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 1930

Printed by Authority of the Hon. Robert Weir, Minister of Agriculture,
Ottawa, 1931

TABLE OF CONTENTS

DOMINION EXPERIMENTAL STATION, CAP ROUGE, P.Q.

REPORT OF THE SUPERINTENDENT, G. A. LANGELIER

THE SEASON

Compared with the average of the last nineteen years, the growing season, May to October inclusive, was slightly warmer, dryer, with less sunshine, the figures being respectively 58·23 and 56·35 degrees Fahrenheit for mean temperature, 20·23 and 23·71 inches for precipitation, and 983·4 and 1,080·2 hours for sunshine. The frost-free season extended 173 days, from April 30 to October 20, which is the longest one since 1912.

METEOROLOGICAL RECORDS AT CAP ROUGE, 1930

Month	Temperature F.						Precipitation				Sunshine	
	Highest	Date	Lowest	Date	Mean	Average 19 years	Rain-fall	Snow-fall	Total	Average 19 years	Total	Average 19 years
	°	°	°	°	°	°	in.	in.	in.	in.	hours	hours
January	43	9	−16	27	15·35	10·47	1·53	25·75	4·10	3·81	48·6	63·0
February	47	23–24	−22	7	16·12	11·24	0·12	17·00	1·82	2·62	112·3	87·4
March	39	12	− 5	3–4	22·05	22·09	0·88	18·50	2·73	2·78	128·5	134·4
April	62	30	10	17	35·85	30·25	2·55	0·25	3·17	2·83	167·6	170·4
May	87	24	33	18–19	52·98	50·50	3·50	.....	3·50	3·51	180·5	193·9
June	86	15–30	46	1–3	64·58	59·28	5·51	.....	5·51	4·11	152·5	193·5
July	83	19–20–28	44	15	65·14	65·66	2·69	.....	2·69	4·00	201·0	229·2
August	80	28	46	11	63·56	62·81	2·83	.....	2·83	3·81	188·4	208·2
September	80	2	41	8–9–10	56·21	54·95	4·22	.....	4·22	4·17	126·4	149·7
October	73	12–13	27	22	46·93	44·90	1·48	.....	1·48	4·11	134·6	105·7
November	56	24	6	29	35·06	30·81	2·64	3·75	3·01	3·57	69·2	61·3
December	36	8	−10	16	19·59	16·89	.....	19·75	1·97	3·10	25·4	47·5
Total	.....	.....	.....	.....	.....	.....	27·95	91·00	37·05	42·43	1,535·0	1,644·2
Average	.....	.....	.....	.....	41·12	38·82	2·33	7·58	3·09	3·53	127·9	137·02

THE CROPS

At this Station, cabbage, celery, clover hay, garden beans, garden beets, garden peas, gooseberries, onions, ornamental plants, bushes and trees, pasture, timothy hay, and tomatoes were very good; apples, asparagus, barley, cauliflowers, field beans, field peas, mangels, muskmelons, oats, parsnips, potatoes, squash, strawberries, sunflowers, swede turnips, sweet corn, and turnips were good; cherries, corn for silage, garden carrots, grapes, peas and oats for fodder, plums, raspberries, and spring wheat were medium.

