	126	54 " 56	" "	9	" ..	3,900	50	20
"	" 15	" 14	121	60 " 62	" "	10	" ..	4,000	60	00
"	" 22	" 14	114	58 " 60	" "	10	" ..	4,100	58	28
"	" 29	" 19	112	58 " 60	" "	10	" ..	5,240	67	22
"	May 6	" 22	108	60 " 62	" "	9	" ..	5,400	55	30
"	" 13	" 23	102	60 " 62	" "	8½	" ..	5,080	54	24

Spring Wheat—Early, Medium and Late Sowings.

Red Fife	April 8	Aug. 13	127	52 to 54	Stiff and bright	3½	Beardless.	4,800	30	40
"	" 15	" 16	123	52 " 54	" "	3½	" .	5,200	36	20
"	" 22	" 17	117	56 " 58	" "	4	" .	6,040	37	40
"	" 29	" 19	112	60 " 62	" "	4 to 4½	" .	6,000	41	20
"	May 6	" 21	107	50 " 52	" "	4	" .	4,200	38	20
"	" 13	" 24	103	48 " 50	" "	4	" .	5,000	35	00
Stanley	April 8	" 9	122	54 " 56	" "	4½	" .	4,500	32	45
"	" 15	" 15	121	52 " 54	" "	3½	" .	5,200	41	45
"	" 22	" 17	116	52 " 54	" "	4	" .	6,100	41	50
"	" 29	" 19	111	56 " 60	" "	4¼	" .	7,300	42	20
"	May 6	" 21	106	56 " 58	" "	4	" .	6,000	29	40
"	" 13	" 24	102	50 " 52	" "	3½	" .	4,000	30	20

Barley—Early, Medium and Late Sowings.

Canadian Thorpe	April 8	Aug. 9	123	43 to 45	Stiff and bright	3	2-rowed...	4,480	41	12
" ..	" 15	" 13	114	44 " 48	" "	3½	" ..	4,100	43	36
" .	" 22	" 14	108	44 " 46	" "	3½	" .	4,200	40	30
" ..	" 29	" 16	103	46 " 48	" "	4	" ..	4,210	40	40
" ..	May 6	" 18	98	44 " 46	" "	4	" ..	4,220	42	24
" ..	" 13	" 21	94	44 " 46	" "	4	" ..	4,800	45	25
Odessa.........	April 8	" 4	118	32 " 34	" "	3	6-rowed...	3,000	28	36
"	" 15	" 6	113	40 " 42	" "	3½	" ..	3,400	32	9
"	" 22	" 9	109	37 " 39	" "	3	" ..	4,100	37	15
"	" 29	" 13	106	41 " 43	" "	3	" ..	3,760	35	20
"	May 6	" 14	100	36 " 38	" "	3	" ..	3,900	33	16
"	" 13	" 17	96	38 " 40	" "	3	" ..	4,100	42	24

PEASE—Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Character of Straw.	Length of Straw.	Weight of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.	
					Inches.	Lbs.	Inches.		Bush.	Lbs.
Mummy.......	April 8	Aug. 9	123	Medium......	36 to 38	4,100	2½	Medium..	25	00
"	" 15	" 12	119	"	36 " 38	4,040	2	" ..	24	40
"	" 22	" 14	114	"	33 " 36	3,600	2	" ..	20	30
"	" 29	" 16	109	"	33 " 36	3,840	2¼	" ..	22	40
"	May 6	" 17	103	"	33 " 36	3,940	2¼	" ..	25	20
"	" 13	" 19	98	"	30 " 34	3,700	1¾	" ..	20	00
Golden Vine....	April 8	" 10	124	Strong........	45 " 50	2,960	2	Small	20	00
"	" 15	" 12	119	"	44 " 48	3,200	2	"	20	40
"	" 22	" 14	114	"	44 " 48	3,300	1¾	"	19	20
"	" 29	" 16	109	" ...	42 " 46	3,160	1¾	"	21	00
"	May 6	" 17	103	"	44 " 48	3,400	1½	"	17	20
"	" 13	" 19	98	"	46 " 50	4,000	1½	"	18	40

EXPERIMENTS WITH INDIAN CORN.

Twenty-six varieties of corn were tested in hills three feet apart each way and in drills three feet apart. The drills were thinned to leave one plant per foot of drill and hills to leave three plants in each hill. The soil was a warm sandy loam that had been in roots in 1896.

The season was favourable for corn and the yields as shown in the following table have been very good. The yield in each case has been calculated from 2 rows each 66 feet long.

INDIAN CORN—Test of Varieties.

Name of Variety.	Date of Sowing.	Character of growth.	Height.	When Tasselled.	In Silk.	Early Milk.	Late Milk.	Condition when cut.	Weight per acre grown in rows.		Weight per acre grown in hills.	
			Inches.						Tons.	Lbs.	Tons.	Lbs.
Red Cob Ensilage	May 18	Very strong	144 to 160	Aug. 10	Aug. 28	Sept. 18	....	Roasting ear	43	900	40	1,950
Selected Leaming	" 18	"	112 to 120	" 5	" 18	" 12	Sept. 22	Beginning to glaze.	43	900	35	1,050
Cuban Giant	" 18	"	120 to 130	" 22	Sept. 14	....	....	Cobs formed	42	700	34	750
Early Butler	" 18	"	114 to 120	" 2	Aug 16	Aug. 27	Sept. 16	Glazed	37	800	31	700
Mammoth 8 rowed Flint	" 18	"	108 to 114	" 7	" 18	Sept. 4	" 24	Late milk	35	950	31	1,300
North Dakota White	" 18	"	78 to 84	" 6	" 16	" 2	" 17	Glazed	34	200	33	1,100
Angel of Midnight	" 18	Medium	84 to 90	" 13	" 27	" 11	....	Late milk	33	....	31	700
Giant Prolific Ensilage	" 19	Slender	108 to 120	" 18	" 30	" 20	....	Early milk	32	350	32	1,450
Thoroughbred White Flint	" 18	Strong	84 to 96	" 8	" 22	" 10	Sept. 24	Commencing to glaze.	29	300	31	1,800
King of the Earliest	" 18	Slender	114 to 120	" 7	" 20	" 7	" 20	Glazing	31	700	28	1,200
Ninety Day	" 18	Strong	88 to 100	" 6	" 11	" 2	" 15	Glazed	29	1,400	26	800
Pearce's Prolific	" 18	"	84 to 96	" 10	" 20	" 6	" 18	"	28	100	19	500
Champion White Pearl	" 18	"	90 to 96	" 22	Sept. 10	....	....	Cobs long but not in milk.	27	780	26	250
Clouds Early Yellow	" 18	Slender	80 to 90	" 16	Aug. 28	Sept. 18	....	Roasting ear	24	400	27	450
Wisconsin White Dent	" 19	Medium	78 to 84	" 20	" 29	" 26	....	Early milk	26	1,350	26	250
Sanford	June 1	"	72 to 78	" 13	" 26	" 11	Sept. 20	Glazed	22	....	26	470
Mammoth Sweet Fodder	May 19	"	80 to 90	" 17	" 26	" 20	....	Roasting ear	26	800	19	500
Canadian White Flint	June 1	"	72 to 78	" 14	" 25	" 10	Sept. 22	Glazing	17	1,860	26	690
Kendall's Giant	May 19	Slender	84 to 90	" 18	" 30	" 20	....	Early milk	24	950	20	1,250
Wisconsin Yellow Dent	June 1	"	78 to 84	" 20	" 30	" 18	Sept. 28	Late milk	21	1,450	20	1,800
Longfellow	May 18	Strong	72 to 78	" 4	" 13	Aug. 30	" 14	Glazed	19	610	20	1,360
White Cap Yellow Dent	" 18	Medium	72 to 78	" 17	" 28	Sept. 16	....	Roasting ear	20	800	13	1,950
Comptons Early	" 18	"	72 to 80	" 6	" 23	" 9	Sept. 21	Late milk	18	1,840	13	150
North Dakota Yellow	" 29	Slender	72 to 78	" 4	" 14	" 6	" 20	Glazed	16	780	17	1,200
Pride of the North	" 18	"	84 to 90	" 20	" 28	" 20	....	Roasting ear	14	1,810	16	1,220
Mitchell's Extra Early	" 18	Medium	54 to 60	July 18	July 29	Aug. 20	Aug. 28	Ripe	10	1,560	14	50

EXPERIMENTS WITH TURNIPS.

These roots, like the carrots, were sown on comparatively new land, which had been in oats the previous year. The growth was strong and even. Soil, a warm loam, ploughed early in spring and harrowed several times before sowing. Eighteen varieties were tested, and two sowings were made, the first on the 14th of May and the second on the 28th of May, and the roots from both were pulled on the 18th of October. The yield has been calculated from three rows each 66 feet long and 2½ feet apart.

TURNIPS—Test of Varieties.

Name of Variety.	Yield per acre. — 1st Plot.		Yield per acre. — 1st Plot.		Yield per acre. — 2nd Plot.		Yield per acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Prize Winner	66	1,555	2,059	14	49	1,000	1,650	..
Prize Purple Top	58	1,040	1,950	40	58	160	1,936	..
Selected Purple Top	57	48	1,900	48	47	600	1,576	40
East Lothian	56	1,168	1,888	8	60	384	2,006	24
Halewood's Bronze Top	56	200	1,870	..	51	80	1,701	20
Hartley's Bronze	55	880	1,848	..	50	1,376	1,689	36
Skirvings	55	....	1,833	30	49	1,264	1,654	24
Jumbo or Monarch	54	1,120	1,818	40	51	1,400	1,723	20
Giant King	53	1,712	1,795	12	47	840	1,580	40
Marquis of Lorne	53	1,360	1,789	20	52	1,600	1,760	.
Carter's Elephant	53	40	1,767	20	48	1,504	1,625	4
Hall's Westbury	51	960	1,716	..	48	800	1,613	20
Mammoth Clyde	50	760	1,679	20	44	880	1,481	20
Perfection Swede	49	208	1,636	48	50	1,376	1,689	36
Bangholm Selected	47	600	1,576	40	46	840	1,547	20
Champion Purple Top	47	600	1,576	40	45	200	1,503	20
Sutton's Champion	45	200	1,503	20	42	1,360	1,422	40
Shamrock Purple Top	40	520	1,342	..	40	960	1,309	20

EXPERIMENTS WITH MANGELS.

