DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

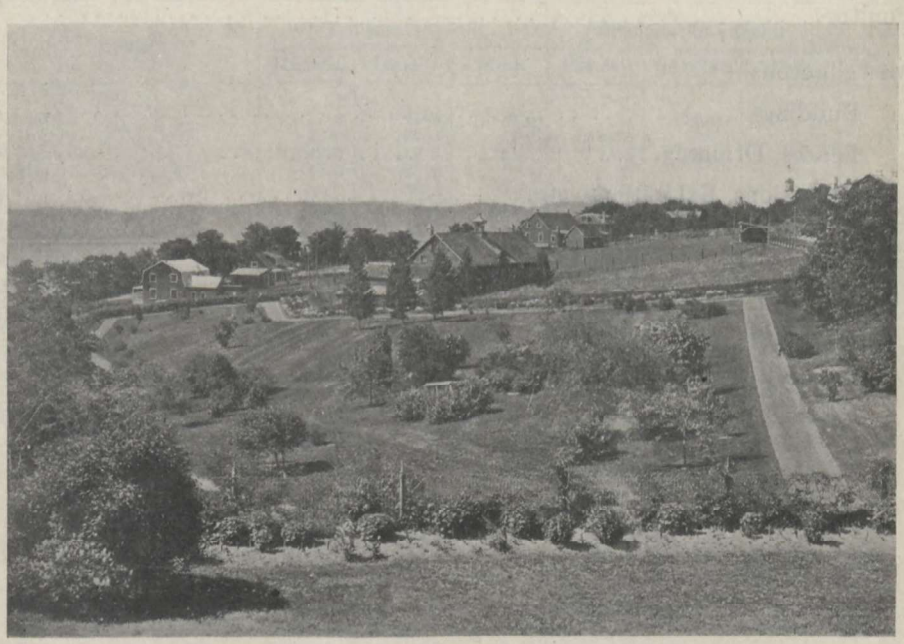
EXPERIMENTAL STATION

CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT

G. A. LANGELIER, D.Sc.A.

FOR THE YEAR 1922



Ornamental Grounds with Sheep Barn and Men's Houses in the Background.

Printed by authority of the Hon. W. R. Motherwell, Minister of Agriculture,
Ottawa.

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OTTAWA
F. A. ACLAND
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1923

EXPERIMENTAL STATION, CAP ROUGE, QUE.

REPORT OF THE SUPERINTENDENT, G. A. LANGELIER

THE SEASON

In previous reports, the season during which plants grow in central Quebec was considered as comprising six months, but, after carefully looking into the matter, it has been decided that from the beginning of May to the end of September would be more correct Certain years a little can be done during the latter part of April, but this should hardly be taken into consideration; it is also true that mangels and swedes do make some growth during October, but this does not amount to much, if one takes into consideration the fact that all grain and other forage crops except roots have then been harvested for some time. The following figures give details about the weather during 1922:—

METEOROLOGICAL RECORDS, 1922

Month	Temperature—°F.			Precipitation—Inches			Total Sunshine hours
	Highest	Lowest	Mean	Rainfall	Snowfall	Total	
January	37·0	−17·9	9·5	.....	22·00	2·20	86·5
February	42·0	−22·8	12·3	0·25	18·00	2·05	89·1
March	49·0	− 9·0	25·43	1·15	5·00	1·65	181·5
April	67·0	23·2	40·0	3·36	1·10	3·47	133·3
May	80·0	30·2	55·32	1·78	.....	1·78	252·0
June	88·0	42·2	63·48	8·97	.....	8·97	143·3
July	85·0	44·2	66·53	1·71	.....	1·71	272·9
August	87·0	43·2	64·07	2·39	.....	2·39	233·4
September	87·0	26·2	57·94	1·14	.....	1·14	200·3
October	74·0	19·2	44·64	3·11	1·00	3·21	89·6
November	51·0	12·2	31·72	0·63	12·50	1·88	80·8
December	47·0	−21·0	13·64	0·40	28·00	3·20	42·7
Total	.....	.....	.....	24·89	87·60	33·65	1,805·4

Temperature	° F.	Date
Highest	88·0	June 8
Lowest	−22·8	February 17
Greatest range	49·0	February 12
Highest monthly mean	66·53	July
Lowest monthly mean	9·5	January
Mean for five growing months—May to September, inclusive	61·47	
Mean for year	15·83	
Precipitation	**Inches**	**Date**
Heaviest in one day	2·20	June 18
Heaviest in one month	8·97	June
Lowest in one month	1·14	September
Totals in five growing months—May to September, inclusive	15·99	
Total in year	33·65	
Number of days with at least 0·1 inch of precipitation in five growing months	52	
Number of days with at least 0·1 inch of precipitation in year	120	
Sunshine	**Hours**	**Date**
Most in one day	14·3	July 6
Most in one month	272·9	July
Least in one month	42·7	December
Total for five growing months—May to September, inclusive	1,101·9	
Total for year	1,805·4	
Number of clear days in five growing months	23	
Number of clear days in year	44	
Number of partly cloudy days in five growing months	116	
Number of partly cloudy days in year	238	
Number of cloudy days in five growing months	14	
Number of cloudy days in year	83	

THE CROPS

The right kind of temperature, the proper amount of precipitation, the desired length of sunshine, no doubt have very much influence on crops, and as they sometimes vary a great deal even within comparatively narrow limits of territory, it must be understood that the notes which follow apply to the Cap Rouge Experimental Station and not to central Quebec as a whole.

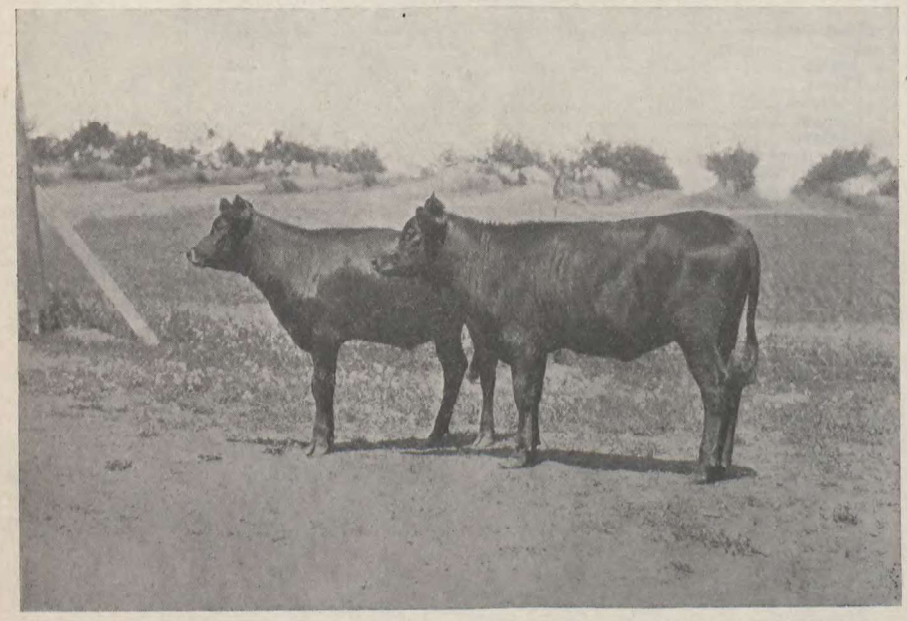
HOW THE CROPS WERE AT CAP ROUGE IN 1922

Kind of Crop	Very Good	Good	Medium	Bad
Forage Crops—				
Timothy hay		*		
Clover hay	*			
Pastures			*	
Corn for silage		*		
Sunflower for silage		*		
Peas and oats for silage		*		
Swede turnips			*	
Grain Crops—				
Oats	*			
Wheat		*		
Barley		*		
Field peas		*		
Field beans		*		
Flax		*		
Horticultural Crops—				
Fruits—				
Apples		*		
Plums			*	
Cherries			*	
Grapes		*		
Currants		*		
Gooseberries		*		
Raspberries			*	
Strawberries			*	
Vegetables—				
Asparagus		*		
Garden beans		*		
Garden beets		*		
Cabbage			*	
Cauliflower				*
Celery			*	
Sweet corn	*			
Carrots		*		
Cucumbers		*		
Musk—melons		*		
Onions				*
Parsnip		*		
Garden peas		*		
Potatoes			*	
Pumpkins		*		
Rhubarb		*		
Squash			*	
Tomatoes		*		
Turnips			*	
Water-melons			*	
Ornamental plants—				
Annuals			*	
Perennials			*	
Bulbs		*		
Bushes and trees		*		

ANIMAL HUSBANDRY

DAIRY CATTLE

At the end of 1922, the herd of French Canadians, all pure-bred numbered sixty-seven head, an increase of eight on the preceding year. There were five bulls, twenty-nine cows, fourteen heifers and nineteen calves of both sexes under a year. The herd at Cap Rouge deserves more than passing mention, as the three bulls which have daughters milking, and all the females which have passed through at least two periods of lactation, are qualified for Record of Performance. Three of the worlds champions for the breed, in the second, third, and fourth year old classes are here, and the two-year-old heifers qualify so easily that a request was made to the F. C. C. Breeders' Association to raise the quan-



Two French Canadian Heifers

tities of milk and fat required at least as high as that for Guernseys. In fact, this standard could be placed even higher than that for Jerseys, as far as the Cap Rouge herd is concerned. The above is not written in a boasting spirit. It is believed, however, that farmers should know where they can get bulls to help out in the improvement of their herds. To those who have been using other breeds to advantage, the foregoing must not be interpreted as suggesting change, but for Quebec, at least, the French-Canadian cow assuredly has her place, and farmers who have not yet made a choice, especially in the butter manufacturing districts or wherever milk is paid for according to percentage of fat—should carefully investigate the possibilities of this breed.

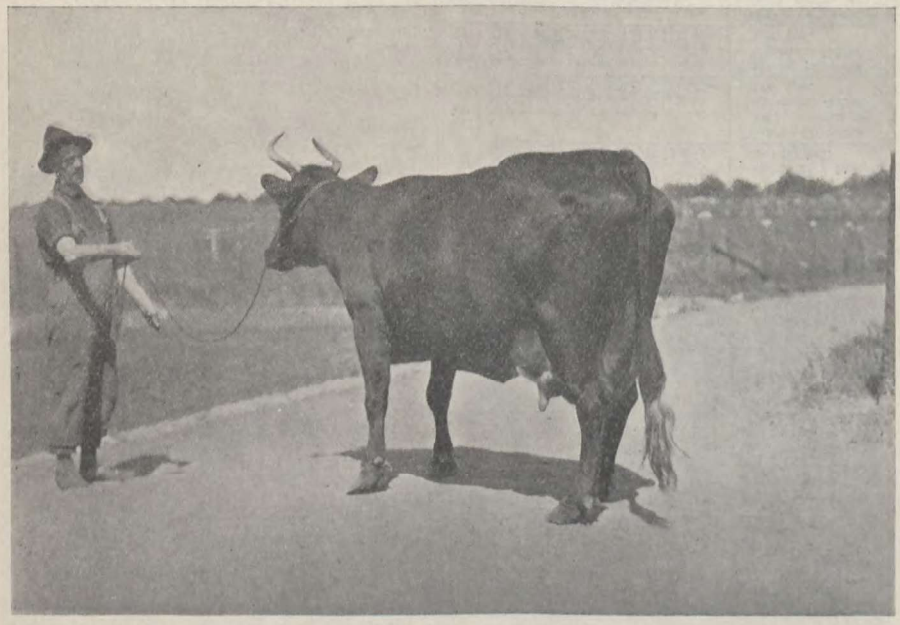
The following table gives details about the fourteen cows and heifers which finished a period of lactation during 1922:—

DETAILS ABOUT COWS WHICH FINISHED A LACTATION PERIOD DURING THE YEAR ENDING DECEMBER 31, 1922

Name of Cow	Registration No.	Age at beginning of lactation period.	Date of dropping calf.	Number of days in lactation period.	Total pounds of milk for lactation period.	Daily average yield of milk.	Average per cent fat in milk.	Pounds of butter produced during lactation period.	Value of butter at 40 cts. per pound.	Value of skim-milk at 25 cts. per 100 pounds	Total value of products.	Pounds of meal eaten at 2 cts. per pound.	Pounds of roots and ensilage eaten at $4.00 per ton.	Pounds of hay eaten at $15.00 per ton.	Pounds of green feed eaten at $8.00 per ton.	Days on pasture at $2.00 per month.	Total cost of feed between calving.	Feed cost to produce 1 pound of butter-skim-milk neglected	Feed cost to produce 100 pound of milk.	Profit over feed on one pound of butter-skim-milk neglected	Profit on cow between calving, labour, manure, and calf neglected.
									$ cts.	$ cts.	$ cts.						$ cts.				$ cts.
Bruna-Reine	3228	7	April 10, 1921	312	7,151·75	22·92	4·2	354·33	141 73	17 13	158 86	2,579	4,755	2,493	1,145	143	92 72	1·296	0·262	0·138	66 14
Brunette de Cap Rouge	4171	4	May 2, 1921	379	8,458·75	22·32	4·5	443·19	177 28	20 21	197 49	3,243	7,976	3,237	1,275	143	118 41	1·400	0·267	0·133	79 08
Canoberte	5289	2	July 22, 1921	365	4,871·75	13·35	4·9	278·00	111 20	11 59	122 79	2,773	8,889	3,153	624	113	106 26	2·181	0·382	0·018	16 53
Colombelle	1775	11	Feb. 1, 1921	363	9,613·00	26·48	4·2	477·80	191 12	23 02	214 14	3,396	6,100	2,946	1,155	143	115 17	1·200	0·241	0·159	98 97
Eglantine de Cap Rouge	4159	4	Mar. 19, 1921	357	7,367·25	20·63	5·3	462·75	185 10	17 43	202 53	2,817	5,903	2,909	1,055	143	102 63	1,393	0,222	0·178	99 90
Fanchette F	1685	12	Aug. 9, 1921	386	9,459·25	24·51	4·3	478·69	191 48	22 63	214 11	4,123	7,245	3,483	810	210	139 50	1·475	0·291	0·109	74 61
Fortune de Cap Rouge	4161	4	April 22, 1921	282	5,690·25	20·18	4·4	293·53	117 41	13 60	131 01	1,929	3,740	1,754	1,025	143	71 78	1·261	0·245	0·155	59 23
Ginette de Cap Rouge	4801	2	Jan. 25, 1921	365	6,315·75	17·30	4·7	346·08	138 43	15 05	153 48	3,021	7,020	2,547	1,275	143	106 88	1·692	0·309	0·091	46 60
Gougou de Cap Rouge	4724	3	Sept. 16, 1921	365	6,031·25	16·52	4·2	300·04	120 02	14 44	134 46	2,604	9,748	3,192	225	150	106 19	1·761	0·354	0·046	28 27
Héloise de Cap Rouge	5297	2	Sept. 3, 1921	333	5,695·25	17·10	5·1	342·38	136 95	13 51	150 46	3,102	9,555	3,199	.....	79	110 39	1·938	0·322	0·078	40 07
Hénédine de Cap Rouge	5280	2	June 5, 1921	386	5,763·25	14·93	4·3	292·06	116 82	13 79	130 61	3,199	8,435	3,286	1,145	150	118 92	2·063	0·401	−0·001	11 69
Hyacinthe de Cap Rouge	5295	2	Dec. 19, 1921	372	6,481·75	17·42	4·7	358·01	143 20	15 44	158 64	3,731	10,520	3,836	.....	135	133 43	2·058	0·373	0·027	25 21
Pauline 3	2482	9	April 28, 1921	335	8,557·25	25·54	4·6	462·05	184 82	20 41	205 23	2,933	6,445	2,868	1,145	143	105 99	1·238	0·229	0·171	99 24
Sylvestre D	2859	8	July 6, 1921	295	5,347·75	18·13	4·2	262·44	104 98	12 81	117 79	1,398	5,355	3,315	850	143	75 58	1·413	0·288	0·112	42 21
Average for 14 head	.....	5	.....	350	6,914·59	19·76	4·5	367·95	147 18	16 50	163 68	2,917	7,263	3,016	838	141·5	107 41	1·553	0·292	0·108	56 27

IMPROVEMENT OF A DAIRY HERD WITH A SIRE OF KNOWN PRODUCTIVE ANCESTRY

This is a subject which would take more than the space allotted to this report, to treat in an exhaustive manner. There seems very little doubt left now that a dairy herd can be improved with sires of known productive ancestry, though all such sires do not, by any means, have the same power of transmitting what they have inherited. For the ordinary dairy farmer, the important point is that his herd is much more likely to be benefited by the use of such a bull than would be a herd such as that of Cap Rouge, for the reason that the use of a prepotent bull, of high-producing ancestry, upon cows below or near the average of milk production, naturally results in an immediate and marked increase of production in the progeny. As the process is continued, however, from generation to generation, further improvement in production becomes less and less marked; in other words, the nearer we approach the ideal, or the maximum, of production, the more difficult each step becomes.



French Canadian Cow—Giving 53 pounds of 4.5 Milk a day when Photo was taken.

A word of warning should here be given, however, to those who believe that once a highly bred dairy bull is brought into the herd, everything is done. This is not so. No heifer or cow can be a high and economical producer if she is not well fed, housed, and managed. The great dairy sire cannot overcome such drawbacks as a poorly balanced ration—timothy hay and corn, for instance—badly ventilated buildings, calving at an extremely early age, etc. A good dairy bull is indispensable for full success, but it is quite easy to fail, even in using one, by not attending to other essential matters. In this case, as in mostly everything, the well-balanced man using well-balanced methods is sure to be the winner over the one-sided man using one-sided methods.

METHODS OF BREEDING DAIRY CATTLE

It is useless to go here into the different methods of breeding live stock, such as in-breeding, line-breeding, out-crossing. In general, the man—and there are mighty few—who leaves after him the reputation of having been a con-

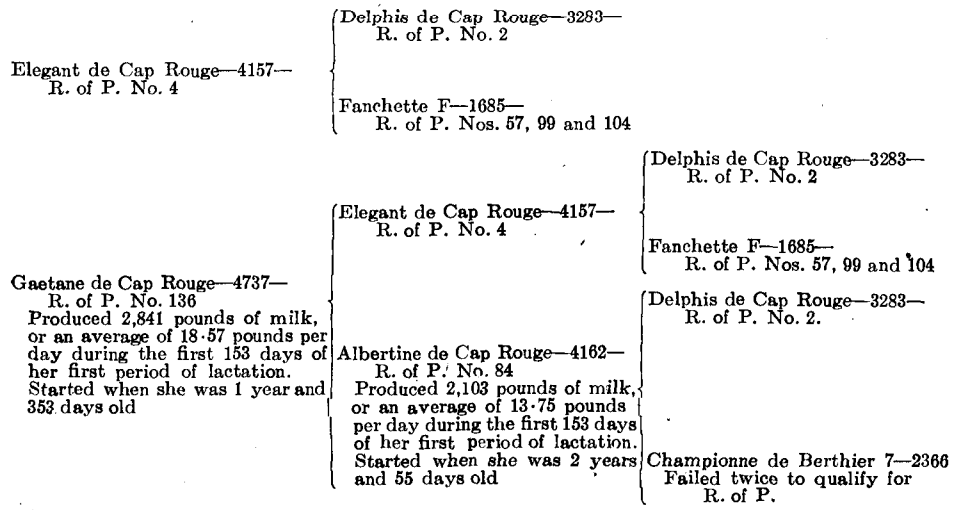
structive breeder, uses some kind of in- or line-breeding, whilst the mass is content with the mediocre results obtained by out-crossing. And this is perhaps what will continue to happen until doomsday. To do constructive work in breeding live stock requires ability, time, money, three things which are very seldom at the disposition of the same individual. But it nevertheless shows that one method—rather close breeding—is superior to the other when it can be employed. That this method cannot often be employed, owing to many circumstances, does not necessarily show that the method itself is not the good one.

The French-Canadian herd of cattle at Cap Rouge is now, without fear of successful contradiction from anybody, the best in existence as far as milk and fat production are concerned. It is a noteworthy exception when a two-year-old heifer does not qualify for Record of Performance and, during the last three years, the world's record for the age and breed was broken twice by animals bred at Cap Rouge. The bulls used to produce these heifers have been bred at the Station and have qualified for Record of Performance, each one having four or more daughters, of different dams, qualified. And most of these heifers have been produced by in- or line-breeding. For instance, Gougou de Cap Rouge—4724—, a world two-year-old champion, was by Victor de Cap Rouge—3818—out of Finette 2—218—, and Victor was out of Finette. The following pedigree shows gradual improvement by line-breeding:—

IMPROVEMENT BY LINE BREEDING

Indienne de Cap Rouge—5584

Produced 3,221 pounds of milk, or an average of 21·05 pounds per day during the first 153 days of her first period of lactation. Started when she was 2 years and 40 days old.



That this in- and line-breeding, after seven or eight years, has not lowered the vitality of the stock, is shown by the average greater weights of the calves, by the increased production of the heifers at about the same age and by the absence of diseases, especialy tuberculosis, as the herd is now fully accredited. It is admitted that other factors have helped in these good results, but it is sincerely believed that the methods of breeding used in the herd have certainly not lowered its stamina.

RAISING DAIRY CATTLE IN SINGLE-BOARDED OPEN FRONT SHEDS

It has been conclusively proven at Cap Rouge that heifers over six months of age at the beginning of November, or anything dropped before May 1 will do well during the winter in an open-front single-boarded shed. This method

would not do, of course, for a half-starved heifer which flies have tormented all summer in a shadeless lot, but it is entirely satisfactory for a strong, normally developed animal. At Cap Rouge, all such heifers are kept in the above-mentioned manner, with pasture from June to October, until a short while before calving, and all bulls are outside all the year round. Milch cows, of course, are stabled.

There is a tendency, during the last few years, to build large and expensive farm buildings. If such barns are the pride of their owners, if they make farmers feel that their position in this world is as good as that of anybody, if the young men are attracted to the farm on account of such surroundings, then let the big barns be built. But for those whose care about large buildings just in so far as they are profitable, it is well to remember that only working horses and milch cows actually require them.

HORSES

There were, at the end of 1922, ninety-one horses, eighty-eight of which pure-bred French Canadians, on the two Farms, Cap Rouge and St. Joachim. At the latter place, 25 miles out of Quebec city, is the largest horse farm in Canada, east of Manitoba, as nearly five hundred arpents of land are devoted solely to the purpose of investigational work with this kind of live stock.

French Canadian Horses at St. Joachim

Experimental horse breeding, feeding, housing and management is a vast undertaking, as there are so many lines of work to be investigated. The problems of breeding—close, in line, or outcrossing—must be studied; the questions of feeds—roughages, concentrates, pasture—should be looked into, not only for the quantities to be given to different classes of animals, idle, work, or breeding, but also for the shape in which they should be fed, raw or cooked, dry or soaked, cut or long, whole or ground; different kinds of housing should be studied, such

as the stable by itself, part of the cattle barn partitioned off, cheap shelters for young horses and animals at rest; diverse systems of management should have some attention, as, for instance, work or no work for stallions and brood mares, ways of preventing common diseases of foals, of raising young stuff, of breeding mares in the autumn.

Some of this work has already been started at many of the Experimental Farms, all through Canada, and very useful data indeed have been collected and published. But it has always been evident that, though good investigational work was done, there was not a sufficient number of animals at any one place to permit of going thoroughly into the matter. This is one of the factors originating the idea of starting somewhere a large horse-breeding farm where at least thirty brood mares could be kept and where, if necessary, as many as one hundred animals, young and old, would be available for experimental purposes.

French-Canadian horses had been bred in a small way at Cap Rouge during the last eight years and this foundation stock has produced over 60 per cent of the prize-winners at Three Rivers and Quebec from 1920 to 1923. Twice as many first prizes and diplomas were won by the St. Joachim French-Canadian horses during that time as by the horses of all other exhibitors combined. Prize money is not taken, the ribbons only being annexed. By so doing, the private breeder loses nothing through competition with Government-owned stock and the excellence of the breed are displayed to the benefit of all concerned.