ANIMAL HUSBANDRY

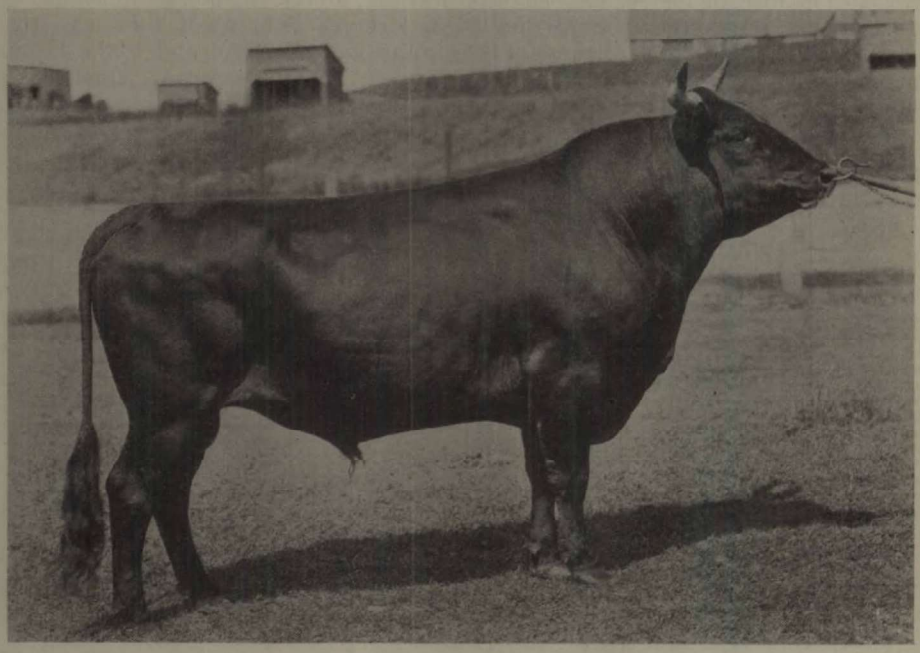
DAIRY CATTLE

BREEDING FRENCH CANADIAN CATTLE

From 60 to 75 head of pure-bred French Canadian cattle are generally kept for experimental work in breeding, feeding, housing, and management. The herd has been fully accredited since 1922, and has passed four consecutive tests for abortion without a single reaction. Every female with a completed period of lactation has qualified for Record of Performance.

At the time of writing this report, September 1930, three out of the four champion 305-day producers of the breed are in the Station herd where they and their sires and dams were bred. Four others were at one time champions of their age in the 365-day class. These 7 champions and ex-champions also 22 other females at present in the herd, are all descended from two cows. The two herd bulls are out of R.O.P. cows, one of them being classified AA and the other A.

Production and show-yard conformation do not always go hand in hand, but good appearance and high yielding power may be combined to a high degree in the same animal. For instance, when Colombelle, the best cow in the herd, was bred to Delphis, he out of a heavy producer, she gave Eglantine who, like her sire and dam, could not have won in mediocre company. Eglantine,



One of the French-Canadian bulls at Cap Rouge. Oedipe de Cap Rouge—9078—A.R. 14 class AA.

to the service of Elegant, also out of a good milker, dropped Herodiade who was still far from a show-ring star. But when the latter was bred to Ottawa Champion 2, the son of a 14,000 good looking cow, she gave Lumina who, besides holding the two-year-old record for production, was first at the Quebec Provincial Exhibition in 1924 as a junior yearling heifer, and first at the same show in 1926 as a three-year-old in milk.

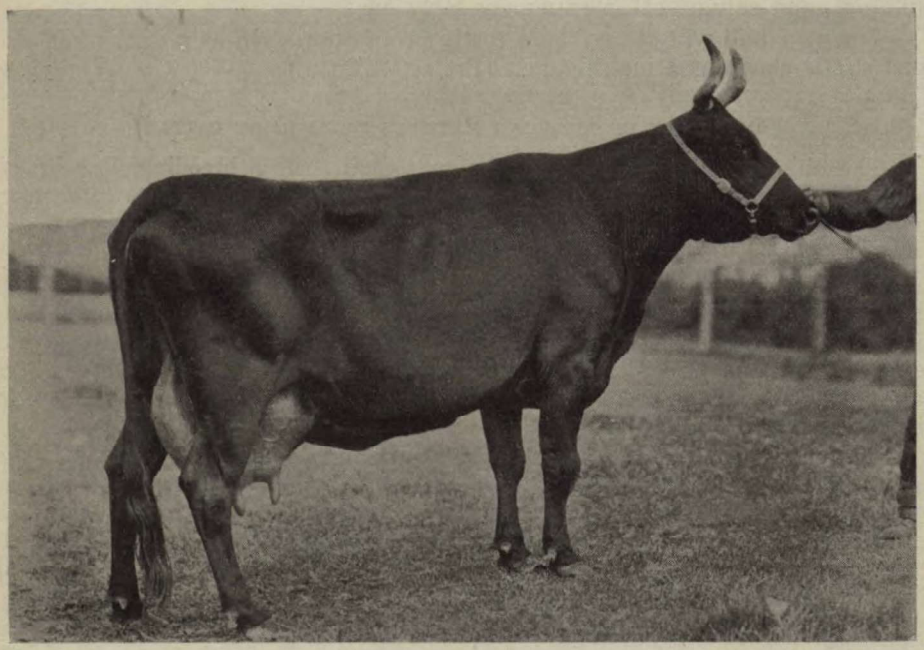
The senior herd bull at Cap Rouge, Oedipe, is a son of the last named cow, Lumina. (Project A 505.)

GRADING UP A DAIRY HERD WITH PURE-BRED SIRES

The object of this experiment was to find out if heifers out of nondescript cows, by a pure-bred bull, would be better milkers than their dams. Nine cows which by outward appearance, seemed to be French Canadian grades were bred to a registered bull of this breed, who was an outstanding show animal but

about whose dam's milk production nothing was known. The best way of determining the improvement is to compare the production of heifers with that of their dams at the same age, estimating that, during her first period of lactation, a cow will give 70 per cent of what she will when mature. This was done and the heifers yielded only 73 per cent of what was required to about equal the quantity given by their dams at the same age. The probable reason is that the dam of the bull was a poor producer, which is unfortunately what happens in too many cases.