Eighteen varieties of mangels were tested along side the turnips, in similar loamy soil, the conditions in every respect being practically the same. These also show the advantage of early sowing.

All the roots this season are smooth, even, and remarkably free from prongs, or long neck. The yields are made up from the produce of three rows, each 66 feet long, and two feet and a half apart.

Two sowings were made, the first on the 24th of April, the second on the 8th of May, and the roots from both were pulled on the 15th of October.

MANGELS.—Test of Varieties.

Name of Variety.	Yield per acre. — 1st Plot.		Yield per acre. — 1st Plot.		Yield per acre. — 2nd Plot.		Yield per acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Selected Mammoth Long Red	39	1,024	1,317	4	32	240	1,070	40
Red Fleshed Tankard	39	320	1,305	20	35	400	1,173	20
Golden Fleshed Tankard	39	140	1,302	24	35	400	1,173	20
Norbiton Giant	35	1,456	1,190	56	34	1,960	1,166	..
Canadian Giant	35	752	1,179	12	28	1,200	953	20
Giant Yellow Intermediate (Steele)	34	1,080	1,151	20	31	40	1,034	..
Gate Post	34	992	1,149	52	36	160	1,202	40
Mammoth Long Red	32	1,824	1,097	4	30	1,600	1,026	40
Giant Yellow half-long	31	1,360	1,056	..	28	672	944	32
Yellow Intermediate	31	1,184	1,053	4	27	1,000	916	40
Prize Mammoth Long Red	29	1,136	985	36	23	1,960	799	20
Ward's Large Oval Shaped	28	496	941	36	22	1,760	762	40
Giant Yellow Globe	27	1,264	921	4	25	600	843	20
Champion Yellow Globe	27	1,000	916	40	25	656	842	36
Giant Yellow Intermediate (Pearce)	27	912	915	32	26	624	877	4
Golden Tankard	27	912	915	32	26	360	872	40
Red Fleshed Globe	24	1,280	801	20	24	400	806	40
Warden Orange Globe	19	1,424	657	4	18	80	601	20

EXPERIMENTS WITH CARROTS.

Fifteen varieties of carrots were tested, two sowings of each variety were made, two weeks apart, in drills one and one-half feet apart.

The soil was a sandy loam, and was new, having only been broken up in the spring of 1895, and was not yet thoroughly uniform, as shown by the heavier yields in the second sowing, in one or two cases. The character of the growth, however, was strong and fairly uniform.

The yields are calculated from three rows of 66 feet each. The first sowing was made on the 23rd of April, the second on the 7th of May, and the roots from both were pulled on the 15th of October.

CARROTS—Test of Varieties.

Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Giant White Vosges	37	1,680	1,261	20	46	400	1,540	
Yellow Intermediate	39	1,200	1,320	..	27	266	904	26
Improved Short White	33	1,466	1,124	26	30	1,893	1,031	33
Green Top White Orthe	33	880	1,114	40	26	800	880	
Carter's Orange Giant	31	1,360	1,056	..	23	640	777	20
Half Long White	31	333	1,038	53	22	1,760	762	40
Guerande or Ox-heart	30	1,600	1,026	40	29	1,840	997	20
White Belgian	30	1,600	1,026	40	24	160	769	20
Early Gem	27	560	909	20	20	480	674	40
Iverson's Champion	27	120	902	..	36	1,060	1,217	20
Half Long Chantenay	26	1,670	894	30	24	693	811	33
Mammoth White Intermediate	26	800	880	..	16	1,440	557	20
Scarlet Altringham	19	1,600	660	..	17	1,786	596	26
Long Orange or Surrey	18	960	616	..	21	240	704	
Scarlet Intermediate	11	880	381	20	13	1,280	454	40

EXPERIMENTS WITH SUGAR BEETS.

Six varieties of these roots were sown in sandy loam which had received a dressing of stable manure early in the spring of 1896, and had produced a crop of carrots that year.

The land was ploughed early in the spring and harrowed several times at short intervals to start and kill the weed seeds. Two sowings were made, the first on the 26th of April and the second on the 10th of May. The seed was sown in drills 2½ feet apart and the plants thinned to about 6 inches in the row. The growth was even and uniform and the roots from both sowings were pulled on the 15th of October.

The following table of weights per acre is calculated from the produce of three rows, each 66 feet long.

Sugar Beets—Test of Varieties.

Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Wanzleben	14	1,040	484	..	13	1,456	457	36
Danish Improved	14	952	482	32	13	1,104	451	44
Red Top Sugar	12	1,080	418	..	15	800	613	20
Danish Red Top	14	600	476	40	13	400	440	..
Improved Imperial	13	1,720	462	..	13	1,280	454	40
Vilmorin's Improved	13	400	440	..	12	1,520	425	20

EXPERIMENTS WITH POTATOES.

One hundred and eleven varieties of potatoes were planted in a strong clay loam, that had been in small fruits for several years.

Some varieties suffered slightly from rot, but the yield has been very fair in every case, and the quality of most varieties very good. They were planted from the 4th to the 28th of May, and dug from the 18th to the 25th of September.

Potatoes—Test of Varieties.

Name of Variety.	Total Yield per Acre.		Yield per Acre of Sound.		Yield per Acre of Rotten.		Yield per Acre of Market-able.		Yield per Acre of Unmar-ketable.		Form and Colour.
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Clay Rose	633	36	633	36	None	....	612	..	21	36	Long pink.
American Wonder	598	24	598	24	"	....	538	54	59	30	" white.
Irish Daisy	591	36	562	..	29	36	506	..	56	..	" "
Brownell's Winner	563	12	563	12	None	....	506	30	56	42	Long flat red.
Abundance Late	550	..	550	..	"	....	527	30	22	30	Round white.
Late Puritan	536	48	510	..	26	48	458	..	52	..	Long white.
Seedling No. 7	535	20	535	20	None	....	481	40	53	40	Long red.
Early Sunrise	528	..	528	..	"	....	475	..	53	..	" pink.
Early Puritan	528	..	528	..	"	....	473	..	55	..	" white.
Clarke's No. 1	528	..	528	..	"	....	448	48	79	12	" pink.
Prize Taker	528	..	528	..	"	....	396	..	132	..	" red.
Rose No. 9	513	20	513	20	"	....	460	20	53	..	" "

POTATOES—Test of Varieties—*Continued.*

Name of Variety.	Total Yield per Acre.		Yield per Acre of Sound.		Yield per Acre of Rotten.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Vanier	506	..	506	..	None	....	455	..	51	..	Long dark red.
Empire State	498	40	498	40	"	....	423	52	74	28	" pink and white.
Reading Giant	481	4	481	4	"	....	433	..	48	4	" white.
Reeve's Rose	481	4	481	4	"	....	409	..	72	4	" rose.
Foreman's Early No. 4	469	20	469	20	"	....	421	30	47	50	Oval white.
Charles Downing	469	20	469	20	"	....	397	40	71	40	"
Monroe County	462	..	462	..	"	....	439	..	23	..	Long red.
Satisfaction	457	36	457	36	"	....	411	46	45	50	" white.
Troy Seedling	457	36	457	36	"	....	410	..	47	36	Round white.
World's Fair	454	40	454	40	"	....	386	40	68	..	" "
Brown's Rot Proof	454	40	454	40	"	....	409	..	45	40	Long dark red.
Henderson's Late Puritan	451	44	428	14	23	30	372	20	45	44	" white.
Pride of the Table	451	44	451	44	None	....	406	44	45	..	Long dark red.
Carman's No. 3	447	20	447	20	"	....	403	50	43	30	Oval white.
Maule's Thoroughbred	447	20	447	20	"	....	402	30	44	50	Long rose.
Dakota Red	445	52	445	52	"	....	401	22	44	30	" red.
State of Maine	440	..	440	..	"	....	394	30	45	30	Oval white.
Dreer's Standard	419	48	419	48	"	....	356	30	63	18	Round white.
Bill Nye	419	28	419	28	"	....	377	10	42	18	Long white.
Algoma No. 1	418	..	418	..	"	....	376	20	41	40	" rose.
Columbus	418	..	418	..	"	....	355	30	62	30	" pink.
Holborn Abundance	418	..	418	..	"	....	355	30	62	30	" white.
Pearce's Extra Early	414	..	401	30	12	30	359	30	42	..	" rose.
Vick's Extra Early	414	..	414	..	None	....	372	..	42	..	" pink.
New Queen	411	..	411	..	"	....	369	30	41	30	" "
New Variety No. 1	409	36	409	36	"	....	369	46	39	40	Round white.
Northern Spy	408	18	408	18	"	....	367	48	40	30	Long red.
Early Norther	408	18	408	18	"	....	367	48	40	30	" pink and white.
Great Divide	407	14	386	14	21	..	347	44	38	30	Long white.
Lee's Favourite	403	20	403	20	None	....	342	50	60	30	" rose.
Ohio Junior	403	20	403	20	"	....	322	40	80	40	" "
American Giant	374	..	355	..	19	..	307	..	46	..	Long white.
McKenzie	363	44	363	44	None	....	319	24	44	20	"
Peerless Junior	362	16	362	16	"	....	308	6	54	10	Oval white.
Lopas White	361	32	361	32	"	....	307	32	54	..	Long white.
Chicago Market	360	10	360	10	"	....	313	10	47	..	" red.
Quaker City	360	10	288	10	72	..	201	43	87	27	" white.
Everett	358	36	358	36	None	....	268	56	89	40	" pink.
Seedling 230	355	40	355	40	"	....	338	10	17	30	Round white.
Pride of the Market	354	12	354	12	"	....	336	30	17	42	Long white.
Seedling No. 3	354	..	354	..	"	....	283	10	70	50	" red.
Good News	352	30	352	30	"	....	317	30	35	..	" rose.
Crown Jewel	352	30	352	30	"	....	317	10	35	20	" "
Flemish Beauty Seedling	352	30	352	30	"	....	281	30	71	..	" pink.
Ashleaf Kidney	346	8	346	8	"	....	294	28	51	40	" white.
Early London	344	20	344	20	"	....	293	50	50	30	" pink.
Ideal	334	24	334	24	"	....	290	44	33	40	Oval "
Sharpe's Seedling	334	24	334	24	"	....	283	54	40	30	Long red.
Money Maker	330	..	314	..	16	..	283	30	31	30	" white.
Record	330	..	330	..	None	....	280	10	49	50	" "
Sir Walter Raleigh	330	..	330	..	"	....	281	30	48	30	Oval "
Rural Blush	322	40	322	40	"	....	290	20	32	20	Long white.
Rochester Rose	322	40	322	40	"	....	258	35	64	5	" rose.
Honeoye Rose	322	40	322	40	"	....	256	40	66	..	" "
Houlton Rose	322	40	322	40	"	....	242	..	80	40	" "
Earliest of All	319	44	319	44	"	....	272	14	47	30	" light rose.
Early White Prize	316	48	316	48	"	....	268	18	44	30	Long white.
Early Harvest	316	48	316	48	"	....	253	28	63	20	Long white.
Seattle	315	20	315	20	"	....	251	20	54	..	"
Victor Rose	308	..	308	..	"	....	278	..	30	..	Long rose.
Rural No. 2	308	..	308	..	"	....	261	30	46	30	Oval white.
Irish Cobbler	305	4	305	4	"	....	244	4	61	..	"
Beauty of Hebron	303	36	303	36	"	....	258	6	45	30	Long rose.
Delaware	303	36	303	36	"	....	241	46	61	40	Oval white.