FIELD HUSBANDRY

FIELD CROPS AREAS AND YIELDS

Every load of corn, swedes, oats, and hay has been weighed for the past eleven years at the Cap Rouge Farm and these figures should be of value to those who wish to know something about the relative yields of the most important crops of central Quebec, on a sandy loam of better than average fertility and in good tilth. The following table gives details:

FIELD CROP AREAS AND YIELDS—ELEVEN YEARS

Year	Longfellow Corn			Good Luck Swedes			Banner Oats			Timothy Hay			Clover Hay		
	Area	Total yield of green corn	Yield per acre	Area	Total yield of roots	Yield per acre	Area	Total yield of grain	Yield per acre	Area	Total yield of cured hay	Yield per acre	Area	Total yield of cured hay	Yield per acre
	Acres	Pounds	Pounds	Acres	Pounds	Pounds	Acres	Pounds	Pounds	Acres	Pounds	Pounds	Acres	Pounds	Pounds
1912.....	4·88	122,925	25,189	3·00	88,920	29,640	34·36	42,808	1,246	51·00	129,000	2,529	7·00	28,000	4,000
1913.....	7·31	40,185	5,497	3·00	33,790	11,263	25·46	22,632	889	21·75	65,250	3,000	27·15	108,600	4,000
1914.....	9·92	144,082	14,524	7·67	301,354	39,290	10·89	28,955	2,659	37·13	153,904	4,145	4·00	19,805	4,951
1915.....	17·35	349,652	20,153	10·80	309,643	28,671	14·68	31,560	2,150	12·03	34,717	2,886	19·37	55,019	2,840
1916.....	17·84	307,980	17,264	5·00	182,725	36,545	15·00	36,300	2,420	14·20	41,505	2,923	15·00	46,275	3,085
1917.....	9·38	171,047	18,235	4·00	67,130	16,782	21·19	29,179	1,377	14·07	65,425	4,650	22·22	119,698	5,387
1918.....	8·60	81,290	9,452	4·00	60,755	15,189	10·23	17,335	1,695	17·65	96,015	5,440	20·01	133,716	6,682
1919.....	18·99	397,444	20,929	4·00	45,640	11,410	20·79	24,437	1,175	16·00	72,480	4,530	14·36	61,116	4,256
1920.....	14·13	203,348	14,391	4·00	111,334	27,833	21·48	32,313	1,504	17·00	71,963	4,233	20·00	83,828	4,191
1921.....	21·07	437,698	20,774	4·00	89,185	22,296	23·00	35,530	1,545	19·39	61,869	3,191	17·14	37,072	2,163
1922.....	21·56	386,220	17,913	1·76	35,820	20,352	29·00	58,222	2,008	4·00	26,480	6,620	22·37	99,658	4,455
Total.....	151·03	2,641,871	.....	51·23	1,326,296	.....	226·08	359,271	.....	224·22	818,608	.....	188·62	792,787	.....
Average...	13·73	240,170	17,492	4·66	120,572	25,874	20·55	32,661	1,589	20·38	74,419	3,652	17·97	72,072	4,011

Though the above figures are interesting, they do not tell the whole story as they only refer to the raw material and not to the digestible nutrients per acre. This is why the table which follows may throw more light on the subject.

DRY MATTER AND DIGESTIBLE NUTRIENTS IN FIVE IMPORTANT CROPS

Crop	Yield of raw material per acre	Dry Matter per acre	Digestible nutrients per acre
	Lbs.	Lbs.	Lbs.
Corn for silage	17,492	3,831	2,571
Swede turnips	25,874	2,820	2,432
Oats (grain only)	1,589	1,424	990
Timothy hay	3,652	3,170	1,698
Clover Bay	4,011	3,397	1,873

NOTE.—Dry Matter and Digestible Nutrients calculated from figures obtained in Feeds and Feeding by Henry.

It is seen that the hoed crops, such as corn and roots, produce more dry matter and more digestible nutrients per acre, but the cost of these digestible nutrients per acre is one of the questions which will no doubt receive the attention of a great number of careful experimentalists in the very near future. The reader is referred to project 35 for further details on this important matter.

COST OF PRODUCTION OF FIELD CROPS

Manual and horse labour, also cost of seed and twine were accurately recorded, during eight seasons, for 170.86 acres of corn, swede turnips, oats, timothy and clover hay, all ready to feed, that is, the corn cut into the silo, the swedes sliced, the oats threshed, the hay cured. In the following table, such fixed charges as rent of land, manure and use of machinery have been added, so as to arrive at the cost per acre of growing and preparing for live stock the above-mentioned crops:

YIELD PER ACRE AND COST PER TON, READY TO FEED, OF RAW MATERIAL, DRY MATTER AND DIGESTIBLE NUTRIENTS IN FOUR IMPORTANT CROPS.

	Average number of pounds per acre			Average cost per ton	
	Eleven years			Eight years	
	Raw Material	Dry Matter	Digestible Nutrients	Raw Material	Dry Matter
				$ cts.	$ cts.
Corn for silage (Longfellow)	17,492	3,831	2,571	5 64	25 75
Swede turnips (Good Luck)	25,874	2,820	2,432	3 85	35 32
Oats (Banner), straw neglected	1,589	1,424	990	25 53	26 26
Clover and timothy hay	3,831	3,283	1,785	6 28	7 33

From the above table, it is clear that hay produced dry matter and digestible nutrients at a much lower cost than the other crops. Warren in "Farm Management" writes as follows: "In Minnesota, it was found that $1 expended for labour and other costs of production of a hay crop have a product with a feeding value of $2.21. For the same cost, fodder corn gave $1.38, silage $0.98, and mangels $0.79. The last two failed to pay the cost of production." It should not be inferred from the above that corn and roots must be left aside, but it certainly shows the importance of devoting more attention to agricultural economics.

Feeding experiments have shown that the dry matter in grain is equal to the dry matter in roots and that the dry matter in roots is equal to the dry matter in corn silage. Experiments have also shown that the dry matter in corn silage has about 11 per cent greater feeding value than the dry matter in hay.

RATES OF SEEDING OATS

Banner was used on a well-tilled, sandy loam of good fertility. This explanation is necessary, as a change of variety or of soil may make a big difference. The experiment was commenced in 1913 and, as it was discontinued after 1920, it is thought advisable to give particulars about it in the following table:—

Year	1 bushel per acre		1¼ bushel per acre		1½ bushel per acre		1¾ bushel per acre		2 bushels per acre		2¼ bushels per acre		2½ bushels per acre	
	Yield per acre		Yield per acre		Yield per acre		Yield per care		Yield per acre		Yield per acre		Yield per acre	
	Total	Seed deducted	Total	Seed deducted	Total	Seed deducted	Total	Seed deducted	Total	Seed deducted	Total	Seed deducted	Total	Seed deducted
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
1913	2,070	2,036	2,025	1,982	2,145	2,094	2,512	2,453	1,972	1,904	1,927	1,851	2,227	2,142
1914	1,260	1,226	1,110	1,067	1,270	1,219	1,065	1,005	1,290	1,222	1,560	1,483	1,980	1,895
1915	1,710	1,676	1,830	1,787	1,860	1,809	2,400	2,340	2,220	2,152	2,550	2,473	2,550	2,465
1916	1,830	1,796	2,100	2,058	2,250	2,199	2,310	2,251	2,220	2,152	2,130	2,054	1,740	1,655
1917	1,845	1,811	1,890	1,848	1,590	1,539	1,515	1,456	1,500	1,432	1,695	1,619	1,500	1,415
Average for 5 years	1,743	1,709	1,791	1,749	1,823	1,772	1,960	1,901	1,840	1,772	1,972	1,896	1,999	1,914
1918							2,340	2,281					2,850	2,765
1919													1,710	1,625
1920													2,130	2,045
Average for 8 years													2,086	2,001

Year	2¾ bushels per acre		3 bushels per acre		3¼ bushels per acre		3½ bushels per acre		3¾ bushels per acre		4 bushels per acre		All rates of seeding	
	Yield per acre		Yield per acre		Yield per acre		Yield per acre		Yield per acre		Yield per acre		Yield per acre	
	Total	Seed deducted	Total	Seed deducted	Total	Seed dedcuted	Total	Seed deducted	Total	Seed deducted	Total	Seed deducted	Total	Seed deducted
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
1913	1,972	1,879	2,182	2,080	2,437	2,327	1,830	1,711	2,287	2,160	2,340	2,204	2,148	2,063
1914	1,860	1,766	1,830	1,728	1,770	1,659	1,920	1,801	2,130	2,002	1,800	1,664	1,603	1,518
1915	2,340	2,246	2,640	2,538	2,520	2,409	2,340	2,221	2,880	2,752	1,950	1,814	2,292	2,207
1916	2,040	1,947	1,620	1,518	1,860	1,750	1,960	1,841	2,250	2,123	1,860	1,724	2,013	1,928
1917	1,980	1,887	1,740	1,638	1,920	1,810	1,260	1,141	1,740	1,613	2,055	1,919	1,710	1,625
Average for 5 years	2,038	1,945	2,002	1,900	2,101	1,991	1,862	1,743	2,257	2,130	2,001	1,865	1,953	1,868
1918	2,280	2,187	2,550	2,448	2,250	2,140			2,490	2,363				
1919	1,410	1,317	1,230	1,128	1,770	1,660			1,290	1,163				
1920	1,920	1,827	1,710	1,608	2,340	2,230			1,830	1,704				
Average for 8 years	1,975	1,882	1,938	1,836	2,108	1,998			2,112	1,985				

It will be noted that, after five years, only six out of the thirteen different rates of seeding were kept, and that, after eight years, the rate of 2½ bushels per acre is at the top. This rate is the one which is generally recommended and which is usually sown. But as mentioned above, one should remember that a difference in soil or in variety of oats, might affect the result, so that it should be remembered that the rate of 2½ bushels per acre applies to Banner oats sown on a well-tilled sandy loam of good fertility.

YIELD OF CLOVER HAY AFTER DIFFERENT KINDS OF NURSE CROPS

To find out with which of the ordinary grains the best catch of clover and timothy would be had, it was decided in 1912 to use the ordinary mixture of eight pounds of timothy, twelve pounds red clover and two pounds alsike on each of the trial plots of barley, oats, peas, and wheat. Since 1913 inclusive, the hay from all these plots, 440 in number and 1/60 acre each, was carefully weighed, and details can be found in the following table:—

YIELD OF CLOVER HAY AFTER DIFFERENT KINDS OF NURSE CROPS

Year when the grain was sown	Year when the hay was weighed	Barley		Wheat		Oats		Peas	
		Number of plots 1-60 acre each	Yield of clover hay per acre	Number of plots 1-60 acre each	Yield of clover hay per acre	Number of plots 1-60 acre each	Yield of clover hay per acre	Number of plots 1-60 acre each	Yield of clover hay per acre
			Lbs.		Lbs.		Lbs.		Lbs.
1912	1913	13	4,687	14	4,386	12	3,642	10	4,944
1913	1914	12	2,184	15	1,927	10	1,488	6	2,646
1914	1915	9	3,276	12	3,318	18	2,822	13	3,246
1915	1916	10	6,432	16	6,186	12	6,330	10	4,752
1916	1917	16	6,274	18	6,291	16	5,854	10	4,058
1917	1918	16	9,250	18	9,002	14	9,467	10	5,210
1918	1919	18	5,651	22	5,550	14	5,070	10	2,430
1919	1920	18	5,260	20	5,193	20	5,277	8	5,475
Average		14	5,377	17	5,232	14	4,994	10	4,095

The average of eight years shows that the crop of clover hay was at the rate of 2 tons 1,377 pounds after barley, 2 tons 1,232 pounds after wheat, 2 tons 994 pounds after oats, 2 tons 95 pounds after peas.

Barley and wheat have had, for a long while, the reputation of being better nurse crops than oats, and the experiment confirms this opinion, shared by many of the best farmers. Of course it is a question of farm management and agricultural economics which must be solved, as must most questions relating to agriculture, by each person. If oats are required on the farm and give a better yield than barley or wheat, it is probably better to sacrifice hay, whilst if the contrary is true, a man would be foolish to sow oats as he would thus be losing at both ends of the game.

Summary.—To sum up, it can be said that:

1st—Barley and wheat are better nurse crops than oats for timothy, red clover, and alsike;

2nd—Every person must decide for himself what nurse crop to use, according to the relative yielding power of barley, wheat and oats on his own farm.

COMPARISON OF THIN AND THICK SEEDING OF TIMOTHY, RED CLOVER AND ALSIKE

Does it pay to sow as much timothy and clover seed as generally recommended? To throw some light on this question, it was decided in 1912 to use on a certain number of plots, with Banner oats as a nurse crop, the quantities supposed to be necessary, and on the other plots, just half of those quantities. Altogether, 186 plots of 1/60 acre each were given for this experiment during nine

consecutive years, and as the land seemed quite uniform, results should have some weight. The following table gives details:—

COMPARISON OF THIN AND THICK SEEDING OF TIMOTHY, RED CLOVER AND ALSIKE

Year	Nurse Crop	Thin Seeding					Thick Seeding				
		Number of 1-60 acre plots	Pounds of Seed per acre				Number of 1-60 acre plots	Pounds of Seed per acre			
			Timothy	Red Clover	Alsike	Pounds of clover hay per acre		Timothy	Red Clover	Alsike	Pounds of clover hay per acre
1913	Banner oats	11	4	6	1	2,989	11	8	12	2	3,393
1914	"	13	4	6	1	1,237	13	8	12	2	1,174
1915	"	13	4	6	1	1,809	13	8	12	2	2,469
1916	"	13	4	6	1	4,573	13	8	12	2	4,952
1917	"	13	4	6	1	6,360	13	8	12	2	6,148
1918	"	13	4	6	1	7,118	13	8	12	2	7,551
1919	"	6	4	6	1	6,020	6	8	12	2	5,770
1920	"	5	4	6	1	4,488	5	8	12	2	5,880
1921	"	6	4	6	1	2,270	6	8	12	2	2,350
	Average	10	4	6	1	4,096	10	8	12	2	4,410

From the above table it is seen that the thick seeding only gave 314 pounds, or not quite 8 per cent more clover hay than the thin seeding. From 1912 to 1920 inclusive, the years during which the seed was bought, the average prices per pound were 13·4 cents for timothy, 32·9 for red clover, and 30·7 for alsike. This shows that it cost $2.81 more for the extra seed used in the thick seeding. To this expense of $2.81 for more seed must be added the manual and horse labour necessary to produce the extra 314 pounds of clover hay.

But one should take into consideration the fact that there might have been more timothy hay and then more pasture during the years following. Incidentally this shows the advantage of a crop such as hay, which does not cost much per acre and is available for more than one year.

Another point in favour of the thick seeding is the fact that the land used for the experiment was always in very good tilth, so that the smaller quantity of seed had the advantage of favourable conditions for germination and growth, while if the land had been cloddy and in bad physical shape, the reverse would have been true.

Summary.—To sum up, it can be said that:

1st—On well tilled and manured soil, it is not as necessary to sow large quantities of grass and clover seed as on badly worked or poor land;

2nd—With normal prices of timothy and clover seed, and under poor conditions of tilth and fertility, the cost of an extra quantity of seed is probably a low premium to pay for the assurance of a better crop of hay.

AUTUMN VERSUS SPRING PLOUGHING FOR ENSILAGE CORN

Generally speaking, it is supposed to be better to plough late in the spring for corn. The principal reason advanced is that, especially when a sod is turned under, the decaying vegetation warms the soil and offers to the rootlets of the young plant, food which is easily available. Admitting that the above contention is correct, there is a drawback to spring ploughing, in central Quebec, or for that matter in any region where the length of time during which farming operations must be done is comparatively short. This is the reason which led to the comparison of autumn versus spring ploughing for ensilage corn.

As the experiment has been conducted for five consecutive seasons, the following table will no doubt be quite interesting:—

COMPARISON OF AUTUMN AND SPRING PLOUGHING FOR ENSILAGE CORN

Year	Autumn Ploughing								Spring Ploughing							
	Area	Total yield	Yield per acre	Hours of Labour per acre					Area	Total yield	Yield per acre	Hours of Labour per acre				
				Man	1 horse	2 horses	3 horses	Tractor				Man	1 horse	2 horses	3 horses	Tractor
	Acres	Pounds	Pounds						Acres	Pounds	Pounds					
1917	4·67	86,957	18,620	77·5	0·75	21·5	3·5	.....	4·71	84,090	17,854	93·5	0·75	10·5	3·5	.....
1918	3·80	38,670	10,176	72·0	0·75	18·0	3·0	.....	4·80	42,620	8,879	91·0	0·75	8·5	3·0	.....
1919	4·21	69,647	16,543	81·5	.....	29·5	3·5	.....	4·21	51,110	12,140	104·5	.....	17·0	3·5	.....
1920	4·20	52,833	12,579	83·5	.....	32·5	2·5	15·0	3·90	70,300	18,026	107·0	.....	23·5	2·5	15·0
1921	4·68	112,765	24,095	79·0	.....	27·5	3·0	9·5	4·68	108,255	23,131	94·5	.....	16·5	3·0	9·5
Average	4·31	72,174	16,746	78·7	0·30	25·8	3·1	4·9	4·46	71,275	15,981	98·1	0·30	15·2	3·1	4·9

From the above figures it is seen that, for an average of five years, the yield per acre was 765 pounds more on the areas which had been ploughed the previous autumn. Calculating manual labour at 25 cents and horse labour at 10 cents per hour, the spring ploughing cost $2.73. There were 10·6 more hours labour of a team of horses, which is equal to 21·2 horse hours, put on the autumn ploughed fields, which came up to $2.12. But the much greater number of weeds on the spring ploughed fields required a lot of hand hoeing, which is mostly responsible for the extra 19·4 hours of manual labour put on per acre, and costing $4.85. Of course, on a very clean farm, this would not have happened, and the $2.73 spent for extra horse labour on the autumn ploughed pieces would have represented 765 more pounds of corn, or at the rate of $7.13 per ton. Putting on corn a value of one-third that of hay, the latter would have had to sell for less than $21.39 per ton to make autumn ploughing a losing proposition.

Summary.—To sum up the experiment to date, it may be said that: (1) fall ploughing, for conditions such as existed at Cap Rouge from 1917 to 1921 inclusive, is at least as good as spring ploughing for the production of ensilage corn; (2) for districts where the season during which farming operations must be done is short, it is better, in general, to plough in the fall for the production of ensilage corn.

HORTICULTURE

Some Eighty Varieties of Apple Trees are on Test at Cap Rouge

VARIETY TESTS OF APPLES

There are generally about 800 apple trees of 80 to 100 varieties, in the orchards, and notes are herewith given regarding ten of the best ones:—

NOTES ABOUT TEN APPLES SUITABLE FOR CENTRAL QUEBEC

Variety	Season	Source	Number of trees in test	Number of years after plantation when first tree fruited	Average number of years after plantation before fruiting	Total production in ten years Gallons	
						Best tree	Average per tree
Rupert	Early summer	C.E.F seedling	2	5	5.	24·0	23·12
Yellow Transparent	Summer	Commercial	5	3	3·04	50·0	45·55
Lowland Raspberry	Summer	"	7	6	8·09	5·75	1·68
Duchess	Early autumn	"	8	3	4·06	41·0	35·53
Okabena	Autumn	"	2	3	4.	77·25	61·75
Petrel	Autumn	C.E.F. Seedling	1	4	4.	29·75	29·75
Wealthy	Early winter	Commercial	7	5	5·03	31·0	25·07
Fameuse	Winter	"	6	5	7·05	19·0	8·92
Milwaukee	"	"	8	3	5·06	31·25	19·31
Walton	"	C.E.F. cross-bred	2	3	4·	50·75	45·25

No mention is made in the above table of McIntosh Red because it was planted a couple of years after the others and could not very well be compared with them.

A good combination and proportion, under ordinary conditions, would be 5 per cent Yellow Transparent, 10 per cent Duchess, 35 per cent Wealthy, 50 per cent McIntosh. For a special market, Lowland Raspberry might take the place of Yellow Transparent, because it is such a better looking apple, and for home use, Petrel, with its superlative quality, could be included, also Walton, which is very late and lengthens the season. But for commercial purposes, it is better to stick, for the present at least, to the four above-mentioned which are well known and for which there is a demand.

VARIETY TEST OF CHERRIES

It is doubtful whether sweet cherries can profitably be grown in Central Quebec, so that only the sour varieties were tested. It is not always possible to find quality, size of fruit, and heavy yield in the same variety, so that a person intending to grow cherries, which should only be done on a small scale in this district, must chose the varieties which combine in the best manner the requisites of his particular market. The following table is offered as a guide:—

VARIETY TEST OF CHERRIES

Variety	Year planted	Number of trees planted	Number of trees living 1922	Average yield per tree	Yield of best producing tree	Date fruit ready to pick 1922	Size of fruit	Quality of fruit
				quarts	quarts			
Cerise de France	1916	3	3	2·54	3·25	July 26	Medium	Good
Cerise d'Ostheim	1916	2	2	6·50	10·00	" 22	Medium	Medium
Fouche Morello	1916	4	4	9·87	12·00	" 25	Small to medium	Medium
Griotte d'Ostheim	1916	2	1	1·00	1·00	" 29	Large	Good
Griotte Morello	1916	3	3	1·25	2·75	No fruit	Large	Good
Heryformige Weichsel	1916	1	1	5·00	5·00	July 25	Medium	Medium
Minnesota Ostheim	1916	2	2	3·50	4·00	" 21	Medium	Medium
Montmorency Large	1916	6	6	2·37	6·00	" 22	Large	Good
Montmorency Ordinaire	1916	1	1	2·00	2·00	" 21	Medium	Good
Susse Fruche Weichsel	1916	1	1	0·75	0·75	" 15	Medium	Good
Vladimir	1916	2	2	7·06	9·00	" 27	Medium	Very good

Fouche Morell is the largest cropper, but the fruit is rather small and of medium quality. Vladimir is the sweetest, while Montmorency Large and Cerise d'Ostheim combine many good points.

Summary.—1. Sweet Cherries cannot profitably be grown in Central Quebec. 2. Montmorency Large, for a general market, and Vladimir, for a discriminating clientèle, may be recommended.

Variety Test of Pears

Since 1913, when twenty-five pear trees were planted, none of them has produced marketable fruit, and only five are now living; ten dwarfs were tried in 1920 and they were all dead in the spring of 1923. The varieties which were completely killed are Bessemianka and Duchesse d'Angoulême amongst the standard sorts, and Doucet and Duchess amongst the dwarfs. One Clapp Favorite is living out of eight planted, three Flemish Beauty out of eleven, and one Seckel out of two. Another small plantation of dwarfs was made in 1922 and, if the trees die, no more will be put in.

Summary.—1. Results show that pears are very hard to grow in Central Quebec. 2. For those who wish to try it, it is advisable to use one of the three following varieties: Clapp Favorite, Flemish Beauty, Seckel.

Variety Test of Plums

Since 1911, over thirty varieties of plums have been tested. It was thought, at first, that the Americans would be better than the Europeans, but the reverse happened, the wood of the former breaking too easily. The following list gives details about six of the best:—

Variety Test of Plums

Variety	Origin	Colour of fruit	Year planted	Number of trees planted	Number of trees living 1922	Average yield per tree	Yield of best producing tree	Date full bloom, 1922	Date fruit ready to pick 1922	Remarks
						Gallons	Gallons			
Bonne Ste-Anne	Eur.	Blue	1911	2	2	19·12	21·50	May 26	Sept. 6..	One of the best eating plums.
Gueii.....	"	"	1911	2	2	4·62	5·75	" 28	" 6..	A good eating plum.
Montmorency..	"	Yellow	1911	12	8	13·03	20·75	" 27	" 11..	One of the best for canning.
Quackenboss...	"	Blue	1911	2	2	26·50	28·50	" 29	" 21..	The hardiest of all.
Raynes.....	"	"	1911	2	2	12·37	13·00	" 27	" 21..	Fruit spits when maturing.
Shipper Pride..	"	"	1911	2	1	13·50	13·50	" 28	No fruit..	One of the best eating plums.

Amongst the above, Montmorency sells best on the Quebec market because it is known as very good for preserving.

Summary.—1. European varieties have done better than American at Cap Rouge. 2. Montmorency and Bonne Sainte-Anne are the two best which have been tried to date.

Variety and Strain Test of Black Currants

Black currants are mostly used for jelly and the demand for them is not keeping pace with that for other small fruits. A very good wine is made with them throughout central Quebec; it is despised or laughed at by people who know that it is manufactured with black currants, but these same people would probably praise it highly if they were told that they are drinking Malaga and, the extensive cultivation of black currants is not to be encouraged, though everybody should have a few bushes for home consumption. The usual yield per bush is from 2 to 4 pounds, the average for 60 bushes, for ten years, at Cap Rouge being 4.33 pounds. The weight of a measured bushel is about 40 pounds. For those who may wish to grow this fruit commercially, it can be said that they are considered a paying crop at six cents per pound, but anything much below this figure would be apt to make a losing enterprise. Of course, when there is lots of cheap labour, or labour, such as that of children, which is not taken into account, it is a different proposition.