The production af a large number of grade herds is quite low so that there is a fair chance of improvement in using a pure-bred sire, simply because the production of the average pure-bred herd is higher than the production of the average grade herd. But once a farmer has a good grade herd, he should



A long distance producer—Binette de Cap Rouge—4801—qualified five times for R.O.P. Gave 65,121 pounds of milk, 3,454 pounds of butter during the ten years following her first calving.

be very careful to get a sire out of a high producing dam. If he exchanges his grade bull for a registered one, without knowing the merit of at least his dam, he is taking a serious risk. (Project A 204.)

INFLUENCE OF A PROVEN SIRE ON A DAIRY HERD

One of the best type bulls of the breed was placed at the head of the herd of French Canadian cattle, many years ago, though nothing absolutely sure was known about the milking qualities of his ancestors. This animal turned out to be such a fine exhibition subject that a comparatively high price could have been obtained for him from a well known breeder. After 25 of his heifers had been sent to the butcher, because they were low producers, a sire was used which was bred at Cap Rouge and was out of a cow that had qualified four times for Record of Performance. Later on, this bull was followed by his own

son out of a cow which qualified three times for Record of Performance. The result was that, with the same feed, housing, and management, heifers by these two last bulls averaged over 2,000 pounds more milk per year than their dams. Moreover, cows which had produced poor heifers when bred to the first mentioned sire produced heifers which easily qualified for Record of Performance when mated to the others.

This shows that a dairy herd may be graded down with registered bulls of unknown (probably low) productive ancestry, and graded up with registered bulls of known high productive ancestry. But a word of caution is needed here: besides breeding, one must attend to feeding, housing, and management, because the great dairy sire cannot overcome such drawbacks as a poorly balanced ration, timothy hay and corn for instance, badly ventilated buildings, and calving at an extremely early age.

The poor bull will always be a costly proposition even as a gift, whilst the good sire is cheap at a high figure. (Project A 263a.)

COMPARISON OF BREEDING METHODS WITH DAIRY CATTLE

The object of this experiment was to compare close breeding, line breeding, and outcrossing. Results of 15 years show that the best results came from inbreeding followed by linebreeding.

That inbreeding does not necessarily lower vitality is shown by the following instance: Finette was bred to her son Victor and gave Gougou who became the champion two-year-old producer of the breed. The latter did not lack stamina as she qualified for Record of Performance as a three-year-old, as a four-year-old, and as a mature cow. She gave Jeanne, the champion 305-day mature cow of the breed, and Iliade who was at one time champion 3-year-old producer.

The good effects of linebreeding are shown in the case of Colombelle who, to the service of Delphis, gave Albertine with a yield of 228 pounds of fat. As a two-year-old Albertine, bred to Elegant, a son of Delphis, gave Herodiade with a production of 354 pounds of fat. As a two-year-old, Herodiade, bred to Champion, a grandson of Delphis, gave Lumina, the champion two-year-old of the breed up to 1927, with 475 pounds of fat.

It must not be forgotten, however, that concentration of blood will increase defects as well as qualities, so that the main requisite is the use of animals of high vitality having no defects in common. (Project A 265.)

COMMERCIAL VERSUS HOME-MIXED MEAL FOR DAIRY CALVES

This project consisted in feeding three lots of calves differently until they were 24 weeks old: one lot received whole milk; the second, skim-milk and a home-mixed meal consisting of 6 parts corn, 3 parts oats, 1½ part flax seed, by weight, all ground together; the last, skim-milk and Royal Purple calf meal, a well known commercial article.

The following table gives details:—

COMMERCIAL VERSUS HOME-MIXED MEAL FOR DAIRY CALVES

Item		Lot 1	Lot 2	Lot 3
		Whole milk	Skim-milk and Royal Purple meal	Skim-milk and corn 6 parts, oats 3 parts, flax seed 1½ part, all ground together
Number of calves	No.	12	13	13
Length of feeding period	days	168	168	168
Gross initial weight	lb.	681	802	864
Average initial weight	"	57	62	66
Gross finished weight	"	3,519	3,586	3,470
Average finished weight	"	293	276	266·9
Total gain per group	"	2,838	2,784	2,606
Average gain per calf	"	236·5	214	200·5
Average daily gain per calf	"	1·4	1·27	1·19
Amount of whole milk per group	"	28,711	1,852	1,742
Amount of whole milk per calf	"	2,393	142	134
Amount of skim-milk per group	"	.....	29,425	29,521
Amount of skim-milk per calf	"	.....	2,263	2,271
Amount of Royal Purple meal in milk per group	"	.....	1,374·25	
Amount of Royal Purple meal in milk per calf	"	.....	105·7	
Amount of home mixed meal in milk per group	"	.....	.....	1,376·00
Amount of home mixed meal in milk per calf	"	.....	.....	105·8
Amount of dry meal per group	"	.....	1,364·75	1,244·20
Amount of dry meal per calf	"	.....	104·98	96
Amount of hay per group	"	2,684	3,567	3,266
Amount of hay per calf	"	224	274	251
Amount of corn silage per group	"	1,105	1,556	1,207
Amount of corn silage per calf	"	92	120	93
Amount of swede turnips per group	"	789	1,590	1,759
Amount of swede turnips per calf	"	65·8	122	135
Total cost of feed per group	$	588 67	207 88	163 23
Cost of feed per calf	$	49 06	15 99	12 56
Cost of feed per pound gain	cts.	20·7	7·5	6·26