POTATOES—Test of Varieties—*Concluded.*

Name of Variety.	Total Yield per Acre.		Yield per Acre of Sound.		Yield per Acre of Rotten.		Yield per Acre of Market-able.		Yield per Acre of Un-market-able.		Form and Colour.
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Burnaby Seedling	302	8	302	8	None	....	256	48	45	20	Long, pale rose.
Green Mountain	300	40	300	40	"	....	240	40	60	..	Oval white.
Seedling No. 23	300	40	300	40	"	....	180	40	120	..	Round, white purple eyes.
Carman No. 1	299	12	299	12	"	....	240	32	58	40	Oval white.
Polaris	297	44	297	44	"	....	267	14	30	30	Long white.
Thorburn	296	22	296	22	"	....	243	22	53	..	" rose.
Orphans	294	4	294	4	"	....	240	4	54	..	" white.
Bovee	293	20	293	20	"	....	264	20	29	..	" rose.
Daisy	293	20	293	20	"	....	249	44	43	36	" "
Early Rose	290	25	290	20	"	....	235	20	55	..	" "
Lightning Express	286	..	257	30	28	30	201	30	56	..	" "
Hale's Champion	284	32	270	2	14	30	170	30	99	32	Round white.
Queen of the Valley	281	36	281	36	None	....	230	6	51	30	Oval pink.
85 Nameless	277	12	277	12	"	....	223	12	54	..	Round white.
Seedling No. 25	271	20	271	20	"	....	218	50	52	30	Long white.
Freeman	271	20	271	20	"	....	203	35	67	45	"
Early Gem	271	20	271	20	"	....	203	35	67	45	Long rose.
I. X. L	266	..	238	..	26	..	180	..	58	..	" pink.
Hopeful	256	40	256	40	None	....	217	50	38	50	Oval white.
Seedling 214	256	40	256	40	"	....	205	..	51	40	Long "
King of the Roses	256	40	256	40	"	....	154	40	102	..	" pink.
Lizzie's Pride	249	20	249	20	"	....	176	20	73	..	" "
Fillbasket	244	36	244	36	"	....	197	56	45	40	" red.
Uncle Sam	234	40	234	40	"	....	222	46	11	44	Oval white.
Wonder of the World	234	40	234	40	"	....	189	52	44	48	Long rose.
Pearce's Prize Winner	234	40	234	40	"	....	176	40	58	40	" pale rose.
Early Ohio	228	48	228	48	"	....	206	28	22	20	" pink.
Bruce's White Beauty	228	48	228	48	"	....	171	36	57	12	Oval white.
Burpee's Extra Early	228	48	228	48	"	....	170	..	58	48	Long rose.
General Gordon	225	52	218	52	12	30	168	22	45	..	" red.
Early Six Weeks	205	20	205	20	None	....	184	..	21	20	" pink.
Maggie Murphy	205	20	205	20	"	....	162	50	42	30	" rose.
Lawton's White	202	24	202	24	"	....	181	54	20	30	" white.
Harbinger	176	..	176	..	"	....	151	..	25	..	" rose.
Vanguard	176	..	176	..	"	....	143	40	32	20	" pink.
Table King	176	..	176	..	"	....	140	45	35	15	Round white.

YIELD OF HAY, FODDER CROPS AND ROOTS.

Hay, first crop	12	tons	1,000 lbs.
" second crop	9	"	1,000 "
Mixed grain, cut for feed	40	"	1,215 "
Turnips	72	"	1,500 "
Carrots	15	"	1,700 "
Mangels	17	"	1,500 "
Sugar beets	5	"	......
Clover, in silo	3	"	......
Corn, in silo	51	"	......

The first crop of clover was cut in June, the second in August. A considerable portion of the clover, both first and second crop, was cut and fed green.

EXPERIMENTS WITH FODDER CROPS.

These plots were sown on loam which had been in roots the previous year and was in very good condition. The Egyptian Lentils, Teosinte, Kaffir Corn, Hungarian Grass and Golden Wonder Millet did not prove worth cutting.

Fodder Crops.	Date of Sowing.	Character of Growth.	Weight per Acre, Green.	Weight per Acre, Cured.	Remarks.
			Tons. Lbs.	Tons. Lbs.	
Mixture No. 1—1 bush. each wheat, oats and pease......	May 1	Strong..	9 900	4 500	Cut Aug. 2nd, wheat in late milk.
Mixture No. 2—1 bush. each oats, pease and barley.....	" 1	" ..	8 1,950	3 1,450	" oats in milk.
Golden Millet....	April 27	" ..	Not weighed green.....	3 1,140	Cut when grain was in late milk.
New Siberian Millet	" 27	" ..	" ..	3 1,240	" "
Holy Terror Millet..........	" 27	" ..	" ..	4 140	" "
New Mammoth Millet	" 27	" ..	" ..	3 1,550	" "
Hungarian Grass..	May 18	....	....	....	Seed did not germinate well, very few plants
Golden Wonder Millet......	" 18	....	... .	....	" "
Egyptian Lentils.......	April 27	....	....	......	Only a few seeds germinated, growth very feeble and no pods formed.
White Kaffir Corn	" 27	....	....	... ...	Only a few seeds germinated, growth from 6 to 10 inches high.
Teosinte	" 27	....	....	....	Only a few seeds germinated, growth from 3 to 5 inches high.

DISTRIBUTION OF SEED GRAIN, &c.

The following is a summary of the distribution of seed grain, plants, scions and cuttings made during 1897 :—

Wheat, 3-lb. bags		51
Oats	"	57
Barley	"	29
Pease	"	49
Potatoes	"	68
Lathyrus Sylvestris, packages		42
Scions	"	105
Cuttings	"	63
Small fruits	"	71
Tree seeds	"	150
Total		685

STOCK.

Since cool weather began three bulls have shown symptoms of the red water. They have been promptly treated and the disease arrested.

These animals have always had comfortable quarters, wholesome food and pure water, which makes it difficult to assign a cause, and, until a cause is found, difficult to prevent.

There are at present on the farm six head of horses, twenty head of cattle, four pigs, seven sheep, and forty-one fowls.

All—with the exceptions above mentioned—are in apparent good health.

BUILDINGS.

A small comfortable shed for shelter has been put up in each of the bull yards.

FENCING.

About three-quarters of a mile of wire fence has been put up along the west side of the farm, and a strip of land is being cleared along this to protect it from fire.

LARGE FRUITS.

APPLES.

The crop of apples has been a very heavy one, and the quality very fine, there being less scab and other fungus diseases than usual, and no injury from insects. The apple miner, which did considerable damage to the fruit last year, has been entirely absent this year. Whether their absence this season is because the injured fruit was carefully gathered and fed to the stock, and the trees sprayed, during the growing season with Bordeaux mixture and Paris green, and in winter with the lime sulphur and salt mixture, or from some other cause, is not known. The following apples fruited for the first time this year:—

Devonshire Quarrenden.—Tree a moderate grower. Fruit medium size, roundish and flattened. Skin deep rich crimson, with small green dots. Flesh white, crisp, juicy; pleasant sub-acid flavour. Season, August.

Summer Red Streak.—Tree a moderate grower. Fruit medium size, roundish conical. Skin yellow, splashed and striped with red. Flesh white, juicy, brisk sub-acid. Season, August.

Grandmother.—Tree an upright vigorous grower. Fruit above medium size, nearly conical. Skin greenish yellow, splashed and streaked with red. Flesh dry, granular and sweet. Season, last of August.

Bogdanoff.—Tree a strong grower. Fruit round, flattened, above medium size. Skin yellow, with a bright red cheek. Flesh white, juicy, sprightly acid. Season, September.

Borovinka (Solovieff).—Tree vigorous. Fruit of the Duchess type, only nearly twice as large. Season, September.

Gipsy Girl.—Tree a strong grower. Fruit large, obovate. Skin yellow, splashed with bright red. Flesh white, juicy, crisp, sprightly acid. Season, September and October.

No. 181.—Tree a vigorous grower. Fruit large, roundish, conical. Skin greenish, yellow. Flesh white, juicy, mild acid. Season, last of September.

Volga Anis.—Tree a strong grower. Fruit large, oblong conical. Skin greenish yellow, with a red blush. Flesh white, coarse, mild sub-acid. Season, October.

Haskell's Sweet.—Tree a vigorous grower. Fruit of medium size, round flattened. Skin greenish yellow, with a blush in the sun. Flesh yellowish, tender, medium, juicy and pleasant. Season, October.

King of Pippins.—Tree a strong grower. Fruit of medium size, roundish. Skin, pale yellow, splashed with red. Flesh firm and sharply acid. Season, October and November.

Somnitelnoe.—Tree a vigorous grower. Fruit small, conical. Skin green, nearly covered with bright red. Flesh white, not juicy or high flavoured. Season, September and October.

Karabovka.—Tree a very vigorous grower. Fruit small, obovate, conical. Skin green splashed with red. Flesh white, medium juicy, sub-acid. Season, September and October.

Titovka (Solovieff).—Tree a very vigorous grower. Fruit large, oblong conical. Skin greenish yellow, with streaks of red on sunny side. Flesh white, medium juicy, mildly acid and pleasant. Season, late autumn.

Plodovitka (Solovieff).—Tree a very vigorous, grower. Fruit of medium size, roundish flat. Skin green, splashed with red. Flesh white, juicy, crisp, pleasant acid. Season, late autumn.