The following table gives details about all varieties which were tested, the same seasons, during ten years:—

VARIETY AND STRAIN TEST OF BLACK CURRANTS

Variety	Source	Size of Fruit	Year planted	Number of bushes	Average yield per bush.	Yield of Fruit per acre—Pounds										
						1912	1913	1914	1915	1916	1917	1918	1919	1920	1922	Average Ten years
					Pounds											
Climax	C.E.F Seedling	Medium to large	1911	6	5·57	786	1,301	11,011	17,424	11,918	8,409	7,683	5,989	8,530	15,185	8,824
Eagle	"	" "	1911	6	4·92	287	1,119	7,078	7,744	11,313	9,922	6,381	8,409	14,459	10,285	7,800
Saunders	"	Large	1911	6	4·90	272	605	7,018	10,164	10,406	9,801	7,623	9,559	13,794	8,409	7,765
Topsy	" hybrid	"	1911	6	4·72	181	454	6,292	11,676	6,050	8,530	8,167	11,918	14,762	6,685	7,471
Lee Prolific	Commercial	Medium to large	1911	6	4·16	181	871	7,865	8,046	9,801	6,776	7,078	7,986	8,288	8,954	6,584
Buddenborg	"	Large	1911	6	3·99	181	575	7,320	7,925	10,406	7,260	6,534	11,495	7,502	3,932	6,313
Eclipse	C.E.F. Seedling	Medium to large	1911	6	3·97	327	272	7,562	8,651	5,082	6,352	7,804	7,139	10,829	8,893	6,291
Ontario	"	" "	1911	6	3·84	121	1,149	8,107	6,594	5,142	7,441	8,591	6,171	12,221	5,263	6,080
Boskoop Giant	Commercial	Large	1911	6	3·75	620	1,542	8,349	9,801	7,018	4,416	5,082	11,495	8,107	2,995	5,942
Victoria	"	" "	1911	6	3·52	128	748	8,258	6,957	6,231	5,808	6,231	9,075	9,680	2,632	5,575
Average					4·33	308	864	7,886	9,498	8,337	7,471	7,217	8,924	10,817	7,323	6,864

The following varieties have been discontinued, because they did not yield enough or had nothing special to recommend them: Black Champion, Clipper, Kerry, Magnus, Success.

Summary.—1. The demand for black currants is generally small and nobody should grow them extensively unless assured of a long time contract at about 6 cents per pound or, which is practically the same, $7\frac{1}{2}$ cents per quart. 2. Of the sixteen varieties tested at Cap Rouge during ten years, Climax leads in yield per acre.

VARIETY TEST OF RED CURRANTS

Before making a plantation of red currants, one should be sure of getting a market, as they are not in great demand. If it is intended to go in heavily for them, a long time contract at a stated price ought to be made with a well known firm. Cumberland, Greenfield, Red Grape, Victoria were dropped because poor croppers, and the same thing will soon be done with Pomona and Rankins Red. Cherry is at the very bottom of the list, but the fruit is so large that it might do for an ultra-fancy market. Red Cross was planted one year after the varieties in the following list and is not included, but it is one of the best:—

Variety Test of Red Currants—1912-1922

Variety	Source	Size of Fruit	Year planted	Number of bushes	Average yield per bush.	Yield of Fruit per acre—Pounds										
						1912	1913	1914	1915	1916	1917	1918	1919	1920	1922	Average Ten years
					Pounds											
Fay Prolific	Commercial	Large	1911	6	7·62	91	938	7,744	11,253	12,947	14,943	11,374	14,883	16,553	19,892	11,062
Perfection	"	"	1911	6	6·53	23	590	5,082	9,438	9,982	12,281	13,612	11,374	15,246	17,242	9,487
Wilder	"	Medium to large	1911	6	6·52	91	847	5,324	7,199	11,253	13,007	12,765	4,779	20,207	19,178	9,465
Red Dutch	"	Medium	1911	6	6·34	127	514	5,203	9,317	8,107	11,737	9,256	11,676	19,299	16,819	9,205
Rankin's Red	"	Small	1911	6	5·19	30	181	2,480	5,868	7,381	11,979	7,986	9,135	19,420	10,950	7,541
Pomona	"	Medium to large	1911	6	4·92	30	182	4,114	4,501	5,80[illegible]	6,897	6,473	8,409	16,032	18,936	7,138
Cherry	"	Large	1911	6	2·19	295	862	5,263	5,687	7,56[illegible]	5,626	907	605	1,633	3,448	3,189

Summary.—1. The market generally calls for large fruit so that varieties combining this quality with high yield should be planted. 2. Fay Prolific has been the best at Cap Rouge, followed by Red Cross and Perfection.

VARIETY AND STRAIN TEST OF GOOSEBERRIES

Gooseberries, it must be admitted, are less appreciated than any other fruit, because, in America, they have been sold sour instead of well ripened when their flavour is scarcely surpassed by any other fruit. Another important requisite, to make them popular, is size, also appearance, and the demand would no doubt be greater if only varieties were sold having large, highly-coloured fruit. In England, the consumption of gooseberries as a dessert delicacy is much larger than in the New World and it should increase in America. Educating the public is a costly proposition but if nurserymen, colleges of agriculture and experimental stations would agree to offer for sale, or recommend, only varieties or strains with fruit such as above mentioned, the situation would no doubt soon be improved.

Gooseberries are divided into two large main types: European and American. In general, the first is larger, better looking, but more sour, whilst the latter is smaller, in fact much too small, but of finer quality. The English varieties have not been a success in America until a few years ago, when better methods of fightng mildew came into vogue.

Twelve varieties were planted in 1911 and in 1912. Josselyn, Mabel and Saunders were taken out because they were low yielders and had no special quality not possessed by others which were higher producers. The following table gives details about the nine varieties left to be tested out:—

VARIETY TEST OF GOOSEBERRIES

Variety	Source	Resistance to disease	Thorns on bush	Size of fruit	Colour of fruit	Yield per Acre in pounds										Average for Nine years		
						1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	Per bus.	Per acre	
																Pounds	Pounds	Quarts
Houghton	Commercial	Strong	Many	Small	Red	145	6,534	14,338	22,445	30,794	28,132	36,360	31,641	No notes taken.	34,485	15·68	22,764	15,176
Queen Anne	"	"	Not many	Medium	Yellow	3,067	8,288	14,520	17,787	19,420	20,570	28,435	24,381		34,727	13·10	19,022	12,680
Red Jacket	"	"	Many	Large	Red	2,117	10,285	11,616	22,082	19,662	17,000	26,922	32,004		25,591	12·80	18,586	12,392
Silvia	C.E.F Seedling	"	Not many	Large	Red	2,686	14,520	17,206	16,456	23,776	16,698	16,758	27,648		20,691	11·97	17,382	11,588
Downing	Commercial	"	Not many	Medium	Green	3,010	11,979	13,673	22,748	19,057	21,780	20,993	19,481		17,303	11·48	16,669	11,112
Industry	"	"	Many	Large	Red	1,754	13,794	14,036	17,363	17,666	15,609	23,595	25,652		17,303	11·23	16,308	10,872
Gibb	C.E.F. Seedling	"	Not many	Large	Red	1,089	10,599	13,576	12,644	20,630	16,093	25,712	21,477		22,869	11·07	16,077	10,718
Pearl	Commercial	"	"	Medium	Green	166	7,326	13,098	20,358	18,119	18,512	18,996	18,815		23,322	10·61	15,412	10,274
Rideau	C.E.F Seedling	Medium	"	Medium	Green	871	7,986	10,309	12,765	17,545	11,253	22,385	20,207		17,000	9·21	13,369	8,912

Of the above, only one, Industry, is a European variety, the others being all American. Houghton is one of the oldest but is too small and is hard to pick on account of thorns. Queen Anne is firm for shipping and remains long on the bush, but these qualities are overbalanced by the unattractive colour—yellowish—of the fruit which is not large enough. Red Jacket is a heavy yielder, has good colour—red—but the fruit is not as large as that of Silvia which, everything taken into consideration, has more to recommend it than any of the others tried. Downing, sometimes called the "great American gooseberry," is supposed to be a seedling of Houghton, but is too small, though commercial jam makers like it. Pearl resembles Downing so much, whilst Gibb and Rideau are such poor yielders that they will be soon discontinued.

Summary.—1. No variety should be grown which has not large, well-coloured fruit growing on bushes fairly free from disease and with few thorns. 2. Silvia, of all those tried at Cap Rouge, possesses most of the requisites to make gooseberries popular.

VARIETY TEST OF RASPBERRIES

Thirteen varieties have been tested since 1912 inclusive and only half a dozen are worthy of further consideration. Heebner, Loudon and Sarah were discontinued because they were low yielders, whilst Cuthbert, Golden Queen, Marlborough and St. Regis will soon be dropped for the same reason. Columbian is of the hybrid type, or purple-cane family, and has a dark fruit which detracts somewhat from its appearance for most markets; it is very productive but is not recommended as a commercial proposition. Cuthbert is so well known that it was given a place in the new plantation of 1918, but it has been such a consistently poor cropper, that it must now be relegated to the "have-beens". Golden Queen, on account of its yellowish colour, may be liked by certain persons, but this is its only merit. St. Regis, a so-called "ever-bearer," has not much to recommend it and though it may be popular in some home gardens, will never be so commercially.

The following table gives details about varieties tested for nine years:—

VARIETY TEST OF RASPBERRIES—1914-1922

Variety	Yield per Acre—Pounds									
	1914	1915	1916	1917	1918	1919	1920	1921	1922	Average
Columbian	4,335	1,493	4,726	3,912	2,501	1,452	3,075	2,571	3,227	3,032
Brighton	1,769	1,473	3,554	1,941	3,441	1,089	3,554	3,504	3,378	2,634
King	1,720	2,046	3,582	3,176	2,269	592	1,437	1,613	1,487	1,991
Eaton	2,096	1,595	3,239	2,672	2,193	538	1,952	2,145	1,265	1,958
Herbert	1,592	2,518	4,147	3,069	1,676	353	681	2,042	1,059	1,904
Marlboro	1,380	2,282	2,779	2,155	1,562	435	655	1,790	1,160	1,589
Cuthbert	1,815	792	2,458	2,458	1,685	242	731	706	857	1,305

In 1918 it was decided to make a new plantation, as anthracnose was playing havoc with some which could not thus be fairly compared with the others. The following figures show that the same varieties are in practically the same positions:—

VARIETY TEST OF RASPBERRIES—1919-1922

Variety	Year planted	Yield per acre—Pounds				
		1919	1920	1921	1922	Average
Brighton	1918	1,089	3,554	3,504	3,378	2,881
Columbian	1918	1,452	3,075	2,571	3,227	2,581
Newman Seedling No. 23	1918	1,605	3,227	2,269	2,310	2,353
Eaton	1918	538	1,952	2,145	1,265	1,475
King	1918	592	1,437	1,613	1,487	1,282
Herbert	1918	353	681	2,042	1,059	1,034
Marlboro	1918	435	655	1,790	1,160	1,010
Cuthbert	1918	242	731	706	857	634
St. Regis	1918	185	504	832	403	481
Golden Queen	1918	242	76	681	555	388

Summary.—1. In making a plantation of raspberries, great care should be taken to get disease-free canes. 2—Herbert for main crop and King for early use have been recommended, but Brighton has been such a consistently high yielder that it may now be added to the list of varieties to be planted in central Quebec.

VARIETY AND STRAIN TESTS OF STRAWBERRIES

The strawberry is easily the most important small fruit in central Quebec. This is why a lot of attention was given to it at Cap Rouge, where forty-one varieties and strains have been carefully tested since 1914. There are now figures for eight years and the following table is certainly very interesting:—

Variety or Strain	Perfect or Imperfect	Source	Season	Shipping qualities	Size	Colour	Eating qualities	Resistance to diseases	Plant producing qualities	Notes for 1922				1915-1922 Yield per acre
										First bloom	First ripe fruit	First picking	Yield per acre	
													Pounds	Pounds
Cassandra	Imperfect	C.E.F	Midseason to late	Medium	Medium to large	Deep red	Sub-acid	Good	Strong	May 22	June 22	June 27	9,007	7,865
Valeria	Perfect	"	Midseason	"	Medium	Deep rose	"	"	"	" 25	" 19	" 24	4,310	7,378
Greenville	Imperfect	Com	"	"	Medium to large	Deep red	"	Medium	"	" 25	" 21	" 24	8,897	7,370
Bisel	"	"	"	"	" "	"	"	"	"	" 23	" 21	" 24	9,275	7,346
Dunlap	Perfect	"	Early to mid-season	"	" "	"	"	"	"	" 20	" 17	" 21	5,880	7,119
Sample	Imperfect	"	Midseason to late	"	Large	Red	"	Good	"	" 27	" 24	" 28	7,062	7,095
Portia	"	C.E.F	Late	Firm	Medium to large	Deep rose	"	"	"	" 27	" 24	" 28	5,218	6,868
Bederwood	Perfect	Com	Early to mid-season	Medium	Medium	Rose	"	Medium	"	" 20	" 19	" 21	8,038	6,822
Nettie	Imperfect	"	Late	"	Large	Deep rose	"	"	Medium	" 27	" 26	" 30	6,483	4,684
Cordelia	Perfect	C.E.F	Midseason to late	"	Medium to large	Deep red	"	"	Strong	" 24	" 22	" 28	6,869	6,661
Glen Mary	"	Com	" "	"	Large	"	"	Good	"	" 26	" 24	" 28	5,502	6,655
New Globe	"	"	" "	Soft	" "	Red	"	Medium	"	" 27	" 26	" 28	4,597	6,630
Mariana	"	C.E.F	Midseason	Medium	Medium to large	Deep red	"	"	"	" 26	" 24	" 28	5,622	6,290
3-W-S	"	Com	Early to mid-season	"	" "	"	"	"	Medium	" 23	" 19	" 21	7,074	6,086
Warfield	"	"	" " "	"	" "	"	"	"	Strong	" 22	" 19	" 21	6,634	5,669
Pocomoke	"	"	Midseason	Firm	" "	"	"	"	"	" 25	" 23	" 28	5,034	5,635
Uncle Jim	"	"	Midseason to late	Medium	Large	Deep rose	Sweet	Good	Medium	" 27	" 26	" 28	4,221	5,559
Williams	"	"	" "	Firm	"	Red	Sub-acid	Medium	Strong	" 27	" 24	" 28	7,211	5,006
Excelsior	"	"	Early midseason	"	Medium to small	Deep red	Acid	"	"	" 18	" 15	" 19	3,820	4,911
Wm. Belt	"	"	Midseason to late	Medium	Large	Deep rose	Sweet	"	Medium	" 26	" 26	" 28	3,244	4,427

Leaving aside the imperfect varieties which are often the cause of poor results, it is seen that the highest yielder is Valeria. But the fruit is too small and not coloured enough for a commercial berry, so that Dunlap stands at the head of the list amongst those which may safely be recommended. Where markets pay well for very early fruit, Excelsior is the best to use as it is the one which averages earliest of all those tried.

Summary.—1—Imperfect varieties of strawberries must have perfect ones near them to obtain fruit; those having small or poorly coloured fruit, should not be grown commercially. 2—Of all those tried at Cap Rouge, Dunlap is the best, whilst Excelsior may be grown, in a moderate way, by persons having a high-priced market for very early berries.

VARIETY TEST OF GRAPES

It is not expected that varieties of grapes will be found which can be grown in central Quebec, for market, but there are certainly a few that will do well in any home garden. Brighton, Lindley, Merrimac, McTavish, Pattison, Peabody, Starr Early, Wilkins, Worden were pulled out because they were too late. Campbell Early, Coleraine, Early Ohio, Early Victor, Florence X, Potter, Hartford, Jamesville, Telegraph, whilst still in the test, are a little late and are not recommended. The following list gives details about the varieties which fruited in 1922, but Brant, Canada and Champion are of poor quality, while Moyer has clusters which are small and not filled:—

VARIETY TEST OF GRAPES

Variety	Year planted	Number of vines planted	Total Yield for five years	Size	Date picked, 1922	Colour	Remarks
			Lbs.				
Beta	1916	4	22·75	Medium	Oct. 4	Black	Medium quality.
Brant	1912	1	10·00	"	" 14	"	Poor quality.
Canada	1912	1	25·25	"	" 14	"	Poor quality.
Champion	1916	5	88·25	Large	Sept. 25	"	One of the earliest; poor quality.
Cottage	1916	5	11·25	"	Oct. 4	"	Good quality; somewhat late; fruit shatters.
Delaware	1916	4	7·25	Small	" 4	Red	A little late; good quality.
Daisy	1916	5	44·75	Medium	Sept. 25	Black	One of the earliest; very good quality.
Manito	1912	1	5·00	"	" 25	"	One of the earliest; medium quality.
Moore Early	1916	4	8·50	Large	Oct. 8	"	A little late; good quality.
Moyer	1916	5	2·75	Small	" 4	Red	Good quality; clusters small and not filled.
Wyoming	1916	5	23·50	Medium	Sept. 25	"	The earliest of the reds; good quality.
Winchell	1916	4	19·50	"	" 21	Green	The earliest of the greens; very good quality.

Summary.—1—Grapes should be grown only for home use in central Quebec. 2—The best varieties are Early Daisy, amongst the blacks, Winchell (sometimes called Green Mountain) amongst the greens, and Wyoming, amongst the reds.

ORNAMENTAL PLANTS

Except in special cases, ornamental plants bring no direct revenue to the farmer, but practically everywhere they have an indirect value much greater than generally thought. In these strenuous times when, for reasons which need not be discussed here, it is hard to keep the young people on the land, everything should be done to make country life attractive to them. Neat home sur-

roundings, with flowers according to circumstances and local conditions, always make boys and girls proud of the "old place" and certainly this is one of the means of lessening rural depopulation. These words of explanation are necessary for those who believe that money spent on ornamental gardening is lost.

ANNUALS

VARIETY AND STRAIN TESTS OF ANNUAL ORNAMENTAL PLANTS

Hundreds of varieties and strains of annual ornamental plants have been tested, as many as 373 the same year. The idea was to try practically everything which would grow at Cap Rouge and gradually to discard what was not suitable for central Quebec. This was done, and in 1922 only 80 were kept. Notes are given in the following table about a few of the best ones:—

SOME OF THE BEST ANNUAL ORNAMENTAL PLANTS—1922

Name	Date sown	Date planted	Height	Principal colours	In bloom	
					From	to
			Inches			
Antirrhinum, Intermediate, mixed	Mar. 30	June 5	15	Red and rose	July 6	Sept. 28
Aster, Early Branching, mixed	April 5	May 30	15	Rose and white	Aug. 8	" 21
Aster, Heart of France	" 5	" 30	18	Red	" 12	" 23
Aster, Late Branching, mixed	" 5	" 30	24	Violet and white	" 15	" 28
Aster, Rochester White	" 5	" 30	20	White	" 8	" 23
Balsam, Camelia, mixed	" 21	June 8	15	Rose and White	July 15	" 28
Candytuft, White Rocket	May 3	.....	10	White	June 28	Aug. 20
Clarkia elegans, Double Salmon	" 3	.....	15	Salmon	July 8	Sept. 15
Cosmos, Early, mixed	April 21	June 8	36	Red and white	" 8	" 28
Gypsophila elegans, alba	May 3	.....	12	White	" 1	Aug. 15
Larkspur, Stock-flowered, mxd.	April 3	June 10	18	Blue and white	" 30	Sept. 28
Lathyrus odoratus (Sweet Peas)	" 26	.....	48	Blue, lavender, red, rose, white	" 8	" 28
Mignonette, Defiance	May 3	.....	12	Red	" 24	" 28
Nasturtium, dwarf, mixed	" 3	.....	10	Red and yellow	" 20	" 23
Nicotiana affinis	Mar. 30	June 8	28	Red and white	" 29	" 28
Nigella, Miss Jekyll	May 3	.....	10	Blue and white	Aug. 5	" 28
Petunia, single, dwarf, mixed	Mar. 30	June 8	12	Red, rose and white	June 20	" 28
Phlox Drummondii, mixed	April 3	" 8	8	Crimson, carmine, red, white	July 3	" 28
Scabious, mixed	Mar. 31	" 5	24	Light blue and white	" 26	" 28
Stock, Ten-Week, mixed	April 22	" 10	18	Blue and white	Aug. 20	" 28
Sunflower, Miniature, mixed	" 7	" 10	36	Golden yellow	" 15	" 28
Sunflower, Primrose Stella	" 7	" 10	42	Golden yellow	" 20	" 28
Zinnia, Giant, mixed	" 8	" 8	24	Deep rose, orange	July 28	" 28

VARIETY TEST OF FLOWERING BULBS

Bulbs are well nigh indispensable for those who wish to have flowers early in the spring. Commencing with crocuses, chionodoxas, scillas, continuing with early tulips, narcissi, hyacinths, and finishing with Darwin tulips, a continuation of bloom may be had for about two months, before most of the herbaceous plants and the shrubs come in. The following list gives details about a few of the best flowering bulbs tried at Cap Rouge:—

VARIETY TEST OF FLOWERING BULBS, 1922

Name	Height	Principal Colours	In bloom	
			From	to
Chionodoxa Luciliae	6	Blue and white	April 26	May 8
Crocus, mixed	6	Blue, white, yellow	" 20	" 3
Hyacinth Single, Grand Lilas	9	Lilac-blue	May 14	" 24
" " King of the Blues	9	Dark blue	" 16	" 26
" " King of the Yellows	8	Yellow	" 17	" 28
" " Lady Derby	9	Rose-pink	" 15	" 28
" " La Grandesse	9	Pure white	" 14	" 28
" " La Victoire	9	Carmine-rose	" 15	" 26
Narcissus Bi-color Empress	10	White and yellow	" 14	June 2
" Emperor	14	Yellow	" 8	May 25
" Golden Spur	12	"	" 14	June 2
" Figaro	12	"	" 4	May 16
" Sir Watkin	12	"	" 5	" 30
" Poeticus Ornatus	12	White	" 30	June 18
Scilla sibirica	6	Blue	April 26	May 8
Tulip Single Early Artus	12	Red	May 4	" 28
" " " Chrysolora	12	Yellow	" 4	" 28
" " " Cottage Maid	12	Rose-pink and white	" 5	" 28
" " " Duchesse de Parma	12	Orange-scarlet and yellow	" 4	" 28
" " " Pottebakker Scarlet	15	Red	" 6	" 28
" " " Pottebakker White	15	White	" 4	" 31
" " Darwin Baronne de la Tonnaye	24	Bright rose	" 25	June 10
" " Clara Butt	22	Clear pink	" 22	" 6
" " Farncombe Sanders	20	Scarlet	" 25	" 10
" " Mde. Krelage	20	Bright rose	" 22	" 6
" " Pride of Haarlem	24	Rosy carmine	" 29	" 12
" " Rev. Ewbank	18	Lavender	" 25	" 10

VARIETY TESTS OF ORNAMENTAL SHRUBS AND TREES

After twelve years of careful testing of ornamental shrubs and trees, a list giving the number living, the height, and the cause of failure for those which died will no doubt be interesting and may be used as a fairly safe guide by residents of central Quebec. In the following table, only deciduous shrubs and trees are mentioned.