Valuing feeds at the prices current when the experiment was made, whole milk $2, skim-milk 20 cents, Royal Purple calf meal $5, home-mixed meal $2.17, other concentrates $1.72 per 100 pounds; with clover hay $9, corn silage $3, swede turnips $1.80 per ton, the cost per pound of gain was respectively 20·7 cents for whole milk, 7·5 cents for Royal Purple calf meal, and 6·26 cents for home-mixed meal.

SKIM-MILK VS. POWDERED SKIM-MILK VS. WHOLE MILK AND BONE MEAL FOR CALVES

Everybody admits that calves should have the best possible start, but it is also a well known fact that the rearing of calves successfully is as difficult a proposition as can be found in connection with the business of dairy farming.

For this project, all the feed given to 23 calves was recorded until they were 24 weeks old, and the animals were weighed at birth and at the end of the experiment. They had as much clover hay and corn ensilage as they would clean up, and each group was fed as follows: one received whole milk at the rate of one quart per three quarts of water and one ounce of bone meal; another received skim-milk; and the last lot received powdered skim-milk at the rate of one pound per gallon of water.

The following table gives details:—

SKIM MILK VERSUS POWDERED SKIM-MILK VERSUS WHOLE MILK AND BONE MEAL FOR CALVES

—		Lot 1 Whole milk and bone meal	Lot 2 Skim-milk	Lot 3 Powdered skim-milk
Number of calves	No.	7	8	8
Length of feeding period	days	168	168	168
Gross initial weight	lb.	394	472	453
Average initial weight	"	56·29	59	56·63
Gross finished weight	"	2,005	2,276	2,115
Average finished weight	"	286·43	284·50	264·38
Total gain per group	"	1,611	1,804	1,662
Average gain per calf	"	230·14	225·50	207·75
Average daily gain per calf	"	1·37	1·34	1·24
Amount of whole milk, at start, per group	"	2,100	2,411	2,512
Amount of whole milk, at start, per calf	"	300	301·38	314
Amount of skim-milk per group	"	.....	18,008	
Amount of skim-milk per calf	"	.....	2,251	
Amount of powdered skim-milk, in water, per group	"	.....	.....	1,563
Amount of powdered skim-milk, in water, per calf	"	.....	.....	195·38
Amount of whole milk, with bone meal, per group	"	7,211·50	.....	
Amount of whole milk, with bone meal, per calf	"	1,030·21	.....	
Amount of bone meal, in whole milk, per group	"	225·40	.....	
Amount of bone meal, in whole milk, per calf	"	32·20	.....	
Amount of dry meal per group	"	519·10	680·50	704·30
Amount of dry meal per calf	"	74·16	85·06	88·04
Amount of hay per group	"	1,811	1,938·10	2,290
Amount of hay per calf	"	258·71	242·28	286·25
Amount of corn silage per group	"	3,790·50	4,327	3,609
Amount of corn silage per calf	"	541·50	540·87	451·13
Amount of oilcake per group	"	.....	549·50	585·20
Amount of oilcake per calf	"	.....	68·69	73·15
Total cost of feed per group	$	223 61	141 08	334 61
Cost of feed per calf	$	31 94	17 64	41 83
Cost of feed per pound gain	$	0·1388	0·0782	0·2013

With the feed valuations current at the time of the experiment, the cost per pound of gain was respectively 20·1 cents for powdered skim-milk, 13·9 cents for whole milk and bone meal, and 7·8 cents for skim-milk.

Powdered skim-milk is out of question until it can be bought at a much lower price than at present. There is also no doubt that skim-milk is the cheapest feed to raise dairy calves when a suitable substitute, such as mentioned in the preceding project, is added to replace the fat taken out. (Project A262.)

The conclusion to be drawn from the results of the two preceding experiments is that whole milk is so costly that it should not be fed longer than a month and then gradually replaced by skim-milk and a fat substitute, also that a good home-mixed meal is practically as satisfactory and considerably cheaper than a commercial calf meal.