Lapough.—Tree a very vigorous grower. Fruit large. Skin clear waxy yellow. Flesh white, crisp, juicy, sprightly acid. Season, late autumn.

Zolotoreff.—Tree a very vigorous grower. Fruit large, roundish, conical. Skin greenish yellow, with a reddish cheek. Flesh white, tender, juicy, sprightly acid. Season, late autumn.

Borsdorf.—Tree a strong and vigorous grower. Fruit of medium size, oblong, tapering to the eye. Skin greenish white, with a little russet. Flesh yellowish white, crisp, juicy, sub-acid. Season, late autumn.

Cox's Orange Pippin.—Tree a moderate and spreading grower. Fruit of medium size, oblate. Skin yellow, splashed, nearly over the whole surface with red. Flesh yellowish, crisp, juicy, rich sub-acid. Season, late autumn.

Melonen.—Tree vigorous. Fruit large, roundish conical. Skin yellow, with a pink blush. Flesh yellowish, crisp, medium juicy, mild acid. Season, autumn.

Calville Saint Sauveur.—Tree a medium grower. Fruit large, oblong conical. Skin greenish yellow, somewhat mottled and sprinkled with whitish dots. Flesh white, tender and juicy, acid. Season, late autumn.

Perry Russet.—Tree a strong grower. Fruit large, oblong. Skin yellow with russet nearly over the whole surface. Flesh, yellow, firm, juicy, pleasant acid. Season, late autumn.

Huntsman's Favourite.—Tree a vigorous grower. Fruit large, roundish conical, Skin greenish yellow with a little pale red on cheek. Flesh yellowish, coarse, crisp. juicy, and of pleasant flavour. Season November and December.

Carthouse.—Tree vigorous. Fruit large. Skin smooth, yellow, streaked with red. Flesh yellow, firm, juicy and fine. Season, winter.

Plum's Cider.—Tree a vigorous grower. Fruit of medium size, oblong. Skin yellow with a little russet, and sprinkled with gray dots. Flesh yellow, tender, juicy and mild, sub-acid. Season, winter.

Switzer.—Tree a moderately vigorous grower. Fruit small to medium, roundish, flattened. Skin green, nearly covered with dark red. Flesh white, firm, juicy, mild, sub-acid, and of pleasant flavour. Season, winter.

Iowa Blush.—Tree vigorous. Fruit of medium size, conical. Skin yellow, with a mottled yellowish red cheek. Flesh white, firm, juicy, mild acid. Season, winter.

Willow Twig.—Tree a medium but spreading grower. Fruit of medium size, roundish, slightly conical. Skin green, streaked and splashed with light red. Flesh greenish white, firm, juicy, pleasant sub-acid. Season, winter.

Scarlet Cranberry.—Tree a medium grower. Fruit small to medium, oblate. Skin green, nearly covered with dull red and freely sprinkled with whitish dots. Flesh yellowish white, firm and juicy, mild, sub-acid. Season, winter.

The list of varieties given last year as the most promising for winter have produced fine crops of apples this season, and that list may be extended by adding Smith's Cider and Stark. Smith's Cider is a strong, vigorous and productive tree, with fruit of medium size, handsome and of good quality, keeping until last of February.

Stark.—Tree a very strong grower and productive. Fruit large and of fair quality, keeping until last of March. Specimens have been kept until last of June.

PEARS.

The season has been a very favourable one for pears and the crop not only a large one but the quality was very fine.

Several of the newer varieties fruited for the first time this year. Below will be found some notes giving date of ripening and quality so far as an opinion can be formed from the first year's crop.

Salviate.—Tree a vigorous grower. Fruit of medium size, obovate, pyriform; skin greenish yellow with a few gray dots. Flesh dry, granular and poor. Ripe, 1st. August.

Wilder.—Tree a vigorous upright grower. Fruit large, obtuse, pyriform. Skin bright yellow, with a warm blush on sunny side. Flesh yellowish, juicy and sweet. Ripe August 4th.

Ritson.—Tree a strong grower. Fruit small to medium, oblong, pyriform. Skin yellow, sprinkled with russet. Flesh white, juicy, buttery. Ripe, last of August.

La France.—Tree a vigorous grower. Fruit of medium size, obovate, obtuse, pyriform. Skin green, with small gray dots. Flesh juicy, melting and of very fine flavour. Season September.

Jargonelle.—Tree a vigorous grower. Fruit large, long pyriform. Skin greenish yellow with a little bronze on cheek. Flesh juicy, white pleasant. Season, August.

Early Bergamot.—Tree a medium grower. Fruit small, roundish, pyriform. Skin yellowish green. Flesh sweet, pleasant but not juicy. Season August.

Comte de Lamy.—Tree a vigorous grower. Fruit small to medium in size, oblate, pyriform. Skin yellow with a reddish cheek and small patches of russet. Flesh white, fine grained, buttery and sweet. Season, September.

Beurre d'Amanlis.—Tree a strong grower. Fruit of medium size, obovate, pyriform. Skin green with a reddish brown cheek and many brown dots. Flesh juicy, with a pleasant flavour. Season, September.

Madame Treyve.—Tree a vigorous grower. Fruit of medium size, obovate, pyriform. Skin yellow, with a red cheek and small brown dots. Flesh white, melting, juicy, sweet, with a rich flavour. Season, September.

Jersey Gratioli.—Tree a medium grower; fruit of medium size, obovate pyriform. Skin yellowish green with patches of russet. Flesh white, juicy and melting. Season, September.

Pitmaston Duchess.—Tree a vigorous grower. Fruit large, oblong pyriform. Skin yellow with russet near the stalk. Flesh yellowish, juicy, buttery, and of pleasant flavour. Season, October.

Gansel's Bergamot.—Tree a moderate grower; fruit of large size, roundish, obovate, nearly flat. Skin russet brown, with a russet red cheek. Flesh white, juicy, melting, and sweet with a rich flavour. Season, September.

Conseiller de la Cour.—Tree a vigorous grower. Fruit above medium size, oblong, pyriform. Skin greenish yellow with russet dots. Flesh yellowish, juicy and melting. Season, last of September.

General Todtleben.—Tree a vigorous, spreading grower. Fruit large, obtuse, pyriform. Skin greenish yellow, sprinkled with russet dots; flesh whitish, coarse, juicy, sweet and pleasant. Season, October.

Nouvelle Fulvie.—Tree a medium grower. Fruit large, pyriform. Skin greenish yellow with a reddish brown cheek. Flesh yellowish, juicy, melting, sweet. Season, October.

Noveau Poiteau.—Tree a vigorous grower. Fruit of medium size, obovate, pyriform. skin greenish yellow ; flesh whitish, buttery, juicy, with a rich sweet flavour. Season November.

Of the new pears the Dr. Jules Guyot, for early autumn. Rivers' Princess, Pitmaston Duchess and Knight's Monarch appear to be the most promising. More than thirty varieties of pears new to our collection were received as scions this year.

PLUMS.

This climate is so suitable to the plum that a crop of fruit is almost certain if the trees have received even ordinary care. This season the crop has been a fairly good one and some varieties gave very heavy crops. Several of the newer sorts fruited this year, as follows:—

Early Favourite.—Tree a vigorous grower, but not an early bearer. Fruit small, roundish, oval. Skin nearly black with a blue bloom. Flesh greenish yellow, juicy, sweet, and of high flavour. Stone small and free. Ripe, 22nd July.

Early Prolific.—Tree a moderate grower, but not prolific here. Fruit small, nearly globular. Skin dark purple with a blue bloom. Flesh yellowish, juicy and sweet. Stone small and free. Ripe, 26th July.

Lincoln.—Tree a strong grower. Fruit large, oval. Skin reddish purple with many whitish dots and a thin white bloom. Flesh yellow, juicy, sweet and pleasant. Stone small. Ripe, 6th August.

July Green Gage.—Tree a moderate grower. Fruit of medium size, globular in shape. Skin yellow, with many small crimson dots. Flesh yellow, juicy, sweet. Ripe, 7th August.

Mariana.—Tree a moderate grower. Fruit small, oval. Skin glossy, yellow, with a reddish blush on sunny side. Flesh yellow, juicy and pleasant. Stone cling and large. Ripe, 10th August.

Goliath.—Tree a strong grower. Fruit large, roundish, oblong, one side enlarged, suture shallow. Skin reddish purple, with a thin whitish bloom. Flesh yellow, with a brisk pleasant flavour. Clingstone. Ripe, 10th August.

Angelina Burdette.—Tree a strong grower. Fruit above medium size, nearly round, with a deep suture and one side enlarged. Skin dark purple with brown dots and a blue bloom. Flesh greenish yellow, juicy, with a sprightly, pleasant flavour. Free stone. Ripe, 10th August.

Wooten.—Tree a moderately vigorous grower. Fruit small. Skin yellow, with a reddish blush nearly over the whole surface. Flesh yellow, juicy and pleasant. Clingstone. Ripe 10th August.

Early Red.—Tree a feeble straggling grower. Fruit, small oval. Skin, dark purple, with a heavy blue bloom ; flesh, light greenish white, dry granular and acid ; ripe, 10th August.

Golden Beauty.—Tree a fair grower. Fruit small, nearly heart shaped. Skin red, sprinkled with whitish dots, and a thin whitish bloom. Flesh yellow, juicy and sweet; clingstone. Ripe, 12th August.

Transparent Gage.—Tree a strong grower. Fruit of medium size, round, flattened. Skin light green with a light red blush, and a whitish bloom. Flesh greenish white, juicy, sweet and of fine flavour, but cracks badly. Ripe, 14th August.

Prince Englebert.—Tree a strong, vigorous grower. Fruit of medium size, oblong oval. Skin dark purple with brown dots and a light blue bloom. Flesh greenish yellow, sweet, juicy and firm. Stone large, and cling. Ripe, 14th August.

Robinson.—Tree a vigorous grower. Fruit small. Skin yellow with a bright red side. Flesh yellow, juicy and sprightly. Stone large, and cling. Ripe, 14th August.

McLaughlin.—Tree a strong grower. Fruit above medium, round and quite flattened. Skin greenish yellow, and dotted with reddish dots about the stem. Flesh yellow, firm, juicy, sweet, and of very rich flavour. Stone small, and cling. Ripe, 16th August.

Orleans Old.—Tree a moderate grower. Fruit below medium size, globular, with a shallow suture. Skin dark purple, with a dark, blue bloom. Flesh yellowish, sweet, juicy, pleasant. Ripe, 16th August.