VARIETY TESTS OF DECIDUOUS ORNAMENTAL SHRUBS AND TREES, 1911–1922

		Total number planted	Number living, autumn, 1922	Winter killed	Died during growing season	Height autumn 1922
						Inches
Acer dasycarpum laciniatum Wieri	Weir Cut-leaved Maple	1	1			156
" platanoides	Norway Maple	2	2			168
" platanoides Schwedleri	Schwedler Purple Maple	1	1			168
" tataricum Ginnala	Ginnalian Maple	4	4			140
Aesculus Hippocastanum	Horse Chestnut	2	2			108
Amorpha fruticosa	False Indigo	2	2			96
Ampelopsis quinquefolia	Virginian Creeper	23	19	4		132
Aristolochia Sipho	Dutchman Pipe Vine	2	2			108
Berberis Aquifolium	Holly-leaved Barberry	2	2			18
Berberis Thunbergii	Thunberg Barberry	2			2	36
Betula alba	European White Birch					192

VARIETY TESTS OF DECIDUOUS ORNAMENTAL SHRUBS AND TREES, 1911-1922—*Continued*

		Total number planted	Number living autumn, 1922	Winter killed	Died during growing season	Height autumn 1922
						Inches
Caragana arborescens	Siberian Pea tree	39	36	3		72
" frutescens macrophylla	Woody Caragana	4	1	3		66
" grandiflora	Large-flowered Caragana	3	3			70
" pygmaea	Dwarf Siberian Pea tree	3		1	2	
Catalpa Kaempferi	Japanese Catalpa	2	2			120
Catalpa speciosa	Western Catalpa	2	2			108
Celastrus articulatus	Japanese Bittersweet	10	2	8		60
Celastrus scandens	Climbing Bittersweet	1			1	
Clematis Vitalba	Traveller Joy	4	1	3		60
Cornus alba sibirica	Siberian Dogwood	5	5			72
Cornus alba sibirica variegata	Variegated Siberian Dogwood	2	2			36
Cornus mascula	Cornelian Cherry	2	2			48
Crataegus Crus-galli	Cockspur Thorn	2	1	1		140
Cytisus nigricans	Summer-flowering Cytisus	3	2	1		48
Cysitus purpureus	Purple Broom	3	1	2		48
Diervilla hybrida Eva Rathke	Weigela Eva Rathke	3	1	2		44
Elaeagnus angustifolia	Silver Thorn	2	2			114
Euonymus europaeus	Spindle tree	2	2			74
Forsythia intermedia	Golden Bell	3		3		
Gleditschia japonica	Honey Locust	2	2			168
Gleditschia triacanthos	Honey Locust	3	2	1		160
Hippophae rhamnoides	Sea Buckthorn	2		1	1	
Hydrangea arborescens	Hills of Snow	3	2	1		42
Hydrangea paniculata grandiflora	Large-flowered Hydrangea	25	22	3		48
Juglans Sieboldiana	Japanese Walnut	1	1			144
Lespedeza bicolor	Bush clover	2	2			54
Ligustrum amurense	Japanese Privet	2	2			54
Lonicera Albertii	Bush honeysuckle	4	2		2	48
" Morrowi	Japanese Bush Honeysuckle	4	3	1		60
" punicea	Woodbine	4	4			48
" tatarica	Tartarian Honeysuckle	2	2			102
" tatarica flore-roseo	Rose-flowered Tartarian Honeysuckle	3	3			72
" tatarica grandiflora alba.	White-flowered Tartarian Honeysuckle	3	3			96
Neillia opulifolia aurea	Golden-leaved Ninebark	7	5	2		66
Philadelphus Bouquet Blanc	Mock Orange	2	2			56
" coronarius	Mock Orange	3	2	1		56
" coronarius foliis aureis	Golden-leaved Mock Orange	1		1		
" grand. speciosissimus	Large-flowered Mock Orange	2	2			78
" nivalis	Mock Orange	6	5	1		96
" Satsumi	Mock Orange	5	4	1		84
" speciosissimus	Mock Orange	4	2		2	66
Populus ang. cordata robusta	Cottonwood	3	3			336
Populus charkoviensis	Cottonwood	3	3			252
Potentilla fruticosa	Shrubby cinquefoil	2	2			20
Prunus Grayana	Ornamental Plum	2		2		
Ptelea trifoliata aurea	Golden Hop tree	1				
Pyrus angustifolia	Wild Crab Apple	4	2	2		92
Pyrus Aucuparia	European Mountain Ash	2	2			140
Quercus imbricaria	Shingle Oak	2	1	1		60
" palustris	Pin Oak	4	3	1		132
" rubra	Red Oak	2	1	1		84
Rhamnus Frangula	Alder Buckthorn	102	102			54
Rhus Cotinus atropurpureus	Smoke Tree	2	1	1		48
Ribes aureum	Missouri Currant	2	2			74
Robinia hispida rosea	Rose Acacia	3	3			168
Salix alba Britzensis	Yellow Willow	2	2			336
" rosmarinifolia	Rosemary-leaved Willow	6	6			96
" Wisconsin Weeping	Wisconsin Weeping Willow	2	2			204
Sambucus nigra foliis aureis	Golden-leaved Elder	4	2	2		
Spiraea arguta	Early Spiraea	2		2		
" callosa	Dwarf White Spiraea	5	4	1		28
" Margaritae	Margaret Spiraea	3	3			36
" salicifolia	Meadow Sweet	2	2			54
" sorbifolia	Sorbus-leaved Spiraea	1	1			60
" Van Houttei	Van Houtte Spiraea	30	16	14		74

VARIETY TESTS OF DECIDUOUS ORNAMENTAL SHRUBS, AND TREES 1911-1922—*Concluded*

		Total number planted	Number living autumn 1922	Winter killed	Died during growing season	Height autumn 1922
						Inches
Symphoricarpus racemosus	Snowberry	2	2	.....	.....	42
Syringa amurensis	Amur lilac	6	6	.....	.....	72
" chinensis rothomagensis	Rouen Lilac	2	1	1	.....	60
" japonica	Japan Lilac	2	1	1	.....	72
" villosa	Himalayan Lilac	5	5	.....	.....	84
" vul. alba grandiflora	Large-flowered white Lilac	4	1	3	.....	72
" " Charles X	Common Lilac var	4	1	3	.....	64
" " Congo	Common Lilac "	2	.....	2	.....	.....
" " Jacques Calot	Common Lilac "	5	5	.....	.....	108
" " Léon Simon	Common Lilac "	2	.....	2	.....	.....
" " Ludwig Spath	Common Lilac "	6	3	3	.....	72
" " Marc Micheli	Common Lilac "	4	2	2	.....	54
" " Melle Fernande Viger	Common Lilac "	6	4	2	.....	72
" " Michel Buchner	Common Lilac "	8	4	3	1	48
" " Mme Casimir Perier	Common Lilac "	2	.....	2	.....	.....
Viburnum dentatum	Arrowwood	3	3	.....	.....	72
" Lantana	Wayfaring Tree	3	3	.....	.....	72
" molle	Soft-leaved Arrowwood	3	3	.....	.....	66
" Opulus	High Bush Cranberry	2	2	.....	.....	96
" Opulus sterile	Common Snowball	7	7	.....	.....	72

VARIETY TESTS OF ORNAMENTAL SHRUBS AND TREES FOR HEDGES

A strongly growing and well trimmed hedge is a pretty sight, wherever seen, but tastes differ and this is why a list is here given with information as to hardiness, height, and appearance. White Spruce and White Pine, for reasons not yet well understood, have done so poorly that they had to be pulled out; Irish Juniper was not hardy enough; and Siberian Dogwood, badly attacked by kermes, was taken away. The following table furnishes details about the ones which were kept:—

VARIETY TEST OF ORNAMENTAL SHRUBS AND TREES FOR HEDGES

Name	Kind	Year planted	Height, autumn, 1922	Remarks
			Inches	
Thunberg Barberry	Deciduous	1912	36	Very fine foliage in autumn.
Wayfaring Tree	"	1913	44	Very hardy.
Alder Buckthorn	"	1912	50	Hardy; not enough growth at bottom.
Josika Lilac	"	1912	50	Very hardy; not enough growth at bottom.
Siberian Pea Tree	"	1912	72	Fine foliage; very hardy.
Amur Lilac	"	1912	72	Very hardy; not enough growth at bottom.
Cockspur Thorn	"	1912	78	Very hardy; not enough growth at bottom.
Colorado Blue Spruce	Conifer	1912	44	One of the very prettiest.
American Arbor Vitae	"	1912	44	Very hardy.
Norway Spruce	"	1912	44	Very hardy.

VARIETY TESTS OF ROSES

The rose, by many, is regarded as the "queen of flowers," so that it is thought advisable, after ten years of testing of many varieties, to give details about those which have been tried at Cap Rouge. Roses grown at the Station are not house varieties but remain outside all through the year. It will be seen by the following table that, out of the 150 bushes planted, 89, or about 60 per cent, were winter-killed, while 18, or 12 per cent, died during the growing season, and 43, or 28 per cent, are living. As there are 17 Rugosas out of these 43, the number of the others comes down to 26 out of 130 planted, or not quite 10 per cent. This clearly shows how important it is to make a good choice. Possibly,

hardy strains could be evolved out of the few which have shown the most resistance.

VARIETY TESTS OF ROSES, 1912–1922

Name	Class	Number planted	Living autumn, 1922	Winter-killed	Died during growing season	Remarks
Avoca	H. T.	3	.....	3	.....	
Dean Hole	"	4	.....	4	.....	
Ecarlate	"	3	.....	3	.....	
Etoile de France	"	4	.....	3	1	
Gruss an Teplitz	"	6	2	4	.....	Red; semi-double; blooms freely.
Killarney	"	4	.....	4	.....	
Le Progrès	"	3	.....	2	1	
Lady Ashtown	"	3	.....	3	.....	
Madame Ravary	"	3	.....	3	.....	
Betty	"	1	.....	1	.....	
Mrs. Aaron Ward	"	1	.....	.....	1	
Mildred Grant	"	1	.....	.....	1	
My Maryland	"	1	.....	.....	1	
Theresa	"	1	.....	.....	1	
White Killarney	"	1	.....	.....	1	
Baroness Rothschild	M. P.	5	.....	5	.....	
Charles Lefebvre	"	3	.....	3	.....	
Frau Karl Druschki	"	6	2	3	1	White; very pretty.
Hugh Dickson	"	5	1	4	.....	Red; very pretty.
Mrs. John Laing	"	3	.....	3	.....	
Mrs. Sharman Crawford	"	3	.....	3	.....	
Magna Charta	"	3	1	2	.....	Bright pink; very pretty.
Reynolds Hole	"	3	.....	3	.....	
Senator Vaisse	"	3	.....	.....	3	
Paul Neyron	"	1	.....	1	.....	
Ulrich Brunner	"	3	.....	3	.....	
Her Majesty	"	1	.....	1	.....	
Mabel Morrison	"	2	.....	2	.....	
Victor Verdier	"	2	1	1	.....	Rosy carmine.
John Hopper	"	2	.....	2	.....	
Jules Margottin	"	5	3	2	.....	Pink; blooms freely.
Mme Gabriel Luizet	H. P.	2	.....	2	.....	
Merveille de Lyon	"	2	.....	2	.....	
Margaret Dickson	"	2	.....	2	.....	
A. K. Williams	"	2	.....	.....	2	
Barbarossa	"	2	.....	.....	2	
Common Moss	Moss	1	1	.....	.....	Pale rose.
Crimson Rambler	Climb'g	3	2	1	.....	Not very hardy.
Dorothy Perkins	"	1	.....	1	.....	
Tausendschon	"	1	.....	.....	1	
Mrs. Taft	Polyant	1	.....	1	.....	
Aennchen Muller	"	1	.....	1	.....	
Katherine Zeimet	"	1	.....	1	.....	
Mrs. W. Cutbush	"	1	.....	.....	1	
Copper Austrian	H. Aust	3	3	.....	.....	Red copper, single.
Soleil d'Or	"	4	.....	3	1	
Lyon	"	4	.....	4	.....	
Conrad F. Meyer	H. Jap.	1	1	.....	.....	Clear silvery rose.
Mme Geo. Bruant	"	1	1	.....	.....	White, semi-double.
Blanc Double de Coubert	"	1	1	.....	.....	White, semi-double.
Mrs. Anthony Waterer	"	1	1	.....	.....	Deep-red, semi-double.
Calocarpa	H. Rug.	1	1	.....	.....	Rose, single.
Rose à Parfum de l'Hay	"	1	1	.....	.....	Red, semi-double.
Belle Poitevine	"	1	1	.....	.....	Pink, semi-double.
Roseraie de l'Hay	"	1	1	.....	.....	Red, semi-double.
Rugosa	Rug.	20	17	3	.....	Deep rose, single.
Rubrifolia	Rub.	2	2	.....	.....	Deep red, single.

VEGETABLES

VARIETY AND STRAIN TEST OF ASPARAGUS

Asparagus should be grown much more extensively than it is, as prices for this earliest product of the garden are always high. It costs a great deal to start a good bed, but the plantation is for a lifetime, if well made and cared for.

There is only one species of edible asparagus in Canada, though a large number of varieties are advertised by seedsmen. But conditions of locality, soil, cultivation and nutrition greatly affect this plant and there are very few distinct sorts; for instance, according to experts at Washington, Bonvalette Giant, Conover Colossal, Palmetto and Argenteuil are all the same variety.

As in other vegetables, many qualities are looked for in asparagus, but the most important ones seem to be productiveness, market quality, disease resistance, size, colour, uniformity, and tall growth before branching. There is no variety or strain, not even the far-famed Washington developed by the United States Government at Concord, Massachussetts, which is completely immune from rust. The best preventive is to keep plants strong by root cultivation, proper fertilization, and not cutting during too long a season.

However, there are varieties and strains best adapted to certain districts and it was to compare a few of the well-known ones that this project was started in 1913, when seed of eleven of them was sown in the nursery. The following season forty plants of each were set three feet apart each way, in what was considered a fairly good asparagus soil, a naturally drained, well fertilized sandy loam.

Cutting was started in 1916, but continued only for a few days, but from 1917 it has lasted from one month to six weeks each year. Wherever clumps died, for one reason or another, the number left was counted and the yield per acre was corrected accordingly. Notes were taken for earliness (though this feature is not very important and may even be disadvantageous when there are late frosts in the spring) also for market quality, freedom from rust, and yield. The following table gives interesting details:—

ASPARAGUS—TEST OF VARIETIES

—	Number of clumps planted, spring, 1914.	Records for 1922										Average yield per acre for six years—Pounds.
		Number of clumps living in spring.	Number of spikes cut.	Number of spikes per clump.	Weight of crop—Ounces.	Weight of crop per clump—Ounces.	Weight of crop per spike—Ounces.	Date of first cutting.	Date of last cutting.	Number of cuttings made.	Yield per acre—Pounds.	
Donald Elmira (Dreer)	40	34	814	24	371	11	0·46	12-V	9-VI	17	3,301	1,881
Mammoth Emperor	40	28	506	18	298	11	0·59	15-V	9-VI	15	3,219	1,646
Reading Giant	40	27	448	9	257	10	0·57	15-V	9-VI	14	2,879	1,453
Argenteuil	40	35	609	17	274	8	0·45	13-V	9-VI	16	2,368	1,352
Donald Elmira (Johnson)	40	26	360	14	209	8	0·58	15-V	9-VI	15	2,432	1,340
Batavian	40	32	306	10	161	5	0·53	15-V	9-VI	15	1,522	1,320
Columbian Mammoth White	40	28	352	13	125	4	0·36	12-V	9-VI	15	1,675	1,252
Conover Colossal	40	22	219	10	111	5	0·51	15-V	9-VI	11	1,526	1,222
Palmetto	40	28	356	13	196	7	0·55	13-V	9-VI	16	2,117	1,164
Philadelphia Mammoth	40	17	160	9	93	5	0·58	16-V	9-VI	11	1,647	786
Average												

Donald Elmira, seed of which was procured from Henry A. Dreer, of Philadelphia, Pa., U.S.A., has proved the heaviest yielder, the least susceptible to rust, and of good market quality. This variety was originated by A. Donald, Elmira, N.Y., and introduced by the old firm of Johnson & Stokes of Philadelphia. Hexamer, in his book on asparagus says that it "is characterized by the delicate green colour of its stems, different from any other kind. Its stalks are very tender and succulent, while its size is all that can be desired."

Breeding work was started with Donald Elmira (Dreer) and plants produced which will be compared with the famous Washington, of the United States Department of Agriculture. But this will not stop the present project to go on with the ten varieties or strains which are left, Eclipse having practically died out, from unknown causes.

Summary.—1. Asparagus is a paying vegetable crop, but it takes a long while, three or four years, before profitable crops may be had. 2. The strain which has given the best results, to-date, is Donald Elmira (Dreer).

Improvement of the Donald Elmira asparagus by selection

In 1913, seed of eleven varieties and strains of asparagus was sown in the nursery and the next year forty plants of each were set three feet apart in all directions. In 1916, cutting was allowed only for a few days, so as not to weaken the plants, whilst from 1917 on, it lasted from one month to six weeks each season. Including the crop of 1919, Donald Elmira (Dreer) was at the head with an average of 1,634 pounds per acre compared with Mammoth Emperor (1418), Batavian (1374), Columbian Mammoth White (1329), Conover Colossal (1293), Donald Elmira, (Johnson) (1204), Reading Giant (1201), Argenteuil (1185), Palmetto (1085), Eclipse (762), Philadelphia Mammoth (717). Two important things to note are that the highest yielder gave more than twice the crop of the lowest, also that the strain of Donald Elmira from Dreer produced 25 per cent more than the one from Johnson.

In 1919, the crop was weighed separately and the sex taken for each of the thirty-nine living plants of Donald Elmira (Dreer), with the following results:—

DETAILS OF THIRTY-NINE CLUMPS OF DONALD ELMIRA (DREER) ASPARAGUS

Plant No.	Sex	Number of spikes cut	Weight of crop cut	Date first spike cut
			Ounces	
1	f.	26	5	May 27
2	m.	56	14·50	" 27
3	f.	23	3·50	" 31
4	m.	17	5·	" 27
5	f.	13	2·50	" 31
6	m.	6	3	" 31
7	f. p.	13	2	" 31
8	i. p.	22	4·50	" 28
9	f. b.	11	2·50	June 3
10	f. b.	20	8	May 31
11	f. p.	45	14·50	" 27
12	f. b.	30	8	" 27
13	f. b.	15	4	" 31
14	Dead.			
15	m.	64	10	" 27
16	m.	58	9	" 27
17	m.	16	4	" 28
18	f. p.	31	7	" 31
19	m.	7	3·50	June 3
20	f. p.	3	0·50	" 7
21	m.	22	3·50	May 28
22	f. p.	34	8·50	" 28
23	f. p.	33	8·50	" 31
24	f. b.	35	5	" 27
25	m.	47	13·50	" 31
26	m.	14	3	June 3
27	m.	18	4·50	" 3
28	f.	32	7	May 31
29	f.	7	3	June 3
30	m.	None good	to cut.	
31	m.	34	12	May 28
32	f.	29	6·50	" 28
33	f.	24	9·50	" 31
34	f.	2	0·50	June 20
35	f.	35	7	May 28
36	m.	75	17	" 27
37	f.	31	10·50	" 31
38	f.	20	3·50	June 5
39	f.	None good	to cut.	
40	f.	"	"	

In 1920, only the highest yielding male plant, No. 36, and the highest yielding female plant, No. 37, were allowed to bloom, so that the seed produced came from the best plants of the best strain of the best variety.

In 1921, plants were grown from this seed and placed alongside of Washington, one of the well known strains produced at the United States Asparagus Experiment Station, Concord, Massachusetts, and seed was gathered as had been done the previous year.

In 1922, seed and plants were again grown, the latter in the nursery, and it is expected to offer some for sale by 1924.

Variety and strain test of garden beans

After testing sixty varieties and strains since 1911, it has been found that lima and pole beans cannot profitably be grown in central Quebec because the first are too late and the second too costly. This left the bush kinds, which are mainly divided into greenpodded and waxpodded, late and early. Careful analysis of all data leaves four varieties clearly outstanding, with production and maturity as follows, for the last six years:—

COMPARISON OF FOUR VARIETIES OF GARDEN BEANS, 1916-1921

Name of Variety	Average number of quarts of green pods per acre	Average number of days to come to maturity
Hodson Long Pod	16,020	79
Pencil Pod	11,761	66
Refugee	11,737	77
Stringless Green Pod	9,800	65

If yield alone is considered, there is not the least doubt that Hodson Long Pod should be taken, but when it was ready for use, nearly half of the crop from Pencil Pod had already been marketed before prices came down, as may be seen by examining the following figures:—

COMPARISON OF TWO VARIETIES OF GARDEN BEANS FOR EARLINESS

Variety	Dates of Picking, also weights in pounds and ounces											
	July 11	July 13	July 15	July 18	July 20	July 26	July 28	July 29	Aug. 1	Aug. 5	Aug. 8	Aug. 14	Total
	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.
Pencil Pod	0 8	1 8	1 8	5 0	2 8	6 0	.....	3 0	1 6	1 2	.....	.....	33·0
Hodson Long Pod	.....	.....	.....	.....	.....	1 10	1 5	1 8	8 3	11 6	2 14	6 2	22·5

Summary.—1. Pencil Pod, early waxpodded, Hodson Long Wax, late waxpodded, Stringless Green Pod, early greenpodded, Refugee (sometimes called 1,000 to 1), late greenpodded, are the best four garden beans tried at Cap Rouge during twelve years. 2. The one which seems to most advantageously meet conditions of central Quebec, for the market, is Pencil Pod, on account of its earliness and yielding capacity combined.

Improvement of Pencil Pod garden bean by selection

In 1920, a certain number of plants of the Pencil Pod garden bean where chosen and in 1921, thirty seeds from ten of them were sown in different rows, spaced in such a way that every plant could be examined easily. Some did not grow whilst others were destroyed in one way or another after coming up, but the following table gives details about every one which lived:—

YIELD OF TEN DIFFERENT STRAINS OF PENCIL POD GARDEN BEAN, 1921

Strain Number	Total number of plants	Total number of pods	Number of pods per plant	Total number of beans	Number of beans per plant	Total weight of beans	Weight of beans per plant
						Ounces	Ounces
1	24	776	32·3	3,372	140·5	30	1·25
4	26	764	29·4	3,315	127·5	30	1·15
5	25	596	23·8	2,663	106·5	25	1
6	24	552	23·0	2,487	103·6	23	0·96
7	25	662	26·5	2,773	111·0	26	1·04
8	26	556	21·4	2,455	94·4	23	0·88
9	25	547	21·9	2,303	92·1	20	0·80
10	21	592	28·2	2,332	111·0	18	0·86
11	22	660	30·0	2,809	127·7	26	1·18
12	28	777	27·7	3,676	131·3	34	1·21

In 1922, a row of four feet was sown to each of the seven strains which had been the best yielders and the most resistant to disease the previous year, with the following results:—

YIELD OF SEVEN DIFFERENT STRAINS OF PENCIL POD GARDEN BEANS, 1922

Strain Number	Date sown	Date ready for use	Quarts of Green Pods picked				
			July 22	July 25	July 27	July 30	Total
1	May 15	July 17	1·25	0·50	0·25	1	3
4	" 15	" 17	1·25	0·25	0·25	1	2·75
5	" 15	" 17	1·25	0·25	0·25	1	2·75
6	" 15	" 18	1·125	0·50	0·125	0·75	2·50
9	" 15	" 17	1·125	0·25	0·125	1	2·50
11	" 15	" 18	1·25	0·125	0·125	1	2·50
12	" 15	" 17	1·50	0·50	0·25	1	3·25

Summary.—It is interesting to see that the two highest yielding strains, 1 and 12, were either first or second in 1921 and in 1922 and that their average production for these two years is 16 per cent more than that of the other strains.

Variety and strain test of garden beets

Now that twenty-seven varieties and strains of garden beets have been tried since twelve years, it is clear that Eclipse is the heaviest yielder for a sandy loam of high fertility and fine tilth. Naturally, varieties sending their roots deeper might have done better in a soil less shallow, but the oval, top-shaped, half long, and long kinds were not as heavy producers at Cap Rouge as the flat, turnip-shaped, or globular sorts. After carefully comparing representative varieties of the above three mentioned types, all were discarded except Crosby Egyptian, flat, and Eclipse, globular. But another one, Black Red Ball, though yielding a great deal less, has always been liked better by buyers and would sell when the others could not be marketed, so that it is included in the following table:—

COMPARISON OF THREE WELL-KNOWN VARIETIES OF GARDEN BEETS

Variety	Shape	Pounds of roots per acre									Days ready to use from sowing
		1915	1916	1917	1918	1919	1920	1921	1922	Average for 8 years	
Eclipse	Globular	26,136	51,691	33,977	49,658	90,169	51,836	74,342	36,881	51,836	73
Crosby Egyptian	Fat	32,380	35,429	28,750	64,614	65,194	39,204	51,256	29,476	43,288	75
Black Red Ball	Globular	21,780	18,876	21,344	25,846	46,593	27,878	36,445	36,010	29,346	79

This shows that, with vegetables, quality and appearance are as essential as yield. And then, it must be considered that the bulk of the table beet crop is sold when roots are about only two inches in diameter, so that the tonnage in the late autumn does not count for much after all.

Summary.—1. The table beet which was found to be the heaviest yielder is Eclipse. 2. The variety which sells best is Black Red Ball.

Improvement of the Black Red Ball table beet by selection

From Burpee seed, roots were grown in 1915 under number 1097; a careful selection was made in the autumn and seed was produced in 1916. In 1918, roots were grown under number 1865 from seed produced in 1916, and another selection was made from which seed was produced in 1919. In 1921, roots were grown in the nursery from seed produced in 1919, another selection was made and seed was again produced in 1922. This same year, roots were grown in the nursery from 1919 seed and were very carefully chosen in the autumn for seed production in 1923.

Comparison of distances at which to thin garden beets

Beets grown for the table must be small to cater to the present demand for tender vegetables, so that they can be grown much more thickly than mangels or sugar beets intended for live stock feeding. In 1916, a project was started to compare three distances, 2, 3 and 4 inches, at which to thin plants in the row. As the experiment has now been made during five seasons, it is thought advisable to give a few details, as follows:—

COMPARISON OF THREE DISTANCES AT WHICH TO THIN GARDEN BEETS

Year	Date sown	Date pulled	Pounds of Roots per acre							
			Thinned to 2 inches		Thinned to 3 inches		Thinned to 4 inches		Average	
			Year	Average	Year	Average	Year	Average	Year	Average
1916	June 9	Oct. 23	25,352		22,913		14,375		20,880	
1917	" 16	" 11	42,108		38,768		43,705		41,527	
Average for Two years				33,730		30,840		29,040		31,203
1919	May 5	" 8	50,774		54,450		37,607		47,610	
Average for three years				39,411		38,710		31,896		36,672
1920	" 19	" 9	30,202		35,574		29,040		31,605	
Average for four years				37,109		37,928		31,182		35,405
1922	" 3	" 9	32,670		31,944		29,766		31,460	
Average for five years				36,221		36,730		30,899		34,616

As for most other garden vegetables with which this experiment was made, it is seen that the yield is heavier if plants are grown thickly in the row. There is not much difference between 2 and 3 inches, but the crop was decidedly smaller when the space was four inches.