FEED REQUIREMENTS OF DAIRY HEIFERS UNTIL CALVING

All feed was weighed for 14 French Canadian heifers until calving at which time they averaged 824 pounds and were just 26 months old. For every one of them, the feed requirements were 436 pounds whole milk, 4,837 pounds skim-milk, 1,018 pounds meal, 3,269 pounds hay, 4,888 pounds corn silage, 2,490 pounds swede turnips, 216 pounds green peas and oats, and 125 days pasture. At the prices current at the time of the experiment, it cost $87.36 for each heifer for feed alone. This may be too high or too low, but the cost

can be arrived at by taking prices obtainable at any farm. Besides the value of feeds, wide variations may be due to age at calving, breed, and kind of management.

These 14 heifers might have been raised with less feed, but would have been smaller, and would probably have cost more at the end, as feeding for growth at the proper time is no doubt ultimately the most efficient way of raising young dairy cattle.

It must not be forgotten that $87.36 represents only the value of feed, besides which should be debited service fee of sire, labour, bedding, interest and depreciation on stable room and equipment, and risks, whilst manure is to be credited. This shows plainly that a cull heifer will be a loss, and that great care should be taken in choosing breeders of good reproducing quality. (Project A 59.)

PERIODIC COSTS OF REARING DAIRY MALES

Few dairymen think of the expense of rearing or maintaining a bull, but it is a fixed charge either on a per cow basis or in the cost of producing milk. To gather information about this, all feed was weighed for 4 French Canadian bull calves until they were about 13 months old or when ready for service. The average feed requirements were 301 pounds whole milk, 2,767 pounds skim-milk, 516 pounds meal, 1,037 pounds hay, 2,948 pounds corn silage, 271 pounds green peas and oats. At the prices current at the time of the experiment, it cost $36.13 just for feed for each bull. This only represents the value of feeds, and no credit is given for manure nor is anything charged for service fee of sire, labour, bedding, risks, interest and depreciation on stable room and equipment. These bulls might have been raised with less feed, but it would be folly to try and save a few dollars on an animal which is to remain in the herd for three or four years at least.

Cornell kept records of the feed eaten by nearly 400 bulls during one year, and the average cost was $137.57, which amounted to about 8 cents per 100 pounds of milk produced in the herds studied, or to $5.10 on a per cow basis.

This shows that only good animals should be kept as breeders, also that these breeders should be fed and managed so as to have them active and useful for as long a period as possible. No matter how much the cost of rearing or the upkeep of a bull, the expense is justified if he is a good reproducer, but if he is not, he is one of the most rapid means of tearing down the production of the herd, and a very costly proposition indeed. (Project A 456.)

FEEDING CONCENTRATES AT DIFFERENT RATES TO MILCH COWS

This project was conducted during five winters with 27 cows of about the same weight, which had calved at nearly the same time, and were practically of the same capacity as milk producers. The housing and care were the same for all. Group 1 received all the meal it would eat, which was 1 pound per 2·16 pounds of milk; group 2, 1 pound of meal per 4 pounds of milk; group 3, 1 pound of meal per 8 pounds of milk. The following figures give details:—

FEEDING CONCENTRATES AT DIFFERENT RATES TO MILK COWS

—		One pound meal per 2·16 pounds milk	One pound meal per 4 pounds milk	One pound meal per 8 pounds milk
Number of cows in test	No.	10	9	8
Gross number of days in test	days	1,425	1,300	1,137
Average number of days in test per cow	"	142·5	144·4	142·1
Gross number of pounds of milk produced	lb.	23,230·25	18,201·66	14,557·16
Average number of pounds of milk produced per day per cow	"	16·30	14	12·80
Average per cent of fat in milk	%	4·53	4·16	4·11
Gross number of pounds of fat produced	lb.	1,053·26	756·50	598·09
Average number of pounds of fat produced per cow per day	"	0·74	0·58	0·53
Total meal consumed	"	10,753	4,524	1,815
Total hay consumed	"	10,807	10,006	8,694
Total swede turnips and corn silage consumed	"	67,326	60,914	54,204
Findings from experiment.—				
Meal consumed per 100 pounds milk produced	"	46·29	24·85	12·47
Meal consumed per 100 pounds fat produced	"	1,020·93	598·02	303·47
Hay consumed per 100 pounds milk produced	"	46·52	54·97	59·72
Hay consumed per 100 pounds fat produced	"	1,026·05	1,322·67	1,453·63
Roots and silage consumed per 100 pounds milk produced	"	289·82	334·66	372·35
Roots and silage consumed per 100 pounds fat produced	"	6,392·15	8·052·08	9,062·85
Cost of meal at $1.72 per cwt	$	184 95	77 81	31 22
Value of hay at $9 per ton	$	48 63	45 03	39 12
Value of roots and silage at $2.40 per ton	$	80 68	73 10	65 04
Total cost of feed	$	314 26	195 94	135 38
Feed cost to produce 100 pounds milk	$	1 35	1 08	0 93
Feed cost to produce 100 pounds fat	$	29 84	25 90	22 64

The prices of concentrates and hay were those current when the experiment was made, whilst silage and roots were calculated in proportion to their feeding value.