Glass Seedling.—Tree a free grower. Fruit above medium size, oval, suture broad and shallow, one side enlarged. Skin dark purple with a blue bloom. Flesh greenish yellow, firm, juicy, sweet; free stone. Ripe, 19th August.

Giant Prune.—Tree a free grower. Fruit large, oblong, with a shallow suture. Skin yellow nearly covered with light red and a thin whitish bloom. Flesh yellowish, juicy, sweet and rich. Ripe, 20th August.

McGillivray.—Tree a moderate grower and poor producer. Fruit small, oval shape, shin light red. Flesh yellow, juicy, slightly astringent; cling stone. Ripe, 20th August.

Field.—Tree a vigorous grower. Fruit above medium in size, oblong with a deep suture. Skin purple with a thin blue bloom. Flesh greenish, sweet, firm and of pleasant flavour. Stone large, cling. Ripe, 20th August.

Tenant Prune.—Tree a strong vigorous grower. Fruit medium to large oblong with a shallow suture. Skin reddish purple with a whitish bloom. Flesh yellow, firm, sweet and pleasant. Stone small and free. Ripe, 22nd August.

Annie Spathe.—Tree vigorous. Fruit small oval with a shallow suture. Skin reddish purple with a thin bluish bloom. Flesh greenish yellow, sprightly and of pleasant flavour. Stone large. Ripe, 24th August.

Several of the Japanese plums fruited this year, but the fruit almost all fell off before fully grown.

Botan.—Tree a straggling poor grower. Fruit of medium size, pointed heart-shape. Colour bright red sprinkled with grayish dots and covered with a thin white bloom. Flesh yellow, juicy, crisp, and of pleasant flavour. Ripe, 7th August.

Ogon.—Tree a medium grower. Fruit large, nearly round. Skin yellow with a thin bloom. Flesh yellow, firm, sweetish and dry. Ripe, 17th August.

Burbank.—Tree a straggling grower. Fruit large, roundish conical. Skin yellowish red. Flesh yellow, moderately juicy, sweetish, not a pleasant flavour. Stone small and free. Ripe, 16th August.

Red Negate.—Tree a feeble straggling grower. Fruit of medium size, pointed heart-shape. Skin bright red with a thin bloom. Flesh yellow, juicy, sprightly, but not a good flavour. Ripe, 16th August.

Grand Duke, *Gueii*, *Monarch*, *Cox's Emperor* and *Lincoln* are the most profitable varieties among those which have fruited for two years or more. Several others are promising but have not been tested long enough to prove them thoroughly.

The Japan plums bloom very freely, but do not set their fruit well, and the trees are without exception lacking in growth and vigour.

Nineteen varieties of plums have been added to the collection this year.

CHERRIES.

The cherry trees bloomed freely this year and set a fine crop of fruit which, unfortunately, suffered very severely from the wet weather, which occurred when many of the varieties were nearly ripe, causing the fruit to split and rot.

Of those that have fruited in previous years, one of the most satisfactory is the Windsor, which gave a fine crop during the past season, and the fruit did not receive so much injury from the wet weather as other varieties of the same season.

Early Rivers.—Fruited this year for the first time. Fruit large, roundish, heart shaped. Skin, nearly black. Stalk, long. Stone, small. Flesh, tender, juicy and sweet. Ripe, 26th May.

White Heart.—Fruit small, heart-shaped. Skin, yellowish white with a pale reddish cheek. Flesh, melting, sweet and pleasant. Ripe, 5th June.

Schmidt's Bigarreau.—Fruit large, nearly round. Skin, nearly black. Flesh firm, juicy and of fine flavour. Ripe, 1st July.

Sparhawk's Honey.—Fruit of medium size, roundish, heart shaped. Skin, yellowish red. Flesh juicy, sweet, and of fine flavour. Ripe, 1st July.

Straus Weichsel.—Fruit large, nearly black, round, a little flattened. Flesh dark red, juicy, firm, slightly acid, of good flavour. Ripe, 1st July.

Nouvelle Royale.—Fruit large, roundish. Skin, bright glossy red, mottled with darker red spots. Flesh white, firm, juicy, pleasant and sprightly. Ripe, 2nd July.

Gruner Glass.—Fruit of medium size, nearly round. Skin dark red, or nearly black. Flesh firm, juicy, sprightly. Ripe, 5th July.

Arch Duke.—Fruit large, obtuse, heart-shaped. Skin, dark red. Flesh tender, juicy and high flavoured, sprightly, sub-acid. Ripe, 5th July.

Royal Duke.—Fruit large, roundish, flattened. Skin, dark red. Flesh reddish, tender, juicy, with a rich flavour. Ripe, 1st to 6th July.

Griotte du Nord.—Fruit small to medium, somewhat oval in shape. Skin light red. Flesh reddish white, juicy, acid. Stone, large. Ripe, 13th July.

Brusseler Braun.—Fruit of medium size, oval shape. Skin, deep red. Flesh reddish white, juicy, firm, pleasant acid. Ripe, 10th to 15th July.

Montmorency Court Queue.—Fruit above medium in size, round flattened. Skin light red. Flesh yellowish, tender, juicy, pleasant acid, very fine flavour, a little soft. Ripe, 5th to 10th July.

Duchess de Pallau.—Fruit large, nearly round. Skin bright red. Flesh yellowish white, firm, solid, and moderately juicy, mild, pleasantly acid, with a fine flavour. Ripe, 10th to 14th July.

Eleven varieties of cherries have been added to our collection this season.

Dwarf Rocky Mt. Cherries.—These bushes fruited freely this season, ripening about the last of August, the fruit hanging on the bushes in good condition for some weeks. A number of seedlings have been raised for distribution; as this fruit can be grown in the interior, where other cherries are not hardy, and under such conditions may be of value.

PEACHES.

Several varieties of peaches fruited fairly well, especially in sheltered locations, but they have not thus far been profitable to plant here for commercial purposes.

The following varieties produced a small crop this season. They are listed in the order of ripening.

Amsden, Early Canada, Hilborn, Crane's Early Yellow, Early Rivers, Mountain Rose, Barnard's New Rare Ripe, Foster, Early Barnard, Muir, Amelia, Druid Hill, Hill's Chili, Fox's Seedling. The above all ripened their fruit. Several of the varieties mentioned in my last report as not ripening their fruit, fruited again this year, but the fruit did not ripen or fully mature.

NECTARINES.

Many of the older nectarine trees blossomed freely, but none of them set more than two or three fruits. Nectarines, like peaches and apricots, do not appear to be well adapted to this climate.

APRICOTS.

Although nearly all the apricot trees bloomed freely the fruit did not set. Alexander, Alexis, Catherine, J. L. Budd, and Montgamet, each produced from two to half a dozen apricots, but the fruit was imperfect and poor. The apricot trees do not appear to be hardy, as large limbs die from time to time, and blossoming very early, as they do, the fruit does not set.

MULBERRIES.

All the mulberry trees fruited freely this year. The fruit began ripening the last of July and continued until the first of September. The fruit is large, sweet and juicy, and is produced in considerable quantities on the trees, but it falls off as soon as ripe, and is too soft for any but a home market.

QUINCES.

The quinces blossomed this year, but no fruit set.

FIGS.

The fig bushes continue to grow, but as they are frequently cut back in winter, and no ripe fruit has been produced, they are not of much value.

MEDLARS.

The Royal, Nottingham, and Holland medlar trees, fruited this year, but the trees evidently require age before the fruit is produced in quantity.

NUT TREES.

Filberts did not fruit freely this season, but a few very fine nuts were produced on the bushes got from Germany last year, and when these bushes have attained size, some desirable varieties, for this climate, may be found amongst them.

The Japanese walnut had a few fine nuts this season, and the hard shell almonds again fruited. The soft shell varieties have not yet fruited.

GRAPES.

The crop of grapes on the farm this season has been very small. Owing to the constant rain during the time they were in blossom, fertilization was imperfect, and consequently the bunches were open and not half the number of grapes in a bunch which there were last year, and a great many of the grapes were small in size and imperfect.

White or Nearly White.

Date of Ripening.

October 1.—Storr's Early.—Sweet, juicy, and of pleasant flavour; a very small crop.
" 3.—Duchess.—Sweet and juicy, but not so good in flavour as last year; a few bunches only.
" 4.—Lady.—Tender juicy and sweet, but very few bunches.
" 4.—Emerald.—Sweet, tender, good flavour; fair crop.
" 4.—Saunders' Seedling, No. 3.—A fair crop of very good grapes; sweet, tender and juicy.
" 4.—Eva.—Grape tender and juicy, a very poor crop.
" 6.—Saunders' Seedling.—(Wild seedling with Muscat Hamburg.)—A fair crop of very good grapes; sweet, juicy and tender.
" 6.—Jessica.—A very few bunches; grapes much inferior to other years.
" 6.—Martha.—A fair crop of nice grapes; a little acid, but juicy and of good flavour.
" 8.—Rommel.—Grape juicy, sprightly, pleasant flavour; a few bunches
" 8.—Pocklington.—Grape pulpy, sprightly, pleasant flavour; a poor crop.
" 13.—Eldorado.—Grape very uneven in size, sweet, skin thick; a very few bunches.
" 13.—Missouri Reisling.—A fairly good crop of juicy tender grapes.
" 13.—Centennial.—A good crop of worthless grapes.
" 13.—Niagara.—A very fair crop of good grapes.
" 13.—Saunders' Seedling.—(Wild seedling with Muscat d'Aout.)—A medium crop of very good grapes, but uneven in size, and many of the grapes dropped off the bunch when ripe.
" 24.—Lady Washington.—Only a few bunches of rather inferior grapes.
" 26.—Elvira.—A fair crop; juicy, tender grapes, but many were imperfect.
" 26.—Noah.—Only a few bunches of very imperfect grapes.
" 29.—Opal.—A few bunches of sour imperfect grapes.

Black or very Dark Blue.

October 4.—Bacchus.—Three or four bunches of poor grapes.
" 4.—Early Victor.—A few bunches of small sweet grapes of rather poor flavour.
" 4.—Florence.—A fair crop of worthless grapes.
" 4.—Cottage.—A small crop of fairly good grapes; sweet and of good flavour.
" 7.—Improved Wild.—A very few bunches of poor grapes.
" 7.—Cynthiana.—A fair crop of worthless grapes.
" 7.—Moore's Early.—A fair crop; grape sweet, pulpy, skin tough.