VARIETY AND STRAIN TEST OF CABBAGE

For twelve years, forty-nine varieties and strains of cabbage have been tested, including the Savoy and Red groups which have not much importance in this district. In passing, though, it may be said that no cabbage has the tenderness and flavour of the Savoy which could be grown much more than it is for home gardens. After seven or eight years of careful testing, it became evident that the following, if seed was procured of a good strain, were the best for their respective seasons: Jersey Wakefield, early; Copenhagen Market, early to midseason; Succession, midseason; Danish Roundhead, late. Each of the above four varieties, which should rather be called groups, is advertised

under many different names, but not a seedman out of fifty could know the one which he sells if grown alongside of a dozen of so-called varieties of the same group. As with most plants, the earliest generally give the lowest yield, and this is well shown in the following table:—

COMPARISON OF FOUR WELL-KNOWN VARIETIES OF CABBAGE.

Variety	Pounds of Cabbage per acre												Days ready for sale
	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	Average	
Jersey Wakefield	42,108	38,768	27,152	34,340	20,935	26,935	11,035	51,546	50,675	72,310	34,703	37,311	121
Copenhagen Market	39,494	63,598	8,712	57,064	29,476	26,862	8,567	36,155	64,614	108,174	27,298	42,729	125
Succession	.....	.....	48,787	63,388	27,298	35,066	13,141	95,106	39,204	92,057	35,719	50,030	136
Danish Roundhead	43,270	36,010	49,949	32,837	23,740	36,500	24,829	81,457	36,590	116,741	41,818	52,167	152

It is rather hard to make recommendations about the varieties suitable for the district, as it all depends upon the market. For a man who retails vegetables each week, it would be well to grow the four so as to have a constant supply, taking care of course, to put in a good proportion of Danish Roundhead for the winter. For a trucker in whose territory lots of main crop cabbage are shipped, it might be advisable to grow only Jersey Wakefield (pointed heads) and Copenhagen Market (round heads) so as to come in early enough, while for a farmer who must dispose of the bulk of the crop through winter, Roundhead, as a heavy cropper, a sure header, and a good keeper, has no superior.

A noted strain of this last-mentioned variety, from Reed Brothers, was beaten in 1922 by a specially selected Cap Rouge strain, and seed of the latter is now available in small quantities.

Improvement of the Danish Roundhead cabbage by selection

Seed from Hartmann, (No. 1112) was procured and in the autumn of 1915, the best heads were chosen in the field to produce seed in 1916. From 1917 to 1922 inclusive cabbages were grown under numbers 1646, 1875, 1978, 2182, 2297, 2364, and seed was grown each year from the best heads of the previous season. In the autumn of 1922, a specially good selection was made in the field and many heads will be culled again before they are planted out to produce seed, in 1923. This continual selection has not only brought out a more uniform type, but has developed a very high yielding strain which has outyielded, in 1922, all others, including the famous Danish Ballhead of Reed Brothers. It is also very probable that the keeping qualities will be improved as only those heads which are perfectly sound are used as seed bearers.

Protecting cabbage plants against root maggots

That cabbage plants sometimes require protection against root maggots is unfortunately too well known by growers who have had a whole patch cut down in a few nights. When this project was started, in 1915, the two methods advocated were tar paper discs and cheese cloth covers. The bichloride of mercury treatment has given such good results elsewhere that it has been used at Cap Rouge since 1920, but it seems advisable to give figures for the five years preceding this.

COMPARISON OF TWO METHODS OF PROTECTING CABBAGE PLANTS AGAINST ROOT MAGGOTS

Year	Variety	Not Protected					Protected with Tar Paper Discs					Protected with Cheese-cloth Covers				
		Number planted	Number harvested	Percentage saved	Pounds harvested	Pounds per acre	Number planted	Number harvested	Percentage saved	Pounds harvested	Pounds per acre	Number planted	Number harvested	Percentage saved	Pounds harvested	Pounds per acre
1915	Early Jersey Wakefield...	33	23	68·70	40·50	14,114	33	26	78,79	45·50	15,856	33	31	93·94	77·00	26,834
1915	Copenhagen Market.....	33	21	63·63	32·00	11,152	33	15	45·45	25·75	8,973	33	28	84·85	59·00	20,561
1916	Early Jersey Wakefield...	40	15	37·50	46·75	13,576	40	27	65·50	94·50	27,442	40	18	45·00	62·50	18,150
1916	Copenhagen Market.....	40	14	35·00	45·75	13,285	40	17	42·50	53·50	15,536	40	23	57·50	93·50	27,152
1917	Early Jersey Wakefield...	40	39	97·50	116·50	33,831	40	32	80·00	131·25	38,115	40	33	82·50	139·25	40,438
1917	Copenhagen Market.....	40	34	85·00	101·50	29,475	40	30	75·00	101·25	29,403	40	37	92·50	149·25	43,342
1918	Copenhagen Market.....	20	12	60·00	38·00	22,070	20	10	50·00	36·25	21,054	20	19	95·00	71·25	41,382
1919	Copenhagen Market.....	20	20	100·00	78·00	45,593	20	20	100·00	88·00	51,110	20	20	100·00	85·50	49,658
	Total.....	266	178	.....	499·00	183,096	266	177	.....	576·00	207,489	266	209	.....	737·25	267,517
	Average.....	33·25	22·25	66·92	62·37	21,789	33·25	22·12	66·53	72·00	25·153	33·25	26·12	78·56	92·16	32,196

The paper discs did not show up well, probably because they were not put on just right; but if careful employees, having no reason to rush, did not attend to this well, it may reasonably be supposed that busy truckers will not do better. The cheese cloth covers gave very good results but they are bulky and costly, and cannot be used with profit in a commercial way with a crop that has not more value per plant (or head) than cabbage.

In 1921, it was thus decided to continue the experiment with paper discs and bichloride of mercury and the results of two years show that the average percentage of plants saved for the unprotected lot, the discs, and the mercury was respectively 90, 100, 100, with the yield per acre 64,759, 69,914 and 73,761 pounds.

Summary.—1. Cabbage plants must receive every year protection of some kind against root maggots. 2. Cheese cloth covers were found effective but too costly. 3. Bichloride of mercury is the most promising treatment.

A fairly good way to prepare the bichloride of mercury or corrosive sublimate is to dissolve it in an earthen or wooden vessel at the rate of one ounce to ten gallons and to apply about half a cupful around each plant. The first treatment is generally made three or four days after the plants are set in the field and one or two more applications at intervals of about a week.

VARIETY AND STRAIN TESTS OF GARDEN CARROTS

Twenty-five varieties and strains of garden carrots have been tested for twelve years and the number has now been cut down to three of different types. The following table gives information about these for every year when they were in the trial plots together:—

COMPARISON OF THREE VARIETIES OF CARROTS OF DIFFERENT TYPES

Variety	Shape	Pounds of roots per acre							Number of days ready to use after sowing
		1916	1917	1918	1919	1921	1922	Average	
Hutchinson	Long	46,464	35,719	52,417	38,914	82,764	30,202	47,747	75
Chantenay	Half Long	56,483	34,558	41,527	51,256	52,272	22,506	43,100	73
Guerande	Short	37,462	31,363	16,262	23,522	81,747	28,169	36,421	73

Hutchinson has been a heavy yielder but it is not as popular on the market as the well-bred Chantenay, being rather long. For forcing, Guerande is the best of the three.

Summary.—1. If yield only is considered, Hutchinson is the one to take. 2. For forcing, Guerande (sometimes called Oxheart) is very good. 3. As a general purpose carrot, combining earliness, yield and quality, Chantenay is recommended.

Improvement of the Chantenay carrot by selection

From Rennie's seed, roots were grown in 1915 under No. 1122 and seed produced in 1916. In 1917, a rigid selection was made in the nursery and these roots produced seed in 1918. In 1919, another careful selection was made, also in the spring of 1920, to produce seed that year. In 1921, the same selection was repeated and seed grown in 1922, when roots also were harvested and placed

in the cellar of the horticultural barn for seed production in 1923. The improvement in quite noticeable for uniformity of type also smoothness of roots and the result is a carrot which is a good looker and an easy seller.

Comparison of distances at which to thin garden carrots

To what distance should garden carrots be thinned in the row is a question which is often asked. In 1916, a project was started and continued in 1917, 1919, 1920 and 1922, using the same variety, Chantenay, every time. Now that the experiment has been conducted during five seasons, it is thought advisable to give details in the following table:—

COMPARISON OF THREE DISTANCES AT WHICH TO THIN GARDEN CARROTS

Year	Average for	Date Sown	Date Pulled	Pounds of roots per acre							
				Thinned to 1 inch		Thinned to 2 inches		Thinned to 3 inches		Average	
				Year	Average	Year	Average	Year	Average	Year	Average
1916	.....	June 9	Oct. 19	34,982	.....	34,110	.....	29,667	.....	32,920	.....
1917	.....	May 16	" 3	13,504	.....	12,778	.....	11,616	.....	12,633	.....
	Two years	.....	.....	.....	24,243	.....	23,444	.....	20,641	.....	22,776
1919	.....	" 12	" 8	36,155	.....	35,911	.....	37,270	.....	36,445	.....
	Three years	.....	.....	.....	28,214	.....	27,600	.....	26,184	.....	27,333
1920	.....	" 19	" 9	23,813	.....	20,328	.....	20,328	.....	21,490	.....
	Four years	.....	.....	.....	27,113	.....	25,782	.....	24,720	.....	25,872
1922	.....	" 3	Sept. 19	17,424	.....	17,831	.....	16,454	.....	17,236	.....
	Five years	.....	.....	.....	25,178	.....	24,192	.....	23,067	.....	24,145

From the above figures it is seen that the yield decreased as the space between plants was increased. The difference, however, is quite small and may be due entirely to experimental error. It would seem advisable to sow thickly and if the stand is very good, to thin out to three inches and sell bunch stuff when near a good market. In the case the stand is poor, as unfortunately is too often the case with this vegetable, then hardly any thinning would be required.

VARIETY AND STRAIN TESTS OF CAULIFLOWER

Cauliflower is one of the hardest vegetables to grow, as high temperatures, low humidity, lack of soil moisture, poor seed, all tend to cause heads to "button," when they are practically worthless. The plants are much less hardy than those of cabbage and if a strong frost stunts their growth, heads will "bolt." There is practically only one type, the Erfurt, with early and late strains, but well known varieties are Erfurt and Snowball, amongst earlies, and Autumn Giant and Large Algiers amongst lates. These four have been tried with the result that the largest heads have generally come from the late ones. The following table compares two standard varieties:—

COMPARISON OF AN EARLY AND A LATE VARIETY OF CAULIFLOWERS—5 YEARS

Variety	Season	Number of days ready to use	Weight of marketable heads in pounds					
			1915	1916	1917	1921	1922	Average
Algiers	Late	146	4·68	2·32	4·24	5·54	3·81	4·12
Erfurt	Early	122	2·47	3·12	2·97	2·25	2·83	2·73

It is seen that Algiers did not produce the largest heads every year and this was probably due to the fact that the hot, dry weather happened to come later than usual in 1916. A good plan would be to use only an early variety and start plants at two or three intervals of a week or so. If there is a vegetable for which not much calculation can be made about the time of starting plants, it is the cauliflower; and this is a case where the man who always delays has as good a chance of succeeding as his more alert neighbour.

Summary.—1. In general, to produce good marketable heads, cauliflower must be either very early or late, so as to escape the heat of midsummer. 2. Snowball and Erfurt are good early varieties, whilst Autumn Giant and Algiers are desirable late ones. The two latter would seem better for inland locations where there is not so much moisture in the air.

Protecting cauliflower plants against root maggots

The cauliflower is one of the hardest vegetable to produce profitably and anything which works against a nearly perfect stand must receive careful consideration because the proportion of good marketable heads is generally small even with the best of care. This is one of the reasons which prompted the starting of a project, in 1915, to compare two methods of protecting plants against root maggots. As the experiment is now closed, after eight tests covering five different seasons, results are given in the following table:—

Year	Variety	Not Protected					Protected with Tar Paper Discs					Protected with Cheese cloth Covers				
		Number planted	Number harvested	Percentage saved	Pounds harvested	Pounds per acre	Number planted	Number harvested	Percentage saved	Pounds harvested	Pounds per acre	Number planted	Number harvested	Percentage saved	Pounds harvested	Pounds per acre
1915	Early Snowball	33	2	6·06	3·50	1,219	33	5	15·15	16·75	5,837	33	8	24·24	21·25	7,405
1915	Early Erfurt	33	5	15·15	15·50	5,401	33	5	15·15	12·00	4,182	33	10	30·30	23·50	8,189
1916	Early Snowball	40	14	35·00	23·87	6,931	40	9	22·50	13·62	3,955	40	21	52·50	14·38	4,175
1916	Early Erfurt	40	9	22·50	11·00	3,194	40	14	35·00	22·12	6,423	40	12	30·00	7·87	2,285
1917	Early Snowball	40	16	40·00	42·38	12,307	40	11	27·50	30·13	8,749	40	26	65·00	42·37	12,304
1917	Early Erfurt	40	12	30·00	23·50	6,824	40	15	37·50	30·13	8,749	40	14	35·00	17·63	5,119
1918	Early Snowball	20	11	55·00	8·50	4,936	20	11	55·00	7·00	4,065	20	16	80·00	13·50	7,840
1919	Early Snowball	20	15	75·00	45·25	26,251	20	16	80·00	61·00	35,428	20	17	85·00	65·25	37,897
	Total	266	84	.....	173·50	67,093	266	86	.....	192·75	77,388	266	124	.....	205·75	85,214
	Average	33·25	10·50	31·58	21·69	7,577	33·25	10·75	32·29	24·09	8,416	33·25	15·50	46·62	25·72	8,985

The above figures show plainly that some kind of protection is required, as in every case the number of plants in the unprotected bunch was lower for one or even both of the protected lots. The tar paper discs have not shown to great advantage, probably because they were not placed exactly right on the surface of the soil and this is one reason why, in many cases, the tar felt discs have not proved satisfactory as the average gardener will not take as much care as was taken all through this experiment. The cheese cloth covers easily lead in the percentage of plants saved but a further analysis of the data show that the plants thus saved only averaged 1·66 pound whilst the unprotected ones averaged 2·07 pounds. If these cauliflowers had been sold by weight, the 84 unprotected ones would have brought, quality being alike, as much as 105 of the cheese cloth lot, so that this makes the difference of percentage saved decidedly smaller. An experiment with cabbage, just like this one, tends to show that bichloride of mercury will be the most efficient protection for plants of this class so that the conclusions of this one should only be used after taking into account the report on cabbage protection.

Summary.—1. There is no doubt that, generally, cauliflower plants should be protected against root maggots. 2. Cheese cloth covers have proven to be a much better protection than tar paper discs, but the use of bichloride of mercury is no doubt the best of the methods known to date.

VARIETY AND STRAIN TESTS OF CELERY

There are two distinct types of celery; the first is, in a measure, self blanching, such as White Plume and Golden Self Blanching, whilst the second must have all light entirely excluded in order to blanch it, such as Giant Pascal and Winter Queen. For twelve years, thirteen varieties and strains have been tested and the following table gives the yield of three of the leading ones which were grown alongside of each other for six years:—

COMPARISON OF THREE LEADING VARIETIES OF CELERY—SIX YEARS

Varieties	1916		1917		1919		1920		1921		1922		Average for six years			
													Actual yield		Corrected yield	
	Number of plants per acre	Pounds per acre	Number of plants per acre	Pounds per acre	Number of plants per acre	Pounds per acre	Number of plants per acre	Pounds per acre	Number of plants per acre	Pounds per acre	Number of plants per acre	Pounds per acre	Number of plants per acre	Pounds per acre	Number of plants per acre	Pounds per acre
Giant Pascal	5,808	7,529	21,780	20,509	21,780	22,869	20,328	32,851	21,780	29,040	21,780	19,602	18,876	22,067	19,481	22,774
Golden Self Blanching	1,452	1,452	21,780	22,782	21,054	17,787	19,602	16,698	21,780	19,420	21,780	14,883	17,908	15,504	19,481	16,867
White Plume	9,438	8,436	21,780	20,146	21,780	21,961	20,328	14,520	21,780	20,509	21,780	8,349	19,481	15,653	19,481	15,653

However, celery does not yet generally sell by weight so that the yield in pounds per acre, though meaning something, is not a fair criterion by which to judge the value of a variety. This was proved when samples were sent to three of the best retailers of Quebec City who all placed White Plume first, Golden Self Blanching second and either Giant Pascal or Winter Queen third or fourth. This was on October 12 and it was thought that if Giant Pascal were blanched in the cellar it would rank higher later on. But on January 17 following, two samples were sent to Quebec city, one of Golden Self Blanching (White Plume being a very early variety was all sold by then) and one of Giant Pascal with the result that the latter did not then command 75 per cent of the price of the former.

Summary.—1. Quality and appearance count more than weight and size in celery. 2. White Plume for very early. Golden Self Blanching for main crop, Giant Pascal for late winter are the best varieties tried at Cap Rouge.

Different methods of blanching celery

There are different methods of blanching celery and three of them have been compared during eight years. The first question was to see how each method would affect yield and the following table gives details about the matter:—

DIFFERENT METHODS OF BLANCHING CELERY AS AFFECTING YIELD

Year	Date sown	Date planted	Soil		Boards		Paper	
			Weight in pounds		Weight in pounds		Weight in pounds	
			Per plant	Per acre	Per plant	Per acre	Per plant	Per acre
1915	Jan. 22	June 7	0·32	6,970	0·33	7,187	0·20	4,356
1916	Feb. 4	" 3	0·93	20,255	0·74	16,117	0·80	17,424
1917	" 21	" 6	1·02	22,216	0·89	19,384	0·99	21,562
1918	Mar. 7	" 24	0·71	15,464	0·60	13,068	0·43	9,365
1919	" 5	" 27	1·37	29,839	1·24	27,007	0·86	18,731
1920	" 3	" 15	0·75	16,335	1·07	23,305	1·22	26,572
1921	" 9	July 5	0·89	19,384	0·65	14,157	0·65	14,157
1922	" 8	June 23	0·91	19,820	0·42	9,148	0·59	12,850
Average	.....	.....	0·86	18,731	0·74	16,117	0·72	15,682

It seems pretty well proved by this experiment that if a method is somewhat superior to others, as far as yield is concerned, it is blanching with soil.

The next question was to find out which method turned out the highest quality product and this was left for decision to three of the best retailers of Quebec city, to whom samples of each lot were sent for examination. Every one of these men without knowing how each lot had been treated or that two other retailers were asked the same thing, placed the celery blanched with soil first, whilst two of them could see no difference between the lots blanched with boards and with paper, and the other gave the preference for second choice to the sample blanched with boards. To see how these retailers estimated the difference of quality and appearance in dollars and cents, they were asked to price the three lots and the samples blanched with soil averaged about 25 per cent higher than the two other lots.

Soil can thus be recommended, as it also a cheaper method than either boards and paper. If boards or paper are used, they must not be left too long after the celery has reached a marketable stage, as there will be a loss in weight and in flavour, and the plant is liable to get pithy and diseased. It has

also been remarked that blanching with soil will protect against a few degrees of frost in the autumn, which is not the case with boards or paper.

Summary.—1. Banking is necessary where celery is grown for early use. 2. Soil gives better satisfaction than either boards or paper.

VARIETY AND STRAIN TESTS OF SWEET CORN

It is not hard to choose a good variety of sweet corn in districts where the season is long, and nearly every desirable quality may be included in the selection, but the choice is not so very easy where the season is short. The main question in this case is earliness and, though the ears may not be as large, it is gratifying to note that early varieties are available which produce a larger number of them per acre than the late ones. The following table shows this quite well:—

VARIETY AND STRAIN TESTS OF SWEET CORN—NUMBER OF EARS PER ACRE

Variety	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	Average	Days ready to use
Early Malcolm....	13,068	23,232	18,876	30,492	16,456	28,072	29,040	20,812	35,816	26,136	24,200	90
Golden Bantam....	11,616	7,260	20,328	24,200	15,246	28,072	28,314	30,972	19,360	27,588	21,296	115
Black Mexican....	8,712	0	23,474	33,880	9,680	23,716	26,136	17,424	38,236	26,620	20,788	113
Country Gentleman.....	2,904	10,164	18,392	25,652	7,502	0	23,474	20,812	14,520	13,552	13,697	120

NOTE.—The years when 0 is entered for yield, the variety did not produce any marketable ears.

There is an unfortunate tendency to use varieties such as Adams, which are not sweet, thinking that they are earlier than the sugar ones. But sweet varieties have been much improved in recent years and Early Malcolm, produced at the Central Experimental Farm, Ottawa, was nine days earlier than Adams in 1913, seven days in 1914, six days in 1915, seven days in 1916, ten days in 1917, and ten days in 1919. This shows that there is no need to sacrifice quality for earliness. Recent experiments have also shown that sweet corn can resist low temperatures better than other corn so that it may be sown a week at least before varieties such as Adams, which is also a very great advantage.

Summary.—1. It is better to use the really sweet varieties of corn rather than the others. 2. Early Malcolm is the best variety or strain of table corn tried at Cap Rouge.

Improvement of the Malakoff corn by selection

In 1911, Malakoff was sent to Cap Rouge from the Central Experimental Farm, Ottawa, for the trial plots where it was grown under number 68. A selection was made that year and many times since, the strain having been grown as follows: in 1912, under number 271; 1913, No. 547; 1914, No. 893; 1915, No. 1164; 1916, No. 1447; 1917, No. 1696; 1918, No. 1891; 1921, No. 2320; 1922, No. 2385. The selection was the highest yielder five years out of ten, over respectively 11, 24, 29, 23 and 8 other well-known varieties and strains. In 1922, it was at the head, beating Black Mexican, Country Gentleman, Early Malcolm, Extra Early Adams, Golden Bantam, Howling Mob, Pickaninny, Whipple Early for yield, and the second ready for use, only Pickaninny, a black variety, surpassing it for this. As it produced 23 per cent more than its rival for earliness, there does not seem any danger that it will be replaced by it, especially when the colour is taken into consideration.

IMPROVEMENT OF LARGE WEATHERSFIELD ONION BY SELECTION

In 1914, seed procured from Dupuy and Ferguson in 1912 was sown under No. 947. From the crop, bulbs were carefully selected and seed grown in 1915. In 1916, a crop was harvested under No. 1498, from which seed was grown in 1917. In 1918, another crop was harvested, No. 1900, and seed again grown in 1919. In 1920, a very careful selection of bulbs was made in the nursery and seed was grown in 1921. In 1922, bulbs were again selected in the nursery and placed in the cellar of the horticultural barn to grow seed in 1923. This continual selection has resulted in a very uniform type, and as the bulbs planted in spring, from the selected lot of the previous autumn, must necessarily be in good condition, it no doubt works towards a type which will be better than the average, for keeping qualities.

Distances at which to thin onions

Will onions do better if sown moderately or very thickly is a question sometimes asked and which the following table helps to answer:—

YIELD OF ONIONS WHEN PLANTS ARE THINNED AT DIFFERENT DISTANCES

Year	Variety	Date Sown	Date Pulled	Pounds of roots per acre					
				Thinned to 1 in.		Thinned to 2 in.		Thinned to 3 in.	
				Year	Average	Year	Average	Year	Average
1916	L. R. Wetherfield	April 26	Oct. 4	28,607	.....	29,782	.....	31,089	.....
1917	" "	May 8	" 10	28,572	28,589	33,183	31,482	24,600	27,844
1918	" "	" 17	" 1	21,497	26,225	22,659	28,541	19,754	25,148
1920	" "	" 7	Sept. 25	20,916	24,898	19,754	26,344	16,849	23,073
1922	" "	April 10	Oct. 16	9,877	21,894	7,803	22,636	6,536	19,766
1916	Yellow Globe Danvers	" 26	" 4	29,521	.....	29,260	.....	25,341	.....
1917	" "	May 8	" 11	27,419	28,470	19,219	24,239	16,912	21,126
1918	" "	" 17	" 1	24,111	27,017	21,787	23,422	27,888	23,380
1919	" "	" 10	" 3	32,245	28,324	24,111	23,594	17,720	21,965
1916	Prize Taker	April 26	" 4	29,782	.....	41,277	.....	26,575	.....
1917	"	May 8	" 11	29,725	29,753	31,262	36,269	20,244	28,409
1918	"	" 17	" 1	13,363	24,290	18,592	30,377	23,821	26,880
1918	Extra Early Red	" 17	" 1	22,368	.....	20,916	.....	19,173	.....
	Average	.....	.....	.....	24,462	.....	24,585	.....	22,039

It is remarkable that, for nearly all vegetables with which this experiment was tried, the two smaller distances give practically the same result whilst the yield is invariably lower when the space between plants reaches three to four inches.

Summary.—1. In general, for onions, thinning plants to two inches will give better results than one or three. 2. There are, naturally, exceptions such as when growing the crop for exhibition, also possibly for very large varieties such as Prizetaker or Denia.