One sure thing is that the more meal fed the more milk was obtained, but it is also evident that the cost of 100 pounds of milk was highest with the largest quantity of concentrates, and came down as the meal was decreased.

However, net profit will ultimately depend upon the price which can be had for the product, as may be seen in the following table.

INFLUENCE ON PROFIT OF VALUE OF PRODUCT

One pound of cencentrates per	Milk production	Cost of feed	Profit over feed when product is sold as	
			Butter at 40 cents per pound	As milk at 5 cents per pint
8 pounds milk	100	100	100	100
4 pounds milk	125	116	103	119
2·16 pounds milk	160	145	103	138

Like all other manufacturing plants the cow must be run economically. The cost or the return per animal does not mean much, it is the relation between the two which is important. (Project A 36.)

INFLUENCE OF FEEDS ON THE DEVELOPMENT AND THE MILK PRODUCTION OF DAIRY CATTLE

Twins were chosen for this project, to minimize the chance of error due to breeding. One of them was well fed and weighed 785 pounds just previous to dropping her calf at 2 years and 22 days; the other was scantily fed and weighed 600 pounds just previous to dropping her calf at 2 years and 83 days. It is evident that feeds had an influence on the development of a heifer, in this case, and this is an important point because there generally seems to be rather close relation between weight of dairy cattle and production.

The well fed heifer gave 11,392 pounds of milk and 655 pounds of fat, during the first two lactation periods, whilst the scantily fed heifer only yielded 3,767 pounds of milk and 168 pounds of fat. This is probably an extreme case, but it seems that the most profitable way is to feed well, without pampering; on very good pasture, no concentrate; at other times, all the clover hay they will consume, with silage and roots when available, and a grain allowance of from 2 to 3 pounds per animal, per day, according to age. (Project A 264.)

WINTERING DAIRY CATTLE IN SINGLE-BOARDED OPEN-FRONT SHEDS

During the last 16 years, 10 bulls and more than 100 heifers have been wintered in single-boarded open-front sheds, and only a few had to be brought in under exceptional circumstances, when suffering from an injury. Among the lot were future champion producers of the breed, in the 2, 3, 4 year, also mature classes, and it is thought that exercise and pure air gave them the vitality and ruggedness necessary for making high records. The herd has been accredited since 1922 and has passed four consecutive tests for abortion without a single reactor, both of which show that pure air and exercise are cheap and evidently efficient means in aiding in the prevention of disease.

It should however be understood that no cow in milk nor weak calf should be thus wintered; that calves not six months old at the beginning of November had better be kept in; that stock should be turned out before September to gradually get used to cold; that no half starved calf which has been tormented by flies all summer should be wintered outside; also that sheds should front south and have no cracks to create drafts. (Project A 266.)

COST OF MILK PRODUCTION

Production costs have been kept since 1912 inclusively for 312 cow years, that is, for a yearly average of about 12 head. The following valuations were used: hay $15, roots and ensilage $4, green peas and oats $6, meal $40 per ton, pasture $2 per month.

The table below gives details for three six-year periods.

PRODUCTION OF AND PROFIT FROM HERD

Period	Average yearly number of cows	Age of cows	Milk produced	Butter produced	Cost of feed	Profit per cow	
						Butter valued at 40 cents per pound	Milk valued at 5 cents per pint
			lb.	lb.	$	$	$
1912–17	12	6	5,932	320	95 87	38 99	144 38
1918–23	18	6	6,213	323	101 30	42 91	159 17
1924–29	22	5	7,233	423	135 93	51 07	189 44

27736—2½

During the whole period of eighteen years, it cost an average of $1.71 to produce 100 pounds of milk and 31·8 cents to produce one pound of butter. This is between calvings, so that it includes all the feed eaten. The skim-milk was put in at 25 cents per 100 pounds and was added to the value of the butter.

The production per cow has gradually crept up, more so than the feed consumed, which leaves a larger profit per cow during the last period.

But the most noteworthy item is the large profit when raw milk is valued at 5 cents per pint compared with the much lower figures when butter is valued at 40 cents per pound. It is obvious that selling raw milk instead of butter, when skim-milk is not required for calves, pigs and chicks, makes all the difference in the world in the relation between the return per cow and the cost of production, even when the latter remains the same. (Project A 56.)