Black or Dark Purple.

October 9.—Canada.—A fair crop; grape small, sweet, but not of good flavour.
" 10.—Roger's No. 39.—Grape large, sweet and pulpy; a poor crop.
" 10.—Merrimac (Roger's No. 19.)—Grape large, juicy, sweet and of good flavour; a fair crop.
" 10.—Wilder.—A small crop of large, juicy and sweet grapes.

Date of
Ripening.

October 12.—Roger's No. 24.—A fair crop; grape pulpy, rather acid, skin tough.
" 12.—Clinton.—A good crop of good grapes.
" 14.—Herbert (Roger's No. 44.)—A poor crop of rather inferior grapes.
" 15.—Naomi.—A very few bunches of worthless grapes.
" 15.—Saunder's Seedling (Clinton with Muscat Hamburg.)—A small crop of very good grapes, juicy and a little acid.
" 15.—Saunder's Seedling (Concord with Delaware.)—A fair crop of good grapes, juicy, sprightly, good flavour.
" 15.—America.—Bunch small; grapes medium in size, juicy, sour, poor flavour; a poor crop.
" 15.—Oriental.—A good crop; grape juicy, sprightly, and of fair quality.
" 15.—Dr. Collier.—Bunch large and loose; grape medium in size, sour, juicy, poor flavour; grape uneven in size.
" 18.—Marion.—A few bunches of very inferior grapes.
" 18.—Hartford.—A few bunches of inferior grapes.
" 20.—Mills.—A small crop of very poor grapes.
" 20.—Highland.—A fair crop, but grapes rather inferior, and a great many imperfect grapes in bunch.
" 20.—Roger's No. 41.—A good crop; grape large, pulpy and of pleasant flavour.
" 22.—Arnold's No. 8.—A few bunches of worthless grapes.
" 22.—Eumelan.—A small crop of very poor grapes.
" 27.—Arnold's No. 2.—A few bunches of poor grapes.
" 27.—Seedling (Clinton with Muscat Hamburg.)—Grape small and acid; a few bunches.

Red and Reddish.

October 2.—Delaware.—A fair crop of good grapes, small, sweet and of good flavour.
" 3.—Roger's No. 5.—A small crop; grape large, juicy, sprightly, skin tough.
" 3.—Moyer.—A very few bunches. Grape small, sweet, juicy and pleasant.
" 3.—Wyoming Red.—A fair crop of very good grapes; medium sized, juicy, and of pleasant flavour.
" 5.—Brillant.—A small crop; grape medium size, sweet, juicy and tender.
" 5.—Ulster.—A fair crop; grape sweet, juicy and of good flavour.
" 5.—Vergennes.—A fair crop of pretty good grapes, pulpy, sweet and of good flavour.
" 10.—Buchanan.—A fair crop; grape juicy, sprightly, of good flavour; skin thin.
" 10.—Chasselas De Fontainbleau.—A fair crop; grape medium in size, pulpy, sweet and pleasant.
" 13.—Lindley (Roger's No. 9).—A few bunches; grape juicy and sweet.
" 13.—Salem (Roger's No. 53).—A few bunches; grape large, juicy and sweet.
" 15.—Amber Queen.—A very few bunches of worthless grapes.
" 15.—Massasoit.—A few bunches; grape juicy, sweet and tender.
" 18.—August Giant.—A small crop of fine looking grapes, but acid, juicy and of poor flavour.
" 18.—Agawam.—A small crop; grape tender, juicy and pleasant.
" 18.—Gærtner (Roger's 14).—A few bunches; grape juicy, sweet, tender and of pleasant flavour.
" 18.—Brighton.—A few bunches of poor grapes.
" 18.—Arnold's No. 1.—A good crop of sour grapes.
Jefferson.—A few bunches; grape medium in size; not ripe 31st October.
Catawba.—A good crop; grape large, but bunch loose and open; not ripe 31st October.

SMALL FRUITS.

Nearly all the small fruits were transplanted this spring to a more suitable piece of land. The soil where they had been growing was a dry gravelly knoll and was not suitable, but it was the best land available at the time many of the bushes were received. In consequence of their removal only a small crop was produced this season but there was already a considerable improvement in the size and quality of the fruit.

GOOSEBERRIES.

The only gooseberry bushes that fruited this year were those on the mountain, and as in previous years these were clean and free from mildew both in fruit and foliage. The bushes on the level had been transplanted early in spring and cut back, and did not fruit. The foliage in some varieties was rather badly attacked with mildew. The Bordeux mixture does not appear to be entirely successful here with this form of mildew and other mixtures are being tried, and it is hoped that some more efficient remedy will be found to preserve this desirable fruit.

CURRANTS.

RED AND WHITE CURRANTS.

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Verriers (white)	June 25	Vigorous ...	Large	Long cluster; sweet; very fine flavour.	Productive.
La Turmoise (red.)	" 25	" ...	" medium	Cluster, medium in length; good flavour, but rather acid	Fairly productive.
Champagner (white.)	" 25	Moderately vigorous.	Small........	Cluster, medium in length; sweet; good flavour.	Moderately productive.
Champagner (red.)	" 25	Vigorous ...	Large medium	Cluster, medium in length; rather acid; good flavour.	" "
Admirable (red)	" 25	" ...	"	Cluster, rather long; good flavour; very mild acid.	" "
English Red....	" 25	" ...	"	Cluster, long; fine flavour; acid.	Fairly productive.
Brandenburger (white.)	" 25	" ...	"	Cluster, medium in length; flavour good; mild acid.	Productive.
Red Cherry (German)....	" 25	" ...	"	Cluster, medium in length; sweet; good flavour.	Not productive.
Raby Castle (red.)	" 25	" ...	" medium	Cluster, medium in length; a little acid, but of good flavour.	Moderately productive.
London Red ...	" 25	" ...	" "	Cluster, rather short; not very good.	Not productive.
White Transparent.	" 25	" ...	" "	Cluster, medium in length; a good currant; sweet.	Moderately productive.
La Fertile (red).	" 25	Very vigorous.	"	Cluster, long and full; sweet; of good flavour; one of the best.	Very productive.
Red Cherry....	" 25	Vigorous ...	Medium......	Cluster, short to medium; fruit rather insipid.	Not very productive.
Red Dutch...	" 25	" ...	Large	Cluster. medium in length; a good currant.	Productive.
White Gondoin	" 25	" ...	" medium	Cluster, medium in length; sweet; good flavour.	Moderately productive.
La Hative.. ...	" 25	" ...	Medium	Cluster, long and fairly full; fine quality; not too acid.	Productive.
Knight's Early.	" 25	" ...	"	Cluster, medium in length; flavour good.	Moderately productive.

RED AND WHITE CURRANTS—*Concluded.*

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
New Red Dutch	June 25	Vigorous...	Above medium	Cluster, long and well filled; good flavour; a little acid.	Moderately productive.
Esperen's White	" 26	" ...	Large	Cluster, medium in length; currant sweet; good flavour	Fairly productive.
Large White...	" 26	" ...	"	Cluster, long and well filled; yellowish white; sweet and very good flavour.	Productive.
Ranker's Red ..	" 26	" ...	" medium	Cluster, medium in length; very fine flavour.	Fairly productive.
Chenonceau (red.)	" 26	" ...	"	Cluster, medium in length; very fine flavour.	Productive.
Ringens (red)..	" 26	" ..	Small.........	Cluster, short; good flavour.	Moderately productive.
White Cherry..	" 26	" ...	"	Cluster, short; sweet; good flavour.	Not very productive.
La Conde . . .	" 26	" ...	Medium	Cluster, long and well filled; very good quality.	Productive.
Red Langtraubige.	" 27	" ...	Large medium	Cluster, medium in length; fine flavour.	"
Beauty of St. Gilles.	" 27	" ...	"	Cluster, medium in length; rather acid, but of good flavour.	Moderately productive.
Red Dutch	" 27	" ...	"	Cluster, medium in length; rather acid, but of good flavour.	"
Eyatt's Novo (red.)	" 28	" ...	Medium......	Cluster, medium in length; flavour good, but rather acid	Fairly productive.
White Pearl....	" 28	Feeble......	Small....	Cluster, short; acid.	Not productive.
De la Rochepoze (red.)	" 29	Moderately vigorous.	"	A few inferior currants.	"
No. 51 (white)..	" 29	" ..	"	Cluster, short; acid.	Not very productive.
Large Red.....	" 29	Vigorous...	Medium.. ..	Cluster, medium in length; good flavour.	Fairly productive.
Large White Dessert.	July 1	" ...	Large........	Cluster, medium in length; acid, but fine flavour.	" "

BLACK CURRANTS.

Dominion......	July 1	Vigorous...	Above medium	Fine mild flavour............	Productive.
London	" 1	" ...	Large medium	Mild, sweet, good flavour	"
Success	" 1	" ...	Small medium	Sweet mild flavour...........	"
Eagle..........	" 1	" ...	Large medium	Flavour a little strong	Fairly productive.
Baldwin........	" 1	" ...	Large	Sweet mild flavour.	Productive.
Prince of Wales	" 1	" ...	"	A very fine currant; flavour sweet and mild............	Moderately productive.
Stewart	" 1	" ...	Above medium	Flavour good.........	Productive.
Ruler..........	" 1	" ...	Large	Mild sweet flavour.	"
Morton	" 1	" ...	"	Sweet mild flavour...........	"
Beauty	" 3	" ...	Small medium	Flavour fairly good..........	Fairly productive.
Ontario........	" 3	" ...	Small	Flavour strong	Moderately productive.
Wood..........	" 4	" ...	Above medium	Rather strong flavour........	" "
Louise.........	" 5	" ...	"	Flavour strong.............	" "
Bella	" 5	" ...	Small	Acid, but of good flavour	Productive.
Eclipse	" 5	" ...	Above medium	" "	Fairly productive.
Pearce.........	" 5	" ...	Small	Sweet mild flavour..........	" "
Black Naples...	" 5	" ...	Large	" "	Productive.
Ethel..........	" 7	" ...	Small	Acid and rather strong flavour	Moderately productive.
Monarch	" 7	" ...	Medium......	Acid, but mild and good flavour	" "
Kentville	" 8	" ...	Small	Strong flavour	Fairly productive.
Champion......	" 8	" ...	Small medium	Flavour rather strong........	" "

Black currant bushes which made vigorous growth but did not produce any fruit this year: Star, Tree Currant, Charmer, Lanark, Cranelle, Ogden's Black, Sterling, Henry, Climax, Oxford, Parker, Middlesex, Lee's Prolific, Manitoba Wild, Victoria Ambrafarbige, Kentish Hero, Gewonliche, Bang Up, Merveille de la Gironde, Lennox, Lewis.