IMPROVEMENT OF THE HOLLOW CROWN PARSNIP BY SELECTION

In 1914, seed was procured from Graham and grown under number 957; roots were chosen in the autumn and seed produced from them in 1915. In 1916, this seed was grown under number 1505; roots were chosen in the autumn and seed produced in 1917. In 1918, roots were picked again in the field but the

plants bearing seed in 1919 were diseased and left aside. From part of what was left of the 1917 seed, roots were produced in 1920 and 45 were planted in 1921; an insect attacked the plants and only 1½ pound of seed was produced. In 1922, roots were again grown and carefully selected in the field for seed production in 1923.

Distances at which to thin parsnips

This project has now given results which may be published, as the experiment has been made during five years. The following table shows that, like other root or bulb vegetable crops, the smaller the distance between plants, up to a reasonable limit of course, the heavier is the crop:—

COMPARISON OF THREE DISTANCES AT WHICH TO THIN PARSNIPS

Year	Date Sown	Date Pulled	Pounds of Roots per acre							
			Thinned to 2 inches		Thinned to 3 inches		Thinned to 4 inches		Average	
			Year	Average	Year	Average	Year	Average	Year	Average
1916	June 9	Oct. 13	23,435		18,905		23,482		21,941	
1917	May 16	" 11	34,267		33,977		31,363		33,202	
Two years				28,851		26,441		27,422		27,571
1919	May 12	Oct. 8	38,913		37,560		34,168		36,880	
Three years				32,205		30,147		29,671		30,674
1920	May 19	Oct. 22	29,040		31,799		34,848		31,896	
Four years				31,414		30,560		30,965		30,980
1922	May 11	Oct. 16	49,078		28,750		25,265		34,364	
Five years				34,947		30,198		29,825		31,657

The above table shows that there is a decrease in the crop when plants are left farther apart in the row.

VARIETY AND STRAIN TEST OF GARDEN PEAS

Sixty-four varieties and strains of garden peas have been tested during the last twelve years and only eight have been found good enough to be continued. Leaving aside the edible podded sorts, which do not seem to be popular in this country, garden peas may be classified into smooth or wrinkled climbing, semi-dwarf or dwarf, early, midseason or late, green or light-coloured. The smooth pea is generally very early but is of a poor quality on account of its low sugar content; when it has other qualifications a dwarf or semi-dwarf variety is to be preferred to a climbing one as there is not the expense of attending to supports; as to the question of season, it must be looked into, for a choice, by the grower himself who should decide if the bigger price received for early peas counterbalances the higher yield which the later kinds invariably give.

It is practically impossible to compare varieties of different seasons, for yield, so that two tables are given, one for each class.

Name	Plant	Pea			Yield: Number of quarts of Green Shelled Peas per acre						Season: Number of Days after Sowing when Ready for Use					
	Character	Surface	Colour	Size	1911	1912	1913	1915	1919	Average	1911	1912	1913	1915	1919	Average
Gregory Surprise	Semi-dwarf	Wrinkled	Greenish	Medium	726	605	1,210	847	1,210	920	43	56	50	63	54	53
Thomas Laxton	Semi-dwarf	Wrinkled	Whitish	Large	726	484	1,452	968	1,573	1,041	47	58	50	63	56	55
American Wonder	Dwarf	Wrinkled	Whitish	Medium	847	605	1,452	363	1,573	968	45	58	53	67	58	56
Gradus	Semi-dwarf	Wrinkled	Whitish	Large	605	605	1,694	363	1,452	944	45	58	54	63	63	57
Sutton Excelsior	Semi-dwarf	Wrinkled	Whitish	Large	484	968	1,694	1,331	1,815	1,258	48	61	59	63	62	59

The above mentioned years are chosen because they were the only ones during which five amongst the well known kinds were tried at the same time. It seems quite clear that Gregory Surprise is the earliest of all those tested as there was never a variety which was ready for use before it was, during any season.

Garden Peas Compared for Yield

Name	Plant	Pea			Yield													
					Number of Quarts of Green Shelled Peas per acre													
	Character	Surface	Colour	Size	1911	1912	1913	1914	1915	5 years Average	1916	1917	7 years Average	1918	1919	1920	1922	11 years Average
Juno	Semi-dwarf.	Wrinkled.	Greenish.	Large.	1,089	847	2,178	847	1,331	1,258	2,662	2,178	1,590	2,420	1,815	1,815	1,815	1,727
Stratagem	Climbing.	Wrinkled.	Greenish.	Large.	1,452	605	1,815	726	1,331	1,186	2,662	2,904	1,642	2,178	1,815	1,452	1,452	1,672
Heroine	Semi-dwarf.	Wrinkled.	Greenish.	Large.	968	605	2,178	484	1,573	1,162	2,178	2,057	1,435	.....	.....	.....	.....	.....
McLean Advancer.	Semi-dwarf.	Wrinkled.	Whitish.	Medium.	1,573	605	2,057	484	1,573	1,258	2,178	484	1,279	.....	.....	.....	.....	.....
Telephone	Climbing.	Wrinkled.	Whitish.	Large.	968	605	2,420	363	726	1,016	.....	.....	.....	.....	.....	.....	.....	.....

Name	Season													
	Number of Days after Sowing when Ready for Use													
	1911	1912	1913	1914	1915	5 years Average	1916	1917	7 years Average	1918	1919	1920	1922	11 years Average
Juno	61	73	67	69	74	69	84	80	73	77	69	76	75	73
Stratagem	61	72	62	67	74	67	84	80	71	77	72	78	78	73
Heroine	57	71	67	67	74	67	83	80	67	.....	.....	.....	.....	.....
McLean Advancer	55	61	57	60	67	60	75	70	60	.....	.....	.....	.....	.....
Telephone	56	68	64	65	73	65	.....	.....	.....	.....	.....	.....	.....	.....

As years passed, varietes were dropped when it was clear, after at least five years' test, that they were not as high yielders as others which were kept.

Summary.—1—For earliness, Gregory Surprise has shown decided superiority. 2—For yield, Juno is at the top.

Improvement of Juno garden pea by selection

In 1920, twelve good plants of the Juno garden pea were chosen and details are herewith given about them.

DETAILS ABOUT TWELVE DIFFERENT PLANTS OF JUNO GARDEN PEA—1920

Strain Number	Number of pods per plant	Number of peas per plant
1	11	63
2	9	43
3	13	75
4	15	79
5	9	48
6	11	67
7	8	45
8	19	113
9	12	68
10	9	54
11	9	45
12	10	52

In 1921, thirty peas were sown from each of the above mentioned plants in as many different rows, spaced in such a way that each plant could easily be examined. Some did not grow, others were destroyed in one way or another, but the following table gives details about every one which survived:—

YIELD OF TWELVE DIFFERENT STRAINS OF JUNO GARDEN PEA—1921

Strain number	Total number of plants	Total number of pods	Number of pods per plant	Total number of peas	Number of peas per plant	Total weight of peas	Weight of peats per plant
						Ounces	Ounces
1	23	144	6·26	660	28·70	7·50	0·33
2	26	148	5·69	690	26·54	7·50	0·29
3	15	120	8·00	655	43·67	7·00	0·47
4	24	147	6·12	726	30·25	8·00	0·33
5	25	142	5·68	728	29·12	8·00	0·32
6	24	133	5·54	746	31·08	8·00	0·33
7	20	150	7·50	806	40·30	8·50	0·42
8	10	68	6·80	343	34·30	4·00	0·40
9	16	81	5·06	405	25·31	4·50	0·28
10	15	140	9·33	700	46·67	8·00	0·50
11	17	111	6·53	565	33·24	6·50	0·38
12	19	144	7·58	728	38·32	8·00	0·42

In 1922, the same thing was done as the previous year with the six strains which had shown up well either in 1920 or in 1921, and the results follow:—

YIELD OF SIX DIFFERENT STRAINS OF JUNO GARDEN PEA—1922

Strain number	Date sown	Date ready for use	Ounces of shelled green peas picked			
			July 17	July 19	July 22	Total
3	May 4	July 14	2·0	3·0	1·0	6·0
4	" 4	" 14	3·0	3·50	1·50	8·0
6	" 4	" 14	3·50	2·50	2·0	8·0
8	" 4	" 14	4·0	3·0	2·0	9·0
10	" 4	" 14	3·0	2·0	0·50	5·50
12	" 4	" 14	4·50	2·50	1·50	8·50

Summary.—1—It is much too early to draw conclusions from this experiment. 2—An interesting strain is No. 8, at the top in 1920, at the bottom in 1921, and back at the top in 1922.

Comparison of an Early Variety of Garden Pea Sown at Four Intervals of about One Week with Four of Different Seasons

Green peas are fast becoming one of the important vegetable crops but they remain a very short while at their best, so that either one variety must be sown at intervals or varieties of different seasons must be sown at the same time. An experiment has now been conducted about this matter during five consecutive seasons and the following table gives details:—

ONE EARLY VARIETY OF GARDEN PEAS VERSUS FOUR VARIETIES OF DIFFERENT SEASONS

Year	One Early Variety sown at four different intervals									Four Varieties of different Seasons sown the same day								
	Thomas Laxton		Thomas Laxton		Thomas Laxton		Thomas Laxton		Average number of gallons of green peas per acre	Thomas Laxton		Gradus		Advancer		Stratagem		Average number of gallons of green peas per acre
	Sown on	Gallons of green peas per acre	Sown on	Gallons of green peas per acre	Sown on	Gallons of green peas per acre	Sown on	Gallons ofgreen peas per acre		Sown on	Gallons of green peas per acre	Sown on	Gallons of green peas per acre	Sown on	Gallons of green peas per acre	Sown on	Gallons of green peas per, acre	
1916.....	April 29	675	May 5	765	May 12	515	May 19	444	599	April 29	675	April 29	453	April 29	693	April 29	569	597
1917.....	May 11	128	" 18	166	" 25	181	June 1	287	190	May 11	128	May 11	378	May 11	378	May 11	279	275
1918.....	" 14	187	" 21	309	" 28	195	" 4	191	220	" 14	187	" 14	238	" 14	291	" 14	202	229
1919.....	" 15	363	" 22	363	" 29	318	" 5	385	357	" 15	363	" 15	476	" 15	454	" 15	439	433
1922.....	" 4	148	" 11	141	" 18	182	May 26	180	163	" 4	148	" 4	219	" 4	346	" 4	296	252
Average....	.....	300	.....	349	.....	278	.....	297	306	.....	300	.....	353	.....	420	.....	357	357

It is seen by the above figures that the four varieties yielded about 12 per cent more, besides lengthening the season some five days. When only one variety is used, it must be an early one, so that the crop from the first lot sown may bring a good price, and as early varieties practically always yield less than others which take longer to develop, the four varieties of different seasons bring in a bigger crop. There is the advantage, for the busy man, that one sowing finishes all the work of putting in the crop, but there is also the drawback of having to save or to buy seed of four varieties, with chances of not always getting the right ones.

Summary.—1—Thomas Laxton, Gradus, Advancer, Stratagem sown the same day gave around 12 per cent more green shelled peas and lengthened the season some five days, compared with Thomas Laxton sown at four intervals of about a week. 2—The drawback, in using four varieties, is that unless a person saves seed himself, he is not always sure of getting the right kinds.

VARIETY AND STRAIN TEST OF POTATOES

Out of sixty-seven varieties and strains tried during twelve years, only seven were kept as worthy of further test, and the following table gives information about six of these, the other, Dooley, having only been taken since 1921:—

VARIETY AND STRAIN TEST OF POTATOES—1917 to 1922 INCLUSIVELY

Variety	Size	Form	Colour	Season	Average yield per acre Pounds		
					Marketable	Unmarketable	Total
Green Mountain	Large	Oblong	White	Late	16,368	3,388	19,756
Dreer Standard	"	Oval	"	"	13,123	1,755	14,878
Irish Cobbler	Medium	Round	"	Early	12,507	1,100	13,607
Table Talk	"	Oval	"	Late	10,505	2,442	12,947
Morgan Seedling	Large	"	"	Medium	10,780	1,577	12,357
Warrior	Medium	"	"	Late	9,493	2,124	11,617

Dooley has shown itself superior to Green Mountain the two years, 1921 and 1922, when it was tested, but it will have to keep this up for at least three years more before it can safely be recommended.

Summary.—1. It would be much better for all potato growers of a district to grow only one or two varieties so that dealers would know where to find carloads of standard sorts. 2. Up to the present, no mistake can be made in using Irish Cobbler for early use and Green Mountain for the general crop.

Improvement of the Green Mountain potato by selection

The title of this project may not seem correct to the specialist in plant breeding who is generally inclined to believe that very few, if any, valuable variations are likely to occur within a commercial variety of potatoes. But nobody would contradict the fact that selection will greatly help in the elimination of weak and diseased plants. And the aim of this project is to isolate the best normal, healthy plants and find out if they will continue to produce normal, healthy plants. If they do, the new strain, or whatever it may be called, will have a greater value to the grower than the others, and the work will not have been undertaken for nothing.

Since 1915, a great deal of work has been done at Cap Rouge in this experiment and enough data have been gathered to fill up this report with figures. The summers are too warm here to favour the development of good seed potatoes and results have been rather disappointing. Out of hundreds of selections, only

five have been kept since 1920 and the following table gives information about them:—

IMPROVEMENT OF THE GREEN MOUNTAIN POTATO BY SELECTION

Strain Number	Yield per acre in pounds				Diseased		
	1920	1921	1922	Average	1920	1921	1922
501	69,696	25,410	11,018	35,375	Yes	No	No
312	84,942	23,232	13,517	40,564	Yes	Yes	No
613	62,073	30,492	14,478	35,681	No	No	No
723	66,429	20,328	10,506	32,421	No	Yes	No
151	76,230	18,876	8,200	34,435	Yes	Yes	No
Average	71,874	23,668	11,544	35,695			

A glance at the above table shows some very interesting things. For instance, there are years which are a great deal more favourable than others, as may be seen by the average yield; there are strains which are more resistant to diseases, as 613 for instance; there are years (1920) when disease-free strains (613 and 723) gave smaller crops than diseased ones (50 and 313), so that other factors must have come in to lower yields.

If 613 continues to be disease-resistent for a few years it will be sent for multiplication to a territory better adapted to potato seed production.

VARIETY TEST OF RHUBARB

Six varieties of rhubarb have been tested on a uniform looking sandy loam with exposure to the south and a great deal of difference was found in the respective yields. A good variety of rhubarb, must be a heavy yielder, have short thick stalks of a high colour, thin and tender skin which does not need to be removed in cooking, crisp and tender fibre with plenty of juice, fine flavour, besides being ready to be used early, and with the least possible tendency to produce seed. It is needless to say that very few varieties possess all these qualities, but the aim is to find out, by careful tests, which combines them in the highest degree.

After five crops, Linnaeus and Monarque were pulled out because they were low yielders, compared to others which were kept; the same thing happened to Prima Dona after six seasons, and to Victoria, after seven years of careful testing. The only two varieties which were kept were Hobday Giant and St. Martin, the last named being by far the best of all the six tried at Cap Rouge. The following table gives details as to yields since 1915 inclusive, also as to the weight per stalk in 1922:—

COMPARATIVE YIELD OF SIX VARIETIES OF RHUBARB

Variety	Yield per acre—Pounds											
	1915	1916	1917	1918	1919	Average for five years	1920	Average for six years	1921	1922	Average for seven years	Average weight per stalk in 1922—Pounds
St. Martin	12,660	23,050	44,785	57,218	44,604	36,463	72,691	42,501	No	48,234	43,320	0·52
Hobday Giant	25,183	15,337	43,197	44,876	15,745	28,868	20,373	27,452	re-	37,344	28,865	0·40
Victoria	18,377	9,347	27,679	26,953	16,607	19,793	23,368	20,388	cords	34,666	22,428	0·35
Prima Donna	3,494	10,799	25,682	40,611	19,057	19,929	14,611	19,042	kept	.....	.....	.....
Linnaeus	10,164	14,475	27,588	13,431	7,986	14,729	.....	.....		.....	.....	.....
Monarque	.....	9,165	12,886	27,724	9,302	11,815	.....	.....		.....	.....	.....

Summary.—1. Yield per acre, small production of seed, earliness, short stout stalks, high colour, fine eating qualities are the main things looked for in rhubarb by the producer, though the consumer, in general, appreciates very little except size and appearance. 2. The two varieties which come nearest to the ideal are St. Martin and Hobday Giant, with a very pronounced preference for the first mentioned.

VARIETY AND STRAIN TEST OF TOMATOES

According to the Bureau of Agricultural Economics of the United States Department of Agriculture, there was a 50 per cent gain in tomato shipments during 1922 compared with the previous year. This is getting to be one of the most important vegetables and there are more inquiries about it at this station than about any other. Out of the seventy-eight varieties and strains tested during twelve years, only four were left in 1922 and three of these are strains of Earliana. The following table gives information for the last six years about these four:—

YIELD OF RIPE FRUIT AND TIME TO MATURE—FOUR LEADING VARIETIES OF TOMATOES

Year	Earliana C. R.		Prosperity		Burbank Early		Alacrity	
	Pounds of ripe fruit per acre	Days to come to maturity	Pounds of ripe fruit per acre	Days to come to maturity	Pounds of ripe fruit per acre	Days to come to maturity	Pounds of ripe fruit per acre	Days to come to maturity
1917	15,110	160	9,120	157	12,523	158	5,173	165
1918	8,372	147	8,508	150	10,550	150	9,529	150
1919	44,104	133	58,874	136	45,942	141	35,392	133
1920	42,199	144	24,298	146	17,832	145	18,989	146
1921	49,549	146	48,188	149	46,691	149	30,084	149
1922	25,728	151	31,717	146	23,073	146	30,220	141
Average	30,844	147	30,117	147	26,102	148	21,564	147

In the above table, when two strains were tested the same year, figures are given for the best.

A remarkable thing is that the average number of days to come to maturity is practically the same, to one day, for the four.

Summary.—1. Strains of Earliana have shown themselves, practically all the time, to be the best adapted to conditions of central Quebec. 2. The Cap Rouge selection is at the head and is now offered for sale at twenty-five cents per packet of one hundred seeds.

The improvement by selection of the Earliana tomato

In 1911, Earliana tomato seed was procured from A. W. Burpee, Philadelphia, U.S.A., and was sown under record number 185. The plant showing the largest number of early fruit was chosen that autumn and seed was sown in 1912 under number 412. The selection was thus continued, as follows: 1913, No. 757; 1914, No. 1048; 1915, No. 1332; 1916, No. 1573; 1917, No. 1830; 1918, No. 1940. In 1919, it was decided to isolate a good strain of the selection and data was collected on forty-five different plants, 260 different weighings being made; in 1920, the ten most likely strains were continued and in 1921, the number was cut down to two. In 1922, though No. 10 gave a slightly higher yield, it was decided to keep No. 17 because two pickings had already been made from it before any fruit from the other strain was ready to use. It is earnestly believed that this strain No. 17, which has been named Capiana, will produce

a larger proportion of fruit, early in the season when prices are high, than any other variety or strain tried at Cap Rouge. Seed will be offered for sale in 1923 and the selection of the best plants, for the purpose above named, will be continued each year.

Comparison of two methods of training tomato plants

Training tomato plants is not necessary and does not pay under ordinary conditions, especially when using varieties of the Earliana type. But for conditions out of the ordinary, such as on rich, strong land, or with tall varieties having an abundance of foliage, or again where the home garden is small and space must be economized, it may be advisable to use some kind of support. This is what prompted the project of comparing stakes for each plant with horizontal wires held by posts put in every fifteen feet. The following table gives details:—

COMPARISON OF TWO METHODS OF TRAINING EARLIANA TOMATO PLANTS

Year	Number of plants put in	Date sown	Date planted	Trained to stakes				Trained to horizontal wires			
				Yield per plant Pounds		Yield per acre Pounds		Yield per plant Pounds		Yield per acre Pounds	
				Green	Ripe	Green	Ripe	Green	Ripe	Green	Ripe
1915	200	Mar. 17	June 8	1·17	2·71	3,185	7,378	1·10	2·68	2,995	7,296
1916	100	" 7	May 29	1·62	6·46	4,410	17,587	1·84	5·82	5,009	15,845
1917	24	" 22	June 9	3·25	1·17	8,848	3,185	3·08	2·42	8,385	6,588
1918	28	April 2	" 8	2·86	1·00	7,786	2,722	2·57	1·07	6,997	2,913
1919	24	" 2	" 12	2·42	5·58	6,588	15,192	2·17	5·75	5,908	15,654
1920	20	Mar. 19	" 9	5·00	2·60	13,612	7,078	1·80	2·20	4,900	5,990
1921	14	" 15	" 6	6·86	19·00	18,676	51,727	13·28	22·60	36,155	61,528
Average	58	.....	.....	3·31	5·50	9,015	14,981	3·69	6·08	10,050	16,545

Summary.—1—Under usual conditions, it does not pay to train tomato plants. 2—If it is decided to do so, horizontal wires held by posts in every fifteen feet is as good a method as any.

Comparison of different methods of pruning tomatoes

In last year's report, details were given showing the following results with Earliana:—

COMPARISON OF DIFFERENT METHODS OF PRUNING TOMATOES

Method	Pounds fruit per acre		
	Ripe	Green	Total
Not pruned	27,301	26,783	54,084
Pruned to two stems, foliage intact	13,178	8,899	23,077
Pruned to two stems, part foliage removed	10,750	6,656	17,406
Pruned to one stem, foliage intact	10,915	5,858	16,773
Pruned to one stem, part foliage removed	7,885	4,417	12,303

It is seen that practically all through, in fifteen cases, with a single exception, pruning has cut down the total, the green, and the ripe crop.

According to the 1922 report of the Research Committee of the Vegetable Growers' Association of America, "results of experiments on pruning tomatoes in Illinois, Missouri, New York and elsewhere have shown that the yield is reduced by pruning, the reduction being proportional to the amount of pruning done. No compensating advantages in earliness and quality have shown up. All of the experiments in the northern states have given similar results and they are conclusive and all show that pruning tomatoes is injurious."

Summary.—1—It seems that the foliage is the manufacturing part of the plant and that it will manufacture less if part of it is removed. 2—Pruning tomatoes, unless foliage diseases are severe, is very seldom advisable.

COMPARISON OF DISTANCES AT WHICH TO THIN GARDEN TURNIPS

This project has received attention during three seasons, 1917, 1919, 1922, and it seems that a few notes should be given about it. The fact that field turnips are generally thinned from 8 to 12 inches would make one feel inclined to do the same with roots cultivated for human consumption. But turnips grown for stock feeding may be rough and contain much fibre without strong objection whilst those for the table should be smoother and more tender. This is why the latter are somewhat better of being a little crowded.

COMPARISON OF DISTANCES AT WHICH TO THIN GARDEN TURNIPS

Year	Variety	Date Sown	Date Pulled	Yield per acre—Pounds			
				Thinned to 2 inc.	Thinned to 3 inc.	Thinned to 4 inc.	All distances
1917	Favourite	May 16	Oct. 16	26,726	60,279	34,279	40,428
1919	Sutton Purple Top	June 16	" 18	29,185	21,954	20,473	23,871
1922	Good Luck	May 11	" 16	101,274	75,794	68,389	81,819
Average for three years				52,395	52,676	41,047	48,706

It is yet too early to say which of the three distances is the best, but the figures, up to the present, tend to show that four inches between plants does not give as high a tonnage as two or three. The yield of over fifty tons per acre for plants thinned to two inches, in 1922, shows that very heavy crops can be had even when roots practically touch each other. It should not be forgotten that turnips, as well as any other root sold for human consumption, should be sold when young and small.

CEREALS

WHAT KIND SHOULD BE GROWN FOR STOCK FEEDING IN CENTRAL QUEBEC

Carefully collected and compiled data show that, at Cap Rouge, it cost, for an average of eight years, $6.28 per ton to grow mixed timothy and clover hay, while the figures were $16.05 for Banner oats, allowing the generous sum of $5 per ton for the straw. This means that it cost 156 per cent more to grow a ton of Banner oats, the variety which produces at Cap Rouge the largest number of pounds of grain per acre, than it did to grow a ton of mixed timothy and clover hay. It is true that there is about 32 per cent more total dry matter in oats than in mixed hay and it must also be admitted that, in this dry matter, there is 52 per cent more crude protein in oats than in mixed hay also 24 per cent

more carbohydrates and fat combined. But it is quite easy to see that dry matter, and especially protein, cost a great deal more per ton in oats, the highest yielding grain in pounds per acre at Cap Rouge, than in mixed hay.

This is an important point which asks for careful consideration.

Possibly, it might be said, conditions at Cap Rouge favour hay and if a comparatively low yield of oats is secured, this will militate against it by bringing up the cost of production per ton. But this is not the case, as will presently be seen. The average crop of oats was 1,814 pounds per acre and of mixed hay 4,587 pounds at Cap Rouge, which is a ratio of about 1 to 2·5, whilst at the Central Experimental Farm, Ottawa, from 1916 to 1920 inclusive, this ratio was 1 to 3·5. It is thus clear that the mixed hay received no due advantage from this fact.