HORSES

BREEDING FRENCH CANADIAN HORSES

From 65 to 80 head of pure-bred French Canadian horses are generally kept for experimental work in breeding, feeding, housing, and management at St. Joachim, county of Montmorency, Quebec. This horse breeding establishment, started under the united efforts of the Dominion and Provincial Departments of Agriculture and the French Canadian Horse Breeders' Association, is the most important one east of Manitoba. The main object is to breed a race of horses weighing about 1,200 pounds in ordinary condition, sound, hardy, full of energy but docile, fast walkers, good lookers, and at home as well on the plough as on the surrey. Such an animal is always in demand and the clear sighted farmer who will breed him will find it advantageous.

The procedure has been to gradually eliminate females producing offspring not coming up to the above requirements; to try out different strains so as to find out which are of the required standard; to concentrate the blood of the best families as long as both parents have strong constitutions and no defect in common, following with line breeding, and, now and then, close breeding, so as not to lose what has previously been gained.

That breeding operations have been successful may be seen by the fact that, since 1922, under 12 different judges, at Quebec, Sherbrooke, and Three Rivers, the three largest exhibitions of the province, over 400 prizes have been won, including more than twice the number of diplomas and firsts awarded to horses of all other exhibitions combined. Horses have been sold for breeding purposes as far west as London, Ontario, also in New Brunswick, Nova Scotia, and Prince Edward Island. (Project A 529.)

COMPARING METHODS OF BREEDING HORSES

There are three methods: inbreeding, when a brother is mated to his full sister, a sire to his daughter, or a dam to her son; linebreeding, when the sire is generally a half brother, a cousin, an uncle, a grandson, or a grandfather of the dam; outcrossing, when there is no relation, or practically none, between the sire and the dam. For the ordinary farmer, it is a question of improving his working stock and of using a sound, virile stallion of the breed which will suit his conditions best, whilst for the man who raises pure breds, it is a matter of breeding the largest number of strong animals having most of the characteristics of the breed.

At Cap Rouge and at St. Joachim, 153 foals were classified, and the following table gives the results:—

COMPARISON OF METHODS OF BREEDING HORSES

Method of breeding	Percentage			
	Very good	Good	Medium	Cull
Inbreeding	31·6	63·1	5·3	0·0
Linebreeding	28·6	32·1	28·6	10·7
Outcrossing	28·3	24·5	25·5	21·7

French-Canadian mares at St. Joachim, Que., all home bred with the exception of the fourth from the right.

It is apparent from the above table that the number of very good and especially of good foals decreases and that the number of culls increases, as one passes from inbreeding to outcrossing. Mention should be made of the fact that there is an improvement in weight, also that there is much more uniformity at the end of the fifteen years covered by above statistics.

A good rule to follow is to mate the best together irrespective of relationship, if they possess no defect in common, and if they both have a strong constitution. The latter point is very important, as no headway can be made in any kind of breeding work, if vigour and stamina are not used as a solid foundation on which to start building. Close breeding calls for rigid selection, since if inferior animals are bred, the descent will be as rapid as the ascent would otherwise have been. (Project A 334.)

WINTERING IDLE WORK HORSES

To cut down manual labour, the most costly item in producing farm crops, more horses must be employed and most of these should be wintered as cheaply as possible without impairing their future usefulness. An experiment was conducted during five winters with six mares and geldings, some quiet, others nervous, aged five to eighteen years. They fared well on a daily ration of one pound hay from mixed grasses, one pound oat straw, and one pound carrots or swede turnips for each hundred pounds of their weight. They gained an average of 28·2 pounds during the 151 days of the experiment, and showed, the following season, that they had lost no vitality or energy.

Valuing hay at $15 per ton, the straw at $5, and the roots at $1.80, it cost about 15 cents per day or $23 for the winter per horse, including a little oats and bran fed during the fifteen days at the start and the two weeks at the end of the experiment, to let them down and bring them up gradually. The above mentioned prices are probably higher than the kind of roughage fed would have brought at the Station, but each farmer can see for himself what the cost will be, according to his own circumstances.

A few things should be remembered: take a couple of weeks to lower the ration in the autumn, and as long to raise it in the spring; leave the horses practically idle, letting them out now and then for just enough exercise to prevent stocking of the legs; if a horse is in low condition, bring him up to normal before laying him aside for winter. Some animals are more restless than others, dissipating more energy, and may need more feed than the above mentioned quantities. (Project A 296.)

WINTERING HORSES IN SHEDS

Stable room is quite costly when interest, repairs, and insurance on the building are calculated, so that an experiment was started in 1913 to find out if all horses, with the exception of the few kept at work, could not be wintered under cheap single boarded sheds. About 450 winters, since then, have thus been spent by horses, from weanlings to twenty years old, and none of them seemed to suffer. The well known vitality and ruggedness of the St. Joachim French Canadian horses is evidence that this method of wintering is a good one.