RASPBERRIES.—RED AND YELLOW RASPBERRIES.

Name.	Date of Ripening.		Growth of Bush.	Size of Fruit	Quality.	Productiveness.
Carter's Prolific.....	June	10	Vigorous...	....		
Hornet	"	15	" ...	Large ...	Round, dark red, good flavour, but soft.	Productive.
Lord Beaconsfield...	"	15	" ...	....		
Crimson Beauty.....	"	20	Moderately vigorous.	Medium....	Round, bright red, not very good flavour.	"
Franconia	"	25	Vigorous . .	"	Round, dark red, fair flavour, soft.	"
Hansell	"	27	Moderately vigorous.	Small	Round, dark red, good flavour, rather soft	Very productive.
Col. Wilder.	"	27	" ..	Above medium.	Round, pale yellow, flavour good, sweet.	Productive.
Red Herrenhauser...	"	28	Vigorous ...	Medium....	Round, dark red, fairly good flavour, rather soft.	Fairly productive.
Spineless Yellow.....	"	28	" ...	"	Pale yellow, fair flavour, soft..	Productive.
Clarke.	"	28	" ...	Small to medium.	Light red, good flavour, but soft and crumbly.	"
Champlain..........	"	28	Moderately vigorous.	Above medium.	Round, yellow, sweet and of pleasant flavour, soft.	"
Heebner.	"	28	Vigorous ...	Large	Sweet, good flavour, moderately firm	Very productive.
Golden Queen.	"	28	" ...	"	Round, yellow, a very good berry, good flavour and firm.	Productive.
Turner.............	"	28	" ...	Small	Red, good flavour, but soft and crumbly.	Moderately productive.
Marlboro'..........	"	28	" ...	Large	Red, of good flavour and moderately firm.	"
Antwerp.....	"	28	" ...	Small	Round, dark red, fair flavour, soft.	Very productive.
London........... ..	"	30	" ..	Large	Round, red, very good flavour, firm; promises to be as good as the Cuthbert.	Productive.
Queen of the Market	July	1	" ...	Very large..	Dark red, sweet, firm..........	"
Queen Victoria......	"	1	" ...	Medium....	Soft, crumbly, insipid..........	Moderately productive.
Duke of Brabant....	"	1	" ...	"	Round, light red, sweet, good flavour, firm..	"
Cuthbert...........	"	1	" ...	Large .. .	A very good berry, red, sweet, and good flavour, firm, and continues in bearing a long time.	Productive.
Belle de Fontenay...	"	1	" ...	"	Long, conical, dark red, fairly firm.	Moderately productive.
Fastolf.............	"	1	" ...	"	Roundish conical, purplish red, of fine quality.	"
White Antwerp.....	"	1	" ...	Above medium.	Round, yellowish white, sweet, soft.	"
Paragon............	"	3	" ...	Large	Round, bright red, good flavour, firm.	Productive.
Muskingum.........	"	4	" ...	Above medium.	Round, dark red, good flavour, firm.	Moderately productive.
Thompson.	"	5	" ...	" .	Round, bright red, good flavour, moderately firm.	"
Cromwell....	"	8	" ...	Medium....	Juicy, sweet, firm............	Fairly productive.
Chili..	"	8	" ...	"	Round, light red, large drupes, crumbly, of poor flavour.	Not very productive.
Arnold's Hybrid....	"	8	" ...	"	Dark red, sweet and pleasant flavour, but soft.	Moderately productive.

The following raspberries are growing thriftily, but did not bear any fruit this year:—Large Yellow, New Fastolf, Beehive, Autumn Surprise, Yellow Antwerp, Barnet, Sarah, Malta, Shaffers Colossal, Carman, Oregon Late, Senator, Garnet, Craig, Garfield, Percy, Muriel, R. B. Whyte, Early Ohio, Miller, Billard's Perpetual, Lemercier, Conrath, American Yellow, Sugar of Metz, Knevett's Giant, Prince of Wales, Nonpariel, Brinckle's Orange, Phœnix, Elvira, Fanny, Royal, Mary, Saunder's Large Red, Lady Anne, Sharpe, Pauline, Herrenhaus, Red Perpetual, Battler's Giant, Sir John, Carleton, Empire, All Summer, Cariboo Wild and Columbia.

BLACK CAP.

Name.	Date of Ripening.	Growth.	Size of.	Quality.	Productiveness.
Lovett	July 4	Vigorous	Medium	Good quality, firm	Productive.
Older	" 4	"	Large	"	"
Palmer	" 5	"	Above medium	"	"
Kansas	" 6	"	Medium	"	"
Cromwell	" 8	"	"	"	"
Ada	" 9	"	Above medium	"	"
Gregg	" 10	"	Large	Very good quality	"
Progress	" 10	"	Medium large	Sweet and good quality, firm.	"
Jackson's May King.	" 10	"	Medium	Good quality, firm	"

The following varieties are thrifty, but did not fruit this year: Nemaha, Lotta, Mamm. Cluster, Smith's Prolific, and Hopkins.

STRAWBERRIES.

The first part of the strawberry season was favourable. The plants were strong and healthy, and the crop good, but after the second picking, we had long continued warm heavy rains, which spoiled at least half of the remaining crop, as the berries were too soft for shipping.

STRAWBERRIES—VARIETIES FRUITED.

Name.	Date of Ripening.	Growth of Plant.	Size of Berry.	Quality.	Productiveness.
Hautbois	June 1	Fairly vigorous.	Small medium	Sweet; fairly good flavour; soft.	Not productive.
Daisy	" 1	Vigorous	Large	Good flavour; firm; stem stout, but not strong.	
Smith's Seedling	" 2	"	Medium	Insipid and rather soft; stem strong.	Fairly productive.
Philip's Seedling	" 3	"	Large; irregular in shape.	Not very good quality; stem stout.	Productive.
Omega	" 3	"	Large	Good flavour; firm; stem long and fairly strong.	"
Chairs	" 3	"	" medium	Good flavour; firm, and continues long in bearing.	"
Van Deman	" 3	"	" "	Fine flavour and good shipper	"
Warfield	" 4	"	Above "	Very good flavour; firm; continues long in bearing.	"

STRAWBERRIES—VARIETIES FRUITED.

Name.	Date of Ripening.	Growth of Plants.	Size of Berry.	Quality.	Productiveness.
Beder Wood....	June 4	Moderately vigorous.	Large medium..	Good flavour..................	Productive.
Alexander II....	" 4	Fairly vigorous.	Medium........	Very good flavour............	Moderately productive.
Madame Joseph Deboise.	" 5	Vigorous ...	Large	Of good flavour, but not firm; stem slender.	Productive.
Iowa Beauty....	" 5	" ...	" medium ..	Good quality; firm.....	"
Maxwell ., ...	" 6	" ...	Medium..	Fairly good flavour; stem strong and fairly long.	"
Alpha..........	" 7	" ...	"	Good quality..................	"
Parker Earle....	" 7	" ...	Large	"	Largest crop of all our berries this year.
Beebe's Seedling, No. 3.	" 7	" ...	"	Good flavour and firm.........	Not very productive.
Beebe's Seedling, No. 2.	" 8	" ...	"	" "	" "
Sir Joseph Paxton.	" 8	" ...	Medium to large.	Fairly good flavour; stems long and rather slender.	Not productive.
Dr. Hogg.......	" 8	" ...	Rather small....	Sweet; pleasant flavour.. . ..	" "
Brandywine	" 8	" ...	Large	Good flavour; firm....	" "
Imp. Jucunda...	" 8	" ...	Above medium..	Bright red berry of good flavour; firm, and long, strong stem.	Productive.
Eleanor	" 8	" ...	Medium........	Sweet; stem weak...........	Fairly productive.
Arrow..........	" 8	" ...	Large medium..	Rather sweet; good flavour; firm	" "
Eclipse.........	" 8	" ...	Ir'gular in shape; medium.	Good flavour...........	Productive.
Weston.	" 9	" ...	Large & irregular in shape.	Acid, but of good flavour; stem short and strong.	"
Mary	" 9	" ...	Large	Good flavour; a little acid; stem medium in length and weak.	Not very productive.
Anna Kennedy..	" 9	" ...	Medium.......	Medium in flavour; firm.......	Fairly productive.
Beverly	" 9	" ...	Above medium..	Good quality; fairly firm.....	Productive.
Tennessee	" 9	Feeble.... .	Small	Inferior quality.	Not productive
Empress Eugenie	" 10	Moderately vigorous.	Large medium..	Good flavour..................	Fairly productive.
Bonny Lass. ..	" 10	Vigorous ...	Medium to large.	Good flavour, but irregular in shape.	Productive.
Lovett's Early ..	" 10	" ...	Small to medium	Fair flavour; stem long and strong.	Not productive.
Michigan.	" 10	" ...	Large	Good flavour..................	" "
	" 10	Feeble......	Small.....	Inferior berry................	" "
Tubbs	" 11	Fairly vigorous.	Large medium..	Fair flavour, but rather soft; stem short and medium strong.	Fairly productive
Bisel 1...... ...					
Windsor Chief...	" 12	Vigorous ...	Above " ..	Acid, but of good flavour; stem strong; stands up well.	" "
Yale.....	" 12	" ...	Medium.	Acid; not very good flavour; seedy	Not productive.
Pine Apple.....	" 12	" ...	" to large.	Mild and insipid in flavour; stem strong and long.	Productive.
H. W. Becher..	" 12	" ...	Large medium .	Fine flavour and firm....	Not productive.
Greenville	" 13	" ...	Above " ..	A firm, handsome bright red berry; of good flavour; long, strong stems.	Productive.
Timbrel	" 13	Not very vigorous.	Large " ..	Good flavour and firm.........	Not very productive.
Laxford Hall....	" 16	Feeble......	Small to medium	Poor flavour; many imperfect berries.	Not productive.

METEOROLOGICAL RECORD.