Then, the cost data might possibly have favoured hay. But this was not the case either. Rent of land and use of machinery were exactly the same for hay and for oats; the charges for manure, seed and twine were entered as they should be; and the actual man and horse labour was calculated at the same price per hour for both crops.

No doubt, the cost per ton of dry matter could be cut down, to a certain limit, in certain cases, by better drainage, fertilization, or tilth. But this would be advantageous to both crops and there is nothing much to expect from these methods, to help oats more than hay.

Where, then, is improvement in favour of the grain to come from? Possibly by choosing kinds of grain which produce more digestible matter and especially more crude protein per acre than does oats.

The following table is very interesting:—

COMPARISON OF YIELD PER ACRE OF GRAIN, DRY MATTER, AND DIGESTIBLE NUTRIENTS IN FOUR IMPORTANT CROPS

Year	Arthur Peas						Banner Oats					
	Yield of Grain per acre	Dry Matter per acre	Digestible Nutrients per acre				Yield of Grain per acre	Dry Matter per acre	Digestible Nutrient per acre			
			Crude protein	Carbo-hydrates	Fat	Total			Crude protein	Carbo-hydrates	Fat	Total
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
1911	2,280	1,938	449	1,124	9	1,582	2,820	2,527	248	1,387	121	1,756
1914	1,200	1,020	236	592	5	833	1,960	1,756	172	964	84	1,220
1915	1,564	1,329	308	771	6	1,085	2,404	2,154	211	1,183	103	1,497
1916	1,950	1,657	384	961	8	1,353	2,398	2,149	211	1,180	103	1,494
1917	2,040	1,734	402	1,006	8	1,416	2,040	1,828	179	1,004	88	1,271
1918	2,160	1,836	425	1,065	9	1,499	1,410	1,263	124	694	61	879
1919	1,230	1,045	242	606	5	853	2,580	2,312	227	1,269	111	1,607
1920	2,280	1,938	449	1,124	9	1,582	2,340	2,097	206	1,151	101	1,458
1921	1,936	1,645	381	954	7	1,342	1,465	1,313	129	721	63	913
1922	2,900	2,465	571	1,430	11	2,012	3,247	2,909	286	1,597	140	2,023
Average	1,954	1,661	385	963	8	1,356	2,266	2,030	199	1,115	97	1,411

Year	Manchurian Barley						Huron Wheat					
	Yield of Grain per acre	Dry Matter per acre	Digestible Nutrients per acre				Yield of Grain per acre	Dry Matter per acre	Digestible Nutrients per acre			
			Crude protein	Carbo-hydrates	Fat	Total			Crude protein	Carbo-hydrates	Fat	Total
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
1911	1,290	1,151	108	842	21	971	2,340	2,094	206	1,579	35	1,820
1914	660	589	55	431	10	496	1,640	1,468	144	1,107	25	1,276
1915	1,942	1,732	163	1,268	31	1,462	1,488	1,332	131	1,004	22	1,157
1916	780	696	65	509	12	586	1,129	1,010	99	762	17	878
1917	1,440	1,284	121	940	23	1,084	1,500	1,342	132	1,012	22	1,166
1918	1,890	1,686	159	1,234	30	1,423	1,170	1,047	103	790	18	911
1919	810	722	68	529	13	610	690	618	61	466	10	537
1920	2,130	1,900	179	1,391	34	1,604	1,770	1,584	156	1,195	27	1,378
1921	1,375	1,226	115	898	22	1,035	1,556	1,393	137	1,050	23	1,210
1922	2,449	2,184	206	1,599	39	1,844	1,990	1,781	175	1,343	30	1,548
Average	1,477	1,317	124	964	23	1,111	1,527	1,367	134	1,013	23	1,818

A careful study of the above figures show that in comparing the four varieties of field peas, oats, barley, and spring wheat which have done the best at Cap Rouge, the two last mentioned cereals, from the standpoint of producing feed for live stock, do not yield enough digestible nutrients, especially crude protein, per acre. The whole thing may be easily seen at a glance by reading the last line of the table " average " from left to right.

This at once shows that figures giving only yield of grain per acre might be misleading to persons who do not get at the *meat* of the whole matter by finding out the digestible nutrients. Thus Banner oats, with its yield of 2,266 pounds of grain per acre, containing 2,030 pounds of dry matter, would seem to be an easy leader over Arthur peas with a yield of 1,954 pounds of grain per acre, containing 1,661 pounds of dry matter. At first sight, one would be inclined to say that the oats yielded, per acre, 16 per cent more grain containing 22 per cent more dry matter. But when the figures are carefully analysed it is found that the Banner oats produced per acre 1,411 pounds of digestible nutrients of which only 199 were crude protein, the most valuable part of the grain, whilst Arthur peas gave 1,356 pounds of digestible nutrients containing 385 pounds of crude protein. Though it hardly seems possible, Arthur peas at Cap Rouge produce a crop which is nearly twice as valuable as that from Banner oats, when the matter is looked at from a live stock feeding point of view, for the growing of all young stuff and the production of milk.

What is the conclusion of all this? That, under conditions as they exist at Cap Rouge, ordinary bread-making varieties of spring wheat cannot profitably be grown for live stock feed; that the varieties of barley tried to date could only profitably be grown for commerce, as for making beer, etc., because they do not produce as much protein, carbohydrates or fat per acre as do the best varieties of oats; that oats should continue to be the main cereal of Central Quebec, because it produces by far more digestible nutrients per acre that either barley and wheat and, further, oats is required to seed down to a hay crop; and—here is the most important recommendaion—that field peas should be grown very much more extensively on account of their high yield of crude protein per acre and of their ability to secure nitrogen from the air.

VARIETY AND STRAIN TESTS OF BARLEY

During the last twelve years, nineteen varieties and strains of two-rowed and six-rowed barleys were tested and the following were or will be discarded because not as suitable to conditions of Central Quebec as others which were kept: Beaver, Black Japan, Duckbill, Gold, Hannchen, Success, Swan's Neck, Swedish Chevalier. As a general rule, the six-row varieties have yielded heavier and matured earlier than the two-row sorts, with the exception of Early Chevalier which has produced more grain per acre and has ripened before the best of the six rowed ones. Four well-known varieties have now been tested the same years, during ten seasons, and it is interesting to compare them side by side:—

COMPARISON OF FOUR VARIETIES OF BARLEY GROWN AT CAP ROUGE FOR TEN YEARS

Year	Early Chevalier, Ottawa 51		O. A. C. No. 21		Manchurian, Ottawa 50		Success	
	Pounds per acre	Days to mature	Pounds per acre	Days to mature	Pounds per acre	Days to mature	Pounds per acre	Days to mature
1911	1,920	74	660	80	1,290	79	1,305	68
1912	1,380	100	900	97	1,020	100	1,080	91
1915	1,905	80	1,717	83	1,942	81	1,743	77
1916	900	84	1,260	85	780	89	1,020	79
1917	1,770	88	1,440	90	1,440	87	1,050	85
1918	1,740	83	1,710	86	1,890	89	1,200	77
1919	1,290	88	990	88	810	90	960	78
1920	2,010	77	2,160	79	2,130	84	1,320	76
1921	1,650	78	2,000	78	1,375	79	1,625	72
1922	2,525	84	2,400	88	2,449	87	2,175	79
Average	1,709	84	1,524	85	1,513	86	1,348	78

Manchurian has been recommended for a few years and, though Early Chevalier admittedly has yielded more grain per acre, it seems better to stick to the first mentioned which seems likely to be much improved by selection, as was shown by the new Chinese, at Ottawa, and the No. 14 at Cap Rouge, both daughters of the old variety which are acknowledged to be quite ahead of it for production. The Cap Rouge No. 14, in a test of four years, has averaged 246 pounds per acre more than Early Chevalier and if it keeps doing as well for a year or two more, it will be propagated and offered for sale.

The following table gives details about all varieties tested in 1922:—

VARIETY AND STRAIN TESTS OF BARLEY AT CAP ROUGE IN 1922

Name of variety	Number of rows	Important varietal character	Average length of plant	Strength of straw on a scale of 10 points	Yield per acre	Days to mature
			Inches		Pounds	
Early Chevalier, Ottawa 51	Two	Awned	56	10	2,525	84
Manchurian, Ottawa 50	Six	"	50	10	2,449	87
Escourgeon	"	"	50	10	2,425	87
O. A. C. 21	"	"	49	10	2,400	88
Albert, Ottawa 54	"	"	39	10	2,273	79
Stella, Ottawa 58	"	"	49	10	2,247	88
Success	"	Hooded	37	10	2,175	79
Chinese, Ottawa 60	"	Awned	45	10	2,125	84
Himalyan, Ottawa 59	"	Hulless	35	10	2,050	83

Success may be recommended for districts where the season is very short as it is the earliest grain of all that were tried at Cap Rouge; it would also suit those who wish to have a variety of barley having no awns.

Summary.—1. The results of ten years have shown that six-row varieties of barley yield more grain per acre and ripen earlier, on an average, than the two-row varieties, the exception, amongst the latter, being Early Chevalier which is at the top of all for production. 2. Manchurian is recommended as suiting the conditions of Central Quebec.

Improvement of Manchurian Barley by Selection

In 1913, ninety average heads were chosen in a field, and, in 1914, part of the grain of each was sown in as many rows. By 1915, the number of strains had been cut down to thirty and to ten the next year. In 1917, the best strain

was multiplied, and in 1918, 1919, 1920 and 1921 it was in the trial plots, where it outyielded all the varieties tested alongside of it, beating the best one by an average of 203 pounds per acre. During autumn of 1921, all the seed grain burned at Cap Rouge, but a one-pound sample of this selection was procured from the Dominion Cerealist to whom it had been sent previous to the fire. This grain was sown in 1922, and produced 23 pounds, part of which will be used in the variety tests of 1923.

VARIETY AND STRAIN TESTS OF FLAX

High-priced and oftentimes inefficient labour has militated against the growing of flax for fibre in Eastern Canada, though repeated trials, on acre plots, have shown conclusively that conditions of climate and soil are, in general, favourable. It is possible that the fibre may in future be used for many other things than cloth, as it already enters into the manufacture of thread, yarn, binding twine, insulating material, upholstering, and when the demand is keener, the price will rise. If this ever happens, varieties like Longstem, with plants averaging nearly 50 per cent longer than those grown for seed, and with very few branches, will be the most profitable to use.

For seed production, shorter varieties are required with many top branches bearing a large number of seed-bolls, so that there are practically two different kinds of flax, one for fibre and the other for seed production. The following table shows how widely different two varieties may be:—

COMPARISON OF TWO VARIETIES OF DISTINCT TYPES OF FLAX GROWN AT CAP ROUGE FOR SIX YEARS

Variety	1915			1916			1917			1918			1919			1920			Average		
	Pounds of seed per acre	Length of plant—Inches	Days to mature seed	Pounds of seed per acre	Length of plant—Inches	Days to mature seed	Pounds of seed per acre	Length of plant—Inches	Days to mature seed	Pounds of seed per acre	Length of plant—Inches	Days to mature seed	Pounds of seed per acre	Length of plant—Inches	Days to mature seed	Pounds of seed per acre	Length of plant—Inches	Days to mature seed	Pounds of seed per acre	Length of plant—Inches	Days to mature seed
Longstem, Ottawa 52	664	35	106	416	32	103	615	31	111	545	43	101	555	37	92	1012	33	103	634	35	103
Novelty, Ottawa 53...	878	22	108	618	21	112	915	26	115	660	31	101	982	26	101	1230	26	98	880	26	106

The above test was enough to show that Longstem is by far the better of the two for fibre production, but as the project was more to find out the high seed yielder, this variety was replaced by Premost, and details are hereby given for 1922:—

VARIETY AND STRAIN TEST OF FLAX FOR SEED PRODUCTION AT CAP ROUGE IN 1922

Variety	Colour of flower	Colour of seed	Size of seed	Length of plant	Weight of straw per acre	Weight of seed per acre	Days to mature
				Inches	Pounds	Pounds	
Novelty	Blue	Light brown	Medium	34	3,225	1,475	111
Premost	Blue	Brown	Small	33	4,275	1,250	104

Well-known authorities, as Bull of Minnesota, for instance, maintain that until a higher price is obtained for fibre, and labour is cheaper and more reliable, the growing of flax, to be remunerative, will have to be for fibre coupled with

seed production. This means that varieties either of superior seed, or of extra fibre-yielding properties would have to be replaced by a general-purpose one. Is it possible to obtain it? Plant breeders no doubt will soon effectively answer the question.

Summary.—1—The climatic and soil conditions of most of central Quebec lend themselves favourably to the production of flax for fibre and the variety named Longstem is a good one for this purpose. 2—For seed production, Novelty is recommended. 3—A dual-purpose variety seems to be required to make this crop profitable under present-day conditions.

VARIETY AND STRAIN TESTS OF OATS

During the last twelve years, eighteen varieties and strains of oats were tried, and the following were discarded because they were found inferior to the ones kept, for central Quebec conditions: Abundance, Clydesdale, Daubeney, Eighty Day, Ligowo, Siberian, Thousand Dollar, Twentieth Century. Eighty Day was by far the earliest, followed by Daubeney, and these two may be used with advantage wherever the frost-free season is short. The three which have unmistakably shown superiority over the rest are Banner, Gold Rain, Victory, and comparative yields are shown in the following table:—

COMPARISON OF THREE BEST VARIETIES OF OATS GROWN AT CAP ROUGE FOR ELEVEN YEARS

Year	Banner		Gold Rain		Victory	
	Pounds per acre	Days to mature	Pounds per acre	Days to mature	Pounds per acre	Days to mature
1911	2,820	87	2,850	87	2,460	87
1913	2,340	112	2,580	112	2,760	112
1914	1,960	94	2,200	85	1,580	89
1915	2,404	92	2,244	91	1,997	92
1916	2,398	98	2,338	95	2,458	100
1917	2,040	111	2,430	104	2,490	104
1918	1,410	104	2,400	104	1,950	104
1919	2,580	97	1,800	95	1,740	97
1920	2,340	100	2,340	92	2,160	100
1921	1,465	94	1,429	91	1,658	93
1922	3,247	104	3,000	95	2,750	101
Average	2,273	99	2,328	96	2,182	98

Banner has always been recommended, though, at times, its yield was slightly surpassed by that of the two others, especially Gold Rain; but Banner is very popular in the district and it would be a fine thing indeed, if practically no other variety of oats were grown in central Quebec, wherever, of course, local conditions are not decidedly against it. If this happened, it might be possible, with time, to develop a good trade in pure-bred seed, as has been done on Prince Edward Island.

Besides the three above-named varieties, four others were tested in 1922 and details are herewith given: —

VARIETY AND STRAIN TESTS OF OATS AT CAP ROUGE IN 1922

Name or number of variety or strain	Important varietal character	Average length of plant	Strength of straw on a scale of 10 points	Yield per acre	Days to mature
		Inches		Pounds	
Banner, Ottawa 49	Spreading...	57	10	3,247	104
Gold Rain	" ..	53	10	3,000	95
Victory	" ..	48	10	2,750	101
Longfellow, Ottawa 478	Side	57	10	2,423	99
Wisconsin No. 19	Spreading...	51	10	2,325	90
Alaska	" ..	47	10	2,100	84
Liberty, Ottawa 480	Hulless	51	10	1,633	90

Beginning in 1922, a certain quantity is to be hulled of all varieties and strains tested, as the quality of oats depends a great deal on the proportion of hull to kernel. According to well-known authorities, " there is no necessary relation between weight per bushel or shape of grain and the per cent of kernel or food value " (Hunt). What is really important is to find out which variety or strain has the highest food value per acre and there seems no better way to get at this than by careful experiments regarding the proportion of hull to kernel. It is not expected that the same proportion will hold good for a variety all through Canada, as it is probable that a variety best suited to the environment of a certain district will develop its kernels most completely there and have a high per cent of kernel, while it would not do so in another district where conditions are not favourable to it.

Summary.—1—To date, Banner is recommended as the best variety of oats for central Quebec. 2—It would seem advisable for farmers of the district to sow Banner only, unless in exceptional cases as mentioned above, with a view of developing a trade in pure-bred seed.

Improvement of Banner Oats by Selection

This was started in 1916, when ninety average heads from different mother plants were chosen, in a large field, the grain from each being grown in 1917 in as many different rows and the thirty best strains kept for 1918; in 1919, the number was cut down to ten and in 1920 the best one was propagated; in 1921, the selection was sown in the trial plots, alongside of other varieties and strains, and was the heaviest yielder. That autumn, the granary burned with all the seed grain, but, fortunately, a one-pound sample had been sent to the Dominion Cerealist, Ottawa; this sample was procured and sown in 1922, producing thirty-nine pounds of clean grain, part of which will be used in the test plots of 1923.

VARIETY AND STRAIN TESTS OF FIELD PEAS

Field peas may also be used for silage, hay or pasture, but they will here only be considered from the point of view of grain production. The seed ultimately is sold for human food, or to feed to animals, but for the latter purpose no widely-known grain plant of equal possibilities has been so generally neglected.

When ripe field peas are to be used for human consumption, the varieties with white seed have practically a clear field to themselves, as the dark-coloured

ones command a much lower price and, oftentimes, cannot be sold at all. In 1921, a number of varieties were sent to three well-known firms in Quebec city who placed Arthur and Chancellor, both white-seeded, at the top of the list, whilst 32D and Solo, both dark-seeded, were at the bottom of the same list. Two of the three firms would not consider the purchase of dark-seeded field peas at any price.

In the 1921 report, details were given of the comparative yield, during the same nine seasons, of Arthur and Golden Vine, which respectively averaged 1,947 and 1,697 pounds of dry peas per acre. This left Arthur practically in a class by itself as a field pea to be grown for human consumption, but a number of varieties and strains, not hitherto tried at Cap Rouge, were procured and the following table gives details about them:—

VARIETY AND STRAIN TESTS OF FIELD PEAS AT CAP ROUGE IN 1922

Name or number of variety or strain	Seed originally from	Colour of pea	Size of pea	Colour of flower	Average length of plant	Yield per acre	Number of days to mature
					Inches	Pounds	
No. 262	California	White	Small	White	16	3,000	95
Mackay, Ottawa 25	C.E.F. Ottawa	"	Large	"	45	3,000	108
Arthur, Ottawa 18	" "	"	"	"	34	2,900	101
Gregory	Oregon	Coloured	Medium	"	39	2,875	110
Carleton	"	"	Large	Coloured	41	2,775	108
Langdon	North Dakota	White	Medium	White	42	2,700	110
Chang	Colorado	"	Small	"	41	2,550	108
Chancellor, Ottawa 26	C. E. F. Ottawa	"	"	"	43	2,100	95
Bangalia	Colorado	Coloured	Medium	Coloured	56	1,900	95
No. 38	California	White	"	White	40	1,875	101
Solo	C. E. F. Ottawa	Coloured	"	Coloured	44	1,625	101
Kaiser	Oregon	"	"	"	35	1,600	108

Records, in the United States, show that, on the acre basis, peas cost less than oats to produce. At Cap Rouge, peas have yielded slightly more digestible nutrients per acre than oats and *more than twice the quantity of protein*, so that they should certainly be grown on a much larger scale for live stock feed.

Summary.—1. Only white-seeded varieties of field peas have a high market value in Central Quebec for human consumption and Arthur Ottawa 18 is the best of those tried at Cap Rouge. 2. The use of field peas for live stock feeding should receive much more attention than it now gets.

Improvement of Arthur Pea by Selection

In 1914, one hundred average plants were chosen in a field of a couple of acres, and in 1915 the same number of peas from the fifty plants which had the heaviest crop were planted in different rows. In 1916, the strains were cut down to ten and in 1917 to three, whilst the best one was used in the trial plots in 1918 when it produced at the rate of only 1,260 pounds per acre whilst the same variety, from the Central Experimental Farm, Ottawa, yielded at the rate of 2,160 pounds per acre. In 1919, the selection was again placed in the trial plots but the crop was lost on the field during the prolonged illness of the man in charge. Work was started again in 1922 when thirty average plants were chosen containing each from 12 to 47 peas weighing about one-eighth to three-eighth ounces. Twelve peas will be sown of each strain in 1923, in thirty different rows, and the selection continued.

VARIETY AND STRAIN TESTS OF SPRING WHEAT

During the last twelve years, twenty varieties and strains of spring wheat have been tried and the following have been left aside because others, which were kept, are better adapted to conditions of central Quebec: Alpha, Bobs, Early Red Fife, Early Russian, Pioneer, Prelude, Preston, Prospect, Red Fife, White Fife, Yellow Cross. Work will be continued with special strains of Bishop, Chelsea, Huron, Ruby and any other variety or strain deemed worthy of a five years' test in the trial plots. Four of the best known varieties have now been tested alongside each other, the same years, for ten seasons, and comparative yields are shown in the following table:—

COMPARISON OF FOUR OF THE BEST KNOWN VARIETIES OF SPRING WHEAT GROWN AT CAP ROUGE FOR TEN YEARS

Year	Huron, Ottawa 3		Bishop, Ottawa 8		Marquis, Ottawa 15		Early Red Fife, Ottawa 16	
	Pounds per acre	Days to mature	Pounds per acre	Days to mature	Pounds per acre	Days to mature	Pounds per acre	Days to mature
1911	2,340	87	1,830	87	1,725	87	765	85
1912	540	112	600	106	660	112	360	112
1915	1,488	93	1,305	94	1,332	100	1,485	97
1916	1,129	95	1,009	93	649	98	1,219	96
1917	1,500	105	1,320	99	1,350	106	1,320	103
1918	1,170	101	1,260	98	1,260	101	1,020	104
1919	690	98	1,530	94	960	97	690	98
1920	1,770	100	1,560	95	1,560	100	1,530	98
1921	1,556	93	1,658	91	1,684	92	1,421	94
1922	1,990	108	1,888	100	1,719	104	1,658	106
Average	1,417	99	1,396	96	1,290	100	1,147	99

Huron has been recommended by this Station for years and, though it is admitted that it has not as high a milling and bread-making value as Marquis, it must be remembered that tests in the United States show a slight difference in its favour for per cent yield of flour. The presence of long beards is often brought up against Huron, but leading authorities to-day claim that yielding power is largely a matter of resistance, and as "the long beards will make a variety more evasive of drought and disease" (Hunt) this same character may sometimes become a quality instead of a defect. According to our tests, it seems evident that Early Red Fife and Marquis, though generally very good for conditions in Western Canada, are not as well adapted as Huron to Eastern Canada.

Other varieties and strains were tested in 1922, besides the above-mentioned four, and details follow:—

VARIETY AND STRAIN TESTS OF SPRING WHEAT AT CAP ROUGE IN 1922

Name of variety	Bearded or Beardless	Colour of grain	Average length of plant	Strength of straw on a scale of 10 points	Yield per acre	Days to mature
			Inches		Pounds	
Chelsea, Ottawa 10	Beardless	Light red	46	10	2,045	101
Huron, Ottawa 3	Bearded	Red	48	10	1,990	108
Early Russian, Ottawa 40	Beardless	"	42	10	1,953	100
Bishop, Ottawa 8	"	Nearly white	47	10	1,888	100
Marquis, Ottawa 15	"	Red	40	10	1,719	104
Early Red Fife, Ottawa 16	"	Dark Red	43	10	1,658	106
Ruby, Ottawa 623	"	Red	38·5	10	1,525	97
Prelude, Ottawa 135	Bearded	"	35·5	10	1,313	92

Chelsea has shown itself to be very productive, yielding an average of 88 pounds more per acre than Huron during the last eight years. But a Cap Rouge selection of Huron outyielded it by an average of 206 pounds per acre during the four years when both were tested together. All this selection, however, was burned in the granary at Cap Rouge during the autumn of 1921, except a one-pound sample which had been sent to Ottawa but which was returned and multiplied in 1922. In 1923, there will be enough seed to place the selection back in the trial plots to see how it will compare with the other varieties and especially with Chelsea.

Summary.—1. Huron is recommended, up to the present, as the most suitable variety of spring wheat for central Quebec. 2. Early Red Fife and Marquis, though highly valuable for vast areas in Canada, will probably never give best results in central Quebec.

Improvement of Huron Wheat by Selection

This project was started in 1913 when ninety average heads from different mother plants were chosen in a field, the grain from each being grown in 1914 in as many different rows. In 1915, the thirty best strains were kept; in 1916, the number was cut down to 10, while in 1917 the best one was multiplied. In 1918, 1919, 1920, 1921 the selection was sown alongside of other varieties in the trial plots and averaged higher than any of them. In the autumn of 1921, the granary, with all the seed grain, burned, and only a one pound sample which had been sent to the Dominion Cerealist, at Ottawa, was available in 1922 when it was sown at Cap Rouge and produced thirteen pounds, part of which will be used in the trial plots of 1923.

FORAGE CROPS

Wherever live stock is the foundation of profitable farming, the matter of forage crops suitable for local conditions is very important.

One of the first questions is whether one or more of the main classes of forage crops—hay, silage, roots—should be grown. The most logical answer would seem to be that the crop furnishing a ton of digestible dry matter at the least cost is the one to grow, but practical stockmen regard palatability and succulence as worth a great deal.

If succulent feed is to be given during winter, should it be in the form of silage, of roots, or of both? If silage, should it be corn, sunflowers or peas and oats; if roots, should it be carrots, mangels, sugar beets or turnips?

In case that corn is chosen for silage, or turnips for roots, what varieties will give best results, and can these varieties be improved to suit special conditions?

Persons who can readily answer all the above questions will say that there is no need for Experimental Farms, but to the very large majority it will be obvious that a great number of problems require, before they are rightly solved, the searching light of carefully conducted experiments.

VARIETY AND STRAIN TESTS OF CORN FOR SILAGE

Twenty-nine varieties and strains of corn have been tested for silage production during nine years. It was soon found out that the very early maturing varieties did not give enough tonnage and they were dropped. It is a question whether some of the "dents" will not be more profitable to grow than the "flints," so that samples of each variety or strain are now examined every year for percentage of dry matter. The results of 1922 show that a tall variety, Eureka, hitherto considered as absolutely unsuitable for the district, has out-

yielded all others, but the season was long without frost and this result should by no means be taken as final, as at least three or four more years are required to throw more light on the question.

VARIETY AND STRAIN TEST OF CORN FOR SILAGE, 1922

Variety or Strain	Class	Yield per acre	Dry matter	Dry matter per acre
		Pounds	Per cent	Pounds
Eureka	Dent	44,284	26·13	11,571·41
Wisconsin No. 7	"	37,857	23·88	9,040·25
White Cap Yellow Dent	"	36,377	23·28	8,468·57
Longfellow, Ottawa	Flint	36,579	22·46	8,215·64
North Dakota	"	33,845	23·28	7,879·12
Stowell Evergreen	Sweet	38,180	20·20	7,712·36
Compton Early	Flint	36,612	20·98	7,681·20
Leaming	Dent	33,762	22·54	7,609·95
Bailey	"	35,168	20·70	7,279·78
Golden Glow	"	32,670	22·28	7,278·88
Wisconsin No. 25	"	24,612	27·32	6,724·00
Longfellow C. R.	Flint	26,654	22·81	6,079·78
Average		34,717	22·93	7,961·74

The leading seven varieties tried the same seasons during six years do not show the same positions when compared for tonnage as for dry matter, if the percentage of dry matter found in 1922 is taken to cover previous crops. The following table gives details:—

VARIETY TESTS OF CORN FOR SILAGE AT CAP ROUGE—SIX YEARS

Variety	Pounds of Corn per Acre, just before ensiling							Per cent Dry matter	Dry matter per acre
	1915	1917	1919	1920	1921	1922	Average		
									Pounds
Bailey	18,300	37,521	26,625	33,382	52,301	35,168	33,883	20·70	7,014
Leaming	15,250	30,688	21,975	26,130	70,553	33,762	33,060	22·54	7,452
Wisconsin No. 1	18,750	33,896	24,900	26,721	55,452	37,857	32,929	23·88	7,863
White Cap Yellow Dent	15,300	26,035	21,750	24,436	62,277	36,377	31,029	23·28	7,224
Longfellow	14,150	20,654	23,325	28,813	50,205	36,579	28,954	22·46	6,503
North Dakota	15,750	21,860	25,875	22,322	49,944	33,845	28,266	23·28	6,580
Compton Early	14,750	22,297	18,075	20,605	50,070	36,612	27,068	20·98	5,679

It will no doubt be interesting to watch the relative positions of the above, during the next few years, and especially to see if these varieties will be able to hold their own with taller ones such as Eureka for dry matter production per acre. Some of the best authorities in the United States now claim that it is advisable to grow the larger and later varieties, much farther north than formerly, as they will give greater tonnage, the feeding value of the stalks being no less important than that of the grain.

Summary.—1. The consensus of opinion now seems that the most profitable variety of corn to grow for silage is the largest one which may become reasonably mature in the locality. 2. It seems better to stick to Longfellow until experiments in the district have found something better adapted to local conditions.

VARIETY AND STRAIN TESTS OF FIELD CARROTS

During the last twelve years, nineteen varieties and strains of field carrots have been tested, of different types, short, intermediate, long, and of different colours, white, yellow, orange, red. The following table gives details for three of different types which have been tested the same seasons during ten years:—

VARIETY AND STRAIN TEST OF FIELD CARROTS—TEN YEARS

Variety	Type	Pounds of Carrots per Acre											Per cent Dry Matter	Dry Matter per acre Pounds
		1911	1912	1913	1914	1915	1916	1917	1919	1920	1921	Average		
Mammoth Short White	Short	21,202	5,197	19,350	10,100	2,550	25,350	29,300	18,746	23,401	76,085	23,128	10·37	2,398
White Belgian	Long	19,429	2,887	17,300	8,750	4,300	27,400	26,600	15,470	29,221	60,885	21,224	9·49	2,014
Mammoth White Intermediate	Intermediate	18,118	3,547	20,400	12,050	3,400	25,600	30,500	16,198	29,473	48,648	20,793	8·99	1,869

The "percentage of dry matter" was taken from the report of the Dominion Chemist. Careful experiments conducted since 1911 clearly show that field carrots do not produce either the tonnage or the dry matter per acre that mangels or swede turnips do, so that it is not recommended to grow them except for horses.

Summary.—1. Field carrots are of little importance for Central Quebec. 2. The variety which gave the best results, at Cap Rouge, is Short White.

VARIETY AND STRAIN TESTS OF MANGELS

Twenty varieties and strains of mangels have been tested since 1911, comprising standard representatives of the different types, long, intermediate, tankard, globe, besides the sugar-mangels. This kind of roots is not popular in central Quebec where the swede turnip does very well, and it will no doubt never be grown to any extent except on the rich alluvial soils of a few small valleys. The following table gives details about each type for the six years during which they were tried alongside of each other:—

VARIETY AND STRAIN TEST OF MANGELS—SIX YEARS

Variety	Type	Pounds of Mangels per acre							Per cent dry matter	Dry matter per acre
		1913	1914	1915	1920	1921	1922	Average		
										Pounds
Giant Yellow Intermediate	Intermediate	4,890	24,550	475	40,679	38,580	21,563	21,789	11·87	2,586
Half Sugar White	Sugar	5,894	20,500	100	31,100	44,221	30,254	22,011	10·70	2,355
Long Red Mammoth	Long	3,434	18,100	250	44,917	40,432	24,613	21,958	9·74	2,139
Golden Tankard	Tankard	2,700	12,550	500	29,731	40,332	21,692	17,917	10·54	1,888
Giant Yellow Globe	Globe	4,140	7,700	450	35,235	42,126	20,274	18,321	7·02	1,286

The figures in the column " per cent dry matter " are from the Dominion Chemist, Dr. Frank T. Shutt.

The above table shows how deceptive it is to judge a variety by tonnage instead of by dry matter yield per acre. Long Red Mammoth produced an average of 21,958 pounds per acre compared with 21,788 pounds for Giant Yellow Intermediate, but it yielded 20 per cent less dry matter, which is the important point when the digestibility, as in this case, is practically the same.

Summary.—1. Mangels will never be as popular as swede turnips on the majority of farms of central Quebec. 2. One of the best varieties for the district is Yellow Intermediate.

VARIETY AND STRAIN TEST OF SWEDE TURNIPS

Sixty-five varieties and strains of swede turnips have been tested during the last twelve years. They have furnished more digestible matter per acre than carrots, mangels, or sugar beets and are without doubt the root crop best adapted to most of the farms of central Quebec. Different types have been tried, such as purple top oval, purple top round, bronze top oval, bronze top round, green top round. The purple top oval kinds have been, in general, the highest yielders of raw material.

The following table gives details about a few of the best ones:—

VARIETY AND STRAIN TESTS OF SWEDE TURNIPS, 1922

Variety and Strain	Source of Seed	Type	Yield per acre	Dry matter	Dry matter per acre
			Pounds	Per cent	Pounds
Bangholm	Steele, Briggs Seed Co., Toronto	Purple top oval	45,102	12·31	5,552
Kangaroo	" " "	Bronze top round	42,624	13·17	5,614
Ditmars	R. Ditmars, Deep Brook, N.S.	Bronze top round	41,303	12·62	5,212
Mammoth Clyde	Wm. Ewing Seed Co., Montreal	Purple top round	41,002	12·26	5,027
Magnum Bonum	Wm. Rennie Seed Co., Montreal	Purple top oval	40,571	12·69	5,148
Derby	Steele, Briggs Seed Co., Toronto	Bronze top oval	36,125	12·16	4,393
Good Luck	" " "	Purple top oval	34,517	13·33	4,601
Bangholm	Exp. Station, Charlottetown	Purple top oval	31,603	14·60	4,614
Monarch	Exp. Station, Nappan, N.S.	Purple top oval	31,118	11·11	3,457
Invicta	Wm. Rennie Seed Co., Montreal	Bronze top round	27,060	12·32	3,334
Average			37,102	12·66	4,695

In looking over varieties which have been tested for a long time, the same years, four are found about which details are herewith given:—

VARIETY AND STRAIN TEST OF SWEDE TURNIPS, EIGHT YEARS

Variety or Strain	Type	Pounds of Swedes per acre									Per cent Dry matter	Dry matter per acre
		1911	1912	1913	1914	1917	1919	1921	1922	Average		
												Pounds
Good Luck	Purple top oval	53,122	23,265	43,600	64,950	31,800	16,575	41,424	34,517	38,657	13·33	5,153
Bangholm	Purple top oval	43,639	24,585	33,750	49,525	27,000	18,525	58,654	45,102	37,597	13·45	5,057
Magnum Bonum	Purple top oval	49,344	19,965	46,400	62,725	37,800	14,820	38,069	40,571	38,712	12·69	4,913
Mammoth Clyde	Purple top round	44,949	22,440	40,900	60,275	31,900	16,380	34,425	41,002	36,534	12·26	4,479

The percentages of dry matter were taken from analyses made by Dr. Frank T. Shutt, Dominion Chemist. The fact that Magnum Bonum is first for tonnage but only third for dry matter per acre shows that more attention will have to be paid to the dry matter yield and possibly to the digestible nutrients in this dry matter.

Summary.—1. Where roots are advantageous to grow, in central Quebec, swede turnips will, in most cases, be more profitable than carrots, mangels or sugar beets. 2. Good Luck is the variety, out of sixty, which has given the best satisfaction.

COMPARISON OF EXPERIMENTAL FARMS GROWN WITH COMMERCIAL ROOT SEED

In comparing commercial seed with that produced on the Experimental Farms system, it is not the intention to try to prove that the former is not as good as the latter, but rather to find out exactly the situation. This project has practically only been started, but will be continued for four or five years more. In the meantime, the following figures are offered as a progress report:—

COMPARISON OF EXPERIMENTAL FARMS GROWN WITH COMMERCIAL ROOT SEED

Year	Kind of Root	Name of Variety	Yield per acre—Pounds	
			Experimental Farms Seed	Commercial Seed
1920	Carrot	White Intermediate	29,473	28,185
1922	"	Danish Champion	24,317	30,526
		Average	26,895	29,355
1921	Mangel	Yellow Intermediate	56,465	38,580
1922	"	" "	20,562	21,563
		Average	38,513	30,071
1920	Swede turnips	Good Luck	39,988	50,056
1922	" "	Bangholm	31,603	45,102
		Average	35,795	47,579

Two of the tests were in favour of the Experimental Farms grown seed and four in favour of the commercial seed. It was noted that the roots produced by the Experimental Farms grown seed were more uniform than the others, probably because selection was made for uniformity. But is uniformity correlated with high tonnage per acre? This is another question. It will also be interesting, in the future, to compare the yield of dry matter per acre, as samples of each lot will be analysed every year.

POULTRY

The poultry work at this Station has been conducted with one breed only, Barred Rocks. Two permanent houses, a number of colony houses, a permanent pipe brooder house, as well as the administration building, comprise the buildings. The plant is a partly wooded tract of land, well sheltered from the east and fairly well protected from the north winds.

Up until November the 1st of this year, the Quebec Egg Laying Contest was held upon this plant, but with its removal to St. Anne de la Pocatière, the contest houses are available for breeding and experimental purposes.

EXPERIMENTAL WORK

PEDIGREE WORK WITH POULTRY

Breeding fowls for heavy production is certainly possible but it is not nearly so easy as most people believe. With other kinds of live stock, conditions of environment can be controlled to a certain point, while with poultry the questions of climate, soil, date of hatching, feeding, housing and management must receive very careful attention indeed. However, that breeding is one of the requisites for high egg yield is undoubted.

For a number of years, trap-nests have been used at Cap Rouge, also pedigree trays in the incubators, so that, with the aid of sealed wing bands, the

genealogy of birds can be traced as easily as that of colts, calves, pigs or lambs. To find out the good layers is comparatively easy, but this work is only preparatory. The difficult problem is to isolate the families of good producers, that is, the ones which will produce progeny as good or better than themselves.

FERTILITY AND HATCHABILITY OF EGGS ALSO VIABILITY OF CHICKS FROM PULLETS AND FROM HENS

It is generally recommended to breed from hens rather than from pullets, and this is the practice usually followed. Upon the Experimental Farms system as a whole the hens have given better results in the percentage of adult birds reared, but where well matured, early pullets are used, the experience at this station has been slightly in favour of the pullets.

In 1917, at Cap Rouge, the percentage of fertile eggs was 87·9 for April pullets, 76·7 for May pullets, 86·9 for yearling hens, 92·2 for two-year-old hens. It will be noted that there is practically no difference in fertility of eggs between early pullets and yearling hens.

In 1916, the percentage of eggs hatched was 40·8 for April pullets, 42·4 for May pullets, 38·6 for yearling hens, 28·2 for old hens. Here, again, there is not much difference between early pullets and yearling hens.

In 1922, the number of eggs required for a living chick on July 1 was 3·35 for hens and 2·99 for pullets, as shown in the following table:—

BARRED ROCK PULLETS AND HENS COMPARED AS BREEDERS, 1922

	Total eggs	Number fertile	Per cent fertile	Number of Chicks	Per cent total eggs hatched	Per cent total fertile eggs hatched.	Number chicks July 1st (alive)	Per cent chicks hatched alive July 1st	Total eggs required for one chick	Total fertile eggs for one chick hatched	Total eggs for one chick, July 1st
Hens.....	476	394	0·84	179	0·40	0·46	142	0·79	2·66	2·20	3·35
Pullets.....	212	180	0·85	87	0·41	0·48	71	0·82	2·44	2·07	2·99
Average.....	344	287	0·84	133	0·40	0·47	106	0·80	2·55	2·13	3·17

It should not be inferred, from the above, that pullets are to be preferred to hens for breeding purposes, but it seems reasonable to say that if hens are not in good condition and pullets are in fine shape, the latter may be used without fear.

HOME MIXED VS. COMMERCIAL FEED

Commercial versus home mixed feeds for winter laying.—There is a growing tendency to buy commercial feeds instead of mixing feeds at home. Whilst this may be all right in special cases, such as for the small poultrymen in the cities, it is generally not the most economical thing for the farmer to do. The present project was started to gather information on the subject and the following table gives details for the winter of 1922-23:—

COMMERCIAL VERSUS HOME MIXED FEEDS FOR WINTER LAYING

Kind of Feed given	Number of Birds in pen	Total weight of birds on November 1	Total weight of birds on February 16	Weight gained or lost during experiment at $0.30 per lb.	Number of eggs laid at $0.60 per dozen	Average weight of eggs per dozen in ounces	Value of eggs	Total value of products	Pounds of commercial grain at $2.75 per 100 lbs.	Pounds of home-mixed grain at $2.20 per 100 lbs.	Pounds of skim-milk at $0.25 per 100 lbs.	Pounds of commercial meal at $3.00 per 100 lbs.	Pounds of home-mixed meal at $2.20 per 100 lbs.	Pounds of meat meal at $3.75 per 100 lbs.	Pounds of sprouted oats at $2.00 per 100 lbs.	Pounds of shells at $1.25 per 100 lbs.	Total value of feed consumed	Loss or gain per pen	Loss or gain per head	Cost of one dozen of eggs	Cost of one pound of eggs
							$	$									$	$	$	$	$
Commercial...	25 pullets.	132	162	+30	427	22·4	21·35	30·35	570	.....	515	24	.....	7	108	23	20·39	+9·96	+0·398	0·573	·409
Home-mixed...	25 pullets.	126	158	+32	400	22·2	20·00	29·60	.....	556	515	.....	23	12·5	108	21·5	16·93	+12·67	+0·507	0·508	·361

The commercial scratch grain and the laying mash were of the Full O' Pep brand, whilst the home-mixed scratch grain was composed of equal parts, by weight, of wheat, barley, oats, cracked corn, buckwheat, and the home-mixed laying mash of equal parts, by weight, of bran, middlings, ground oats, corn meal, meat meal.

Summary.—1. Full O'Pep scratch grain and Full O'Pep laying mash gave as good results as home mixtures, but the cost of production was much higher. 2. Before conclusively deciding which is the most economical to use, it may be better to await further experimental data on the subject but, in the meanwhile, farmers should stick to the home mixtures.

ANIMAL FEEDS

Green bones, meat meal, raw meat, skim-milk compared for laying hens.—Experimental work conducted at Cap Rouge a few years ago showed that skim-milk is a better and cheaper source of animal protein for laying hens than is meat meal. The Poultry Division, Ottawa, thinking that other sources of animal protein might be more suitable, suggested the present project in the autumn of 1922. There were twenty pullets in each pen and the experiment lasted four months, November to February inclusive. The following table gives details:—

GREEN BONE, MEAT MEAL, RAW MEAT, SKIM-MILK COMPARED FOR LAYING HENS—THE FIRST THREE CHARGED AT ACTUAL COST PRICE

Source of protein	Number of Birds in Pen	Total weight of birds on December 1	Total weight of birds on February 16	Weight gained or lost during experiment at $0.30 per lb.	Number of eggs laid at $0.60 per doz.	Average weight of eggs per dozen, in ounces	Value of eggs	Total value of products	Pounds of grain at $2.20 per 100 lbs.	Pounds of skim-milk at $0.25 per 100 lbs.	Pounds of meal at $2.20 per 100 lbs.	Pounds of meat meal at $3.75 per 100 lbs.	Pounds of raw meal at $3.00 per 100 lbs.	Pounds of green bones at $5.00 per 100 lbs.	Pounds of sprouted oats at $2.00 per 100 lbs.	Pounds of shells at $1.25 per 100 lbs.	Total value of feed consumed	Loss or gain per pen	Loss or gain per head	Cost of one dozen of eggs	Cost of one pound of eggs
							$	$									$	$	$	$	$
Meat meal	20 pullets.	111	115	+ 4	505	22·4	25·25	26·45	392	.....	15·5	9·5	.....	.....	62	8	10·66	+15·79	+0·789	0·253	0·181
Skim-milk	20 pullets.	109	120	+11	582	22·3	29·10	32·40	392	400	14	.....	.....	.....	62	14	11·34	+21·06	+1·053	0·234	0·168
Raw meat	20 pullets.	108	124	+16	405	22·5	20·25	25·05	389	.....	17	.....	101	.....	62	12	13·35	+11·70	+0·585	0·396	0·272
Green bone	20 pullets.	106	121	+15	230	22·5	11·50	16·00	393	.....	19	.....	.....	78	62	8·5	14·32	+ 1·68	+0·080	0·747	0·531

In the above figures, the actual amounts paid for green bone, meat meal and raw meat were entered, but as this may be quite different elsewhere, a table is herewith given showing the cost of eggs per dozen and per pound, when the same price, $5 per 100 pounds, is charged for all, except skim-milk, of course, which is calculated at 25 cents per 100 pounds:—

GREEN BONE, MEAT MEAL, RAW MEAT, SKIM-MILK COMPARED FOR LAYING HENS—THE FIRST THREE CHARGED AT SAME PRICE

Source of Animal Protein	Value of products	Cost of Feed	Gain per Pen	Cost per dozen of Eggs	Cost per pound of Eggs
	$	$	$	$	$
Skim-milk	32·30	11·34	21·06	0·234	0·168
Meat meal	26·45	10·77	15·68	0·256	0·183
Raw meat	25·05	15·37	9·68	0·455	0·324
Green bone	16·00	14·32	1·68	0·747	0·531

Summary.—1. One of the main causes of poor laying in winter, due to feeding, is the too small quantity in the ration of protein from animal sources. 2. The two best sources of this protein are skim-milk and meat meal, with a preference for the former.

GREEN FEEDS

Clover hay, Epsom salts, roots, sprouted oats compared for laying hens.—Green feed of some kind has for a long while been considered necessary for laying hens, and with the newer knowledge of nutrition, its good effects were ascribed to the vitamins it contains. However, experiments conducted at this station during five seasons, from 1916 to 1921, showed that, contrary to expectations, the lots receiving no succulent food, but dry clover leaves, gained more weight and produced eggs at a lower cost per dozen, during the four winter months, November to February inclusive. Now comes this new experiment which shows—though it is only for a season—that Epsom salts turned out better than either clover hay, roots, or sprouted oats. From the latter case, it would seem that part of the good results obtained by the use of green feed is due to its laxative effect. Still, it is better to be on the safe side and to give Epsom salts in the drinking water at least once a month while also feeding the usual green feed. The following table gives details about the project in 1922-23:—

CLOVER HAY. EPSOM SALTS, ROOTS, SPROUTED OATS COMPARED FOR LAYING HENS

Besides the basal Ration, received	Number of Birds per Pen	Total weight of birds on December 1	Total weight of birds on February 16	Weight gained or lost during experiment, at $0.30 per lb.	Number of eggs laid at $0.60 per dozen	Average weight of eggs per dozen in ounces	Value of eggs	Total value of products	Pounds of grain at $2.20 per 100 lbs.	Pounds of skim-milk at $0.25 per 100 lbs.	Pounds of meal at $2.20 per 100 lbs.	Pounds of meat meal at $3.75 per 100 lbs.	Pounds of sprouted oats at $2.00 per 100 lbs.	Pounds of mangels at $0.20 per 100 lbs.	Pounds of dry clover leaves at $0.75 per 100 lbs.	Pounds of Epsom Salts $0.25 per 100 lbs.	Pounds of shell at $1.25 per 100 lbs.	Total value of feed consumed	Loss or gain per pen	Loss or gain per head	Cost of one dozen of eggs	Cost of one pound of eggs
							$	$										$	$	$	$	$
Sprouted Oats...	20 pullets.	96	120	+24	361	22·4	18·05	25·25	392	320	16	8	78	.....	.....	.....	7·5	11·72	+13·53	+0·676	0·390	0·279
Roots.....	20 pullets.	96	119	+23	284	22·5	14·20	21·10	387	320	19	4	.....	119	.....	.....	16·0	10·32	+10·78	+0·539	0·436	0·310
Clover.....	20 pullest.	96	117	+21	338	22·4	16·90	23·20	392	320	19	11	.....	.....	103	.....	15·5	11·21	+11·99	+0·599	0·398	0·284
Epsom salts.....	20 pullets.	96	110	+14	388	22·3	19·40	23·60	395	320	19	4	.....	.....	.....	27	8·5	10·63	+12·97	+0·648	0·328	0·236

Summary.—1. Green feed has for a long time been considered one of the important components of a good ration for laying hens. 2. Dry clover leaves, in a long experiment, and Epsom salts, in a short one, have advantageously replaced green feed, but more light should be thrown on the subject before the latter is completely dropped.

Office Building Erected at Cap Rouge in 1922

MISCELLANEOUS

BUILDINGS

The dairy cattle barn, commenced last season, was continued this year, and will be completed in 1923.

The houses where live the farm foreman and the horseman were slightly repaired and painted.

FENCES.

Nearly one mile of wire fencing was put up at the Horse Farm, St. Joachim. The numerous old fences which cut up the farm in small or irregular pieces are now all torn down and the whole area will be divided in ten fields, two of each to enter into a part of a five-year rotation.

DRAINING

One car load of tiles was used at the Horse Farm. The system of under-drainage is not what is generally called a complete one, that is with pipes laid at regular intervals, but only the places which suffer from an excess of water are attended to.

EXCURSIONS

A larger number of excursionists came to the farm than usual, especially small parties. These take up more time but, in general, are composed of persons who are eagerly seeking information on certain special points, and everything possible is done to attend to them carefully.

EXHIBITIONS

As usual, the Saint Joachim Farm exhibited two carloads of French-Canadian horses, whilst Cap Rouge showed grain, forage crops, fruits, flowers, vegetables, in the regular classes, at Three Rivers and at Quebec. No money is taken, only the prize cards or ribbons, so that breeders and farmers, losing a first to the station exhibit, still receive first prize money, according to a special arrangement with the Fair management. If money had been taken, over $1,200 would have been brought home.

PUBLICITY

A great number of bulletins, leaflets, circulars were distributed, while articles were prepared for "Seasonable Hints" and the press.