—	Date of Highest Temperature.	Degrees	Date of Lowest Temperature.	Degrees	Rain-fall.	Snow-fall.	Sun-shine.
1896.					Inches.	Inches.	H. M.
December	10th	53	16th	22	10·70	None.	19 18
1897.							
January	11th, 20th, 22nd and 31st	50	27th	18	5·74	4½	59 24
February	26th	61	17th	29	1·61	6	41 18
March	31st	57	11th	10	5·31	26	108
April	16th	85	3rd	32	3·12	None.	118 18
May	26th	93	23rd	28	4·42	"	225 18
June	27th	84	18th, 23rd	40	12·06	"	114 18
July	31st	85	31st	43	4·58	"	198 36
August	16th	97	22nd	40	1·13	"	283 18
September	24th	89	27th	32	6·50	"	140 48
October	6th	78	14th	30	6·23	"	128 30
November	1st	67	28th	10	4·55	9	36 54
					65·95	45½	1,474
Totals for 1896					63·47	75½	1,417 27

I have the honour to be, sir,
Your obedient servant,

THOS. A. SHARPE.

STATEMENT OF EXPENDITURE ON THE DOMINION EXPERIMENTAL FARMS, FOR THE YEAR ENDING 30th JUNE, 1897.

CENTRAL EXPERIMENTAL FARM—EXPENDITURE, 1896-97.

Live stock	$ 144 27
Feed for stock, including veterinary services	699 25
Seed grain, seeds, trees, &c.	1,273 25
Implements, tools, hardware and supplies	890 99
Drainage and drain tiles	88 06
Manure and fertilizers	477 57
Travelling expenses	1,340 92
Exhibition expenses	1,061 50
Blacksmithing, harness supplies and repairs	143 11
Bee supplies	177 62
Salaries	1,842 57
Wages, farm work, including experimental work with grain and other farm crops; also, salaries of farm foreman and Director's assistant in experimental work	5,836 31
Wages, care of stock	2,446 49
Chemical department	762 88
Botanical and entomological department	1,128 28
Horticultural department	4,300 43
Poultry department	1,558 19
Forestry department and care of grounds	1,791 15
Arboretum	849 65
Office help, correspondence branch and messenger service	2,948 86
Printing and stationery	648 41
Seed testing and care of greenhouses	876 02
Dairy department	741 99
Museum	26 94
Contingencies	375 42
" books and newspapers	212 86
" telegrams and telephones	152 40
	$ 33,095 39

EXPERIMENTAL FARM, NAPPAN, N.S.—EXPENDITURE, 1896-1897.

Live stock	$ 6 75
Feed for stock, including veterinary services	100 15
Seed grain, seeds, trees, &c.	154 53
Implements, tools, hardware and supplies	228 78
Draining and drain tiles	97 80
Manure and fertilizers	252 04
Travelling expenses	148 46
Exhibition expenses	163 98
Blacksmithing, harness supplies and repairs	62 42
Salaries, including proportion of salaries for general work, Ottawa	3,194 84
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	1,635 39
Wages, care of stock	700 20
Chemical department	445 02
Botanical and entomological department	411 25
Poultry department	3 55
Forestry department, including care of grounds	243 80
Office help	
Seed grain distribution	276 74
Contingencies (including postage, $32.04)	49 22
" printing and stationery	25 43
" books and newspapers	3 50
" telegrams	
	$ 8,203 85

EXPERIMENTAL FARM, BRANDON, MANITOBA—EXPENDITURE, 1896-97.

Live stock	$ 347 35
Feed for stock, including veterinary services	57 95
Seed grain, seeds, trees, &c	219 21
Implements, tools, hardware and supplies	366 04
Draining	8 00
Travelling expenses	121 10
Exhibition expenses	218 80
Blacksmithing, harness supplies and repairs	251 40
Salaries, including proportion of salaries for general work, Ottawa	2,474 84
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	3,476 99
Wages, care of stock	636 50
Chemical department	445 02
Botanical and entomological department	411 25
Forestry department, including care of grounds	281 50
Poultry department	55 40
Office help (including delivery of mail, $111)	392 69
Seed grain distribution	750 38
Tree distribution	211 03
Contingencies, (including postage, $33.06)	195 13
" printing and stationery	101 28
" books and newspapers	21 85
" telegrams and telephones	40 12
	$ 11,083 83

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.—EXPENDITURE, 1896-97.

Live stock	$ 14 25
Feed for stock, including veterinary services	30 10
Seed grain, seeds, trees, &c	242 20
Implements, tools, hardware and supplies	626 54
Manure and fertilizers	
Travelling expenses	13 90
Exhibition expenses	34 00
Blacksmithing, harness supplies and repairs	214 65
Salaries, including proportion of salaries for general work, Ottawa	2,474 84
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	2,953 88
Wages, care of stock	1,178 62
Chemical department	445 02
Botanical and entomological department	411 25
Poultry department	79 37
Forestry department, including care of grounds	378 00
Office help	493 80
Seed grain distribution	493 20
Tree distribution	262 16
Contingencies, (including postage, $88.28)	182 95
" printing and stationery	47 06
" books and newspapers	4 00
" telegrams	3 83
	$ 10,583 62

EXPERIMENTAL FARM, AGASSIZ, B.C.—EXPENDITURE, 1896-97.

Live stock		
Feed for stock, including veterinary services	$	117 18
Seed grain, seeds, trees, &c		212 84
Implements, tools, hardware and supplies		260 69
Draining and drain tiles		
Manure and fertilizers		61 13
Travelling expenses		44 40
Exhibition expenses		90 90
Blacksmithing, harness supplies and repairs		87 64
Salaries, including proportion of salaries for general work, Ottawa		2,474 84
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c		2,257 10
Wages, care of stock		443 25
Chemical department		445 02
Botanical and entomological department		411 25
Poultry department		16 40
Forestry department		52 50
Office help		100 00
Seed grain distribution		129 78
Tree distribution		7 69
Clearing land		805 30
Contingencies (including postage, $58.14)		106 76
" printing and stationery		23 59
" books and newspapers		23 50
" telegrams		2 95
	$	8,174 71

SUMMARY.

Central Experimental Farm		$ 33,095 39
Nappan "		8,203 85
Brandon "		11,083 83
Indian Head "		10,583 62
Agassiz "		8,174 71
Seed grain distribution		3,532 15
Forest tree and tree seed distribution		109 54
Printing bulletins and distribution of bulletins and reports	$ 4,216 91	
Less special sum in estimates for this item	4,000 00	
		216 91
		$ 75,000 00
Special vote to replace chemical apparatus and supplies destroyed by fire in the laboratory		$ 1,000 00

SUMMARY OF STOCK, MACHINERY, IMPLEMENTS, &c., ON HAND 31ST DECEMBER, 1897.

CENTRAL EXPERIMENTAL FARM, OTTAWA.

15 Horses	$ 1,065 00
3 Ayrshire cattle	130 00
3 Guernsey "	550 00
4 Jersey "	200 00
7 Canadian "	200 00
14 Grade "	323 00
3 Yorkshire swine	60 00
3 Berkshire "	70 00
3 Tamworth "	60 00
5 Poland China swine	78 00
2 Chester white "	40 00
14 Grade swine	80 00
Farm machinery	1,849 00
Farm implements	644 50
Vehicles, including farm wagons and sleighs	810 00
Hand tools, hardware and sundries	1,033 00
Harness	314 55
Dairy department, machinery, &c.	832 00
Horticultural department, implements, tools, &c.	281 90
Forestry " "	419 70
Botanical " "	7 00
Poultry " 241 fowls	261 00
" " implements, furnishings, &c.	83 50
Bees and apiarian supplies	259 30
Chemical department, apparatus and chemicals	2,133 95
Books in several departments	333 58
Greenhouse plants, supplies, &c.	1,138 50
Office furniture and stationery	1,301 00
Furniture at Director's house	1,270 00
	$ 15,828 48

EXPERIMENTAL FARM, NAPPAN, N.S.

6 Horses	$ 400 00
3 Guernsey cattle	605 00
2 Holstein "	100 00
2 Ayrshire "	320 00
27 Grade "	1,073 00
2 Yorkshire swine	35 00
3 Berkshire "	21 00
2 Tamworth "	28 00
8 Grade "	30 00
46 Fowls	31 00
Vehicles, including farms wagons and sleighs	365 00
Farm machinery	475 00
" implements	198 00
Hand tools, hardware and sundries	296 75
Harness	126 10
Furniture for office, reception room, and bedroom for visiting officials	274 78
	$ 4,377 63

EXPERIMENTAL FARM, BRANDON, MANITOBA.

10 Horses	$ 750 00
3 Ayrshire cattle	175 00
2 Durham "	150 00
5 Holstein "	250 00
10 Grade "	215 00
1 Chester White swine	15 00
3 Tamworth "	48 00
2 Berkshire "	38 00
60 Fowls	55 50
Bees and apiarian supplies	70 20
Vehicles, including farm wagons and sleighs	500 00
Farm machinery	996 00
" implements	565 00
Hand tools, hardware and sundries	623 09
Harness	215 50
Furniture for reception room and bedroom for visiting officials	154 55
" supplies and books for office	192 40
	$ 5,013 24

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

14 Horses	$ 1,665 00
1 Ayrshire	75 00
8 Durham cattle	585 00
1 Polled Angus	75 00
15 Holstein cattle	760 00
16 Grade cattle	440 00
15 Yorkshire swine	163 00
4 Berkshire "	61 00
17 Tamworth "	130 00
4 Grade "	43 00
115 Fowls	115 00
Bees and apiarian supplies	36 50
Vehicles, including farm wagons and sleighs	510 00
Farm machinery	1,314 00
" implements	682 50
Hand tools, hardware and sundries	448 40
Harness	210 75
Furniture for reception room and bedroom for visiting officials	251 50
" supplies and books for office	203 15
	$ 7,768 80

EXPERIMENTAL FARM, AGASSIZ, B.C.

6 Horses	$ 800 00
5 Durham cattle	390 00
6 Ayrshire "	300 00
6 Holstein "	450 00
2 Grade "	40 00
6 Dorset horned sheep	60 00
2 Berkshire swine	50 00
2 Tamworth "	50 00
53 Fowls	46 00
Bees and apiarian supplies	35 95
Vehicles, including farm wagons	250 00
Farm machinery	600 00
" implements	205 50
Hand tools, hardware and sundries	207 00
Harness	100 50
Furniture for reception room and bedroom for visiting officials	251 00
" supplies and books for office	100 00
	$ 3,935 95

W. H. HAY,
Accountant.

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