Some maintain that it takes extra feed to heat up the body and for the energy used up in taking exercise. On the other hand, there is no doubt that feed is better digested and assimilated in the open than in most of the badly ventilated stables which are unfortunately very numerous. Two great advantages of the system, besides the economy of barn room, is that breeding stock takes the much needed exercise which it usually lacks in the stable, and that youngsters can be fed to the limit without fear of ruining their legs. It was also remarked that animals wintered outside commenced to shed their hair earlier than those which were kept inside.

A few points should however be well understood: no foal dropped later than June nor weak animal should be wintered outside; all stock should be turned out for good before the beginning of September so as to gradually get used to the cold; the sheds should face south, to have the advantage of the sun, and should have no cracks nor holes to form drafts. (Project A 330.)

COST OF RAISING HORSES

All feed given to 23 French Canadian foals was weighed from the time they were weaned, at five months of age, until they were ready to earn their living, when they were 34 months old and weighed 1,215 pounds. During that period, the average feed consumption was 8,936 pounds hay, 4,066 pounds oats, 3,702 pounds bran, and 7·3 months pasture. Instead of stinting these young-

sters, they were fed to the limit, getting them as strong as possible to tackle the average ten years' work which a horse has before him when broken.

Prices of feeds change quite often, and there is the question whether one should charge to the live stock the actual cost of raising feeds or their value at the farm. But if hay is calculated at $15 per ton, oats at 2 cents per pound, bran at $35 per ton, pasture at $2 per month, the cost of feed per colt is $227.66 from weaning until ready to work. This does not include service fee, loss of time by dam, stable room, bedding, care, and risks of accident or death, which would, of course, bring the total cost to a higher figure.

This brings us to the perennial inquiry: Will it pay me to raise horses or is it cheaper to buy them? In general, it is better for a farmer to raise his work stock, as he is thus fairly sure of getting what he requires. But if he does so, the most elementary common sense should make him decide to use the best stallion obtainable, sound mares of proper conformation, and suitable feeds. For there is no getting out of the fact that a young horse, ready to work, costs a good deal of money.

COST OF MAINTAINING WORK HORSES

All feed given to 17 horses averaging 11 years of age and 1,261 pounds in weight was weighed, and a record kept of the number of hours of work during the experiment. The average quantities eaten were 4,341 pounds hay, 2,914 pounds oats, 752 pounds bran, and the average number of hours of work was 1,189. If feeds are valued at prices current at the time of the experiment, that is $15 per ton for hay, $1.75 per 100 pounds for oats, $29 per ton for bran, it cost about 8 cents per hour of work. However, to this should be added bedding, care, doctoring, shoeing, harness, blankets, stable supplies, also interest and depreciation on horses, stable room, and equipment.

No doubt something may oftentimes be saved by proper feeds, and especially by avoiding waste of hay which is generally given in too large quantities. But the two main points are to plan work in such a manner that each animal will be employed as many hours as possible during the year, and to lay aside for the winter all animals not absolutely required. The reader is referred to project A 330 for information regarding wintering idle horses cheaply. (Project A 331.)

WORK VERSUS NO WORK FOR PREGNANT BROOD MARES

A mare carries her young about eleven months and must be in good health practically the whole year if the foal is not to suffer from her lack of vitality. It is practically impossible to keep a brood mare in good health if she does not get exercise of some kind, as without exercise there is inactivity of the respiratory functions, accumulation of fat, and a sluggish state of the excretive organs.

There are three ways of giving exercise to a brood mare: by working her, by keeping her in the stable with a daily run outdoors, and by turning her out all the time with some kind of a shelter for the night or bad weather. To try out these methods, 160 in-foal mares were used during 16 years, and no difference was found in the livability or vitality of the offspring.

The most conclusive result was obtained when the same mare foaled six years to the service of the same stallion, and was subjected to three different ways of exercising. Two winters she was worked moderately until foaling; two others she was kept in a box stall and turned out often for exercise; two more she was turned outside with only a single boarded shed as a shelter. And she raised six fine, strong foals.

The main deduction from this experiment is that exercise is essential for the brood mare, but the mode of exercising does not matter very much. If a farmer must work her, he should see that she does not get tired, overheated, or

injured in any way, does not draw or back heavy loads in deep ground or snow nor trot at a fast pace down hill. But if there is no time to work her, she may be turned out daily for exercise, or kept in a tight walled single boarded shed facing south. (Project A 332.)

REARING FALL FOALS

The price of horses is low compared with that of other classes of live stock, and the cost of production must be cut down if a profit is to be made. A good way of lowering expense is to have mares drop their foals in the autumn so that they may be free to do farm work during the crop raising season.

A project was thus started in 1916 to see how the thing would work out and since that time twelve fall foals were dropped by eight different mares. Out of these twelve youngsters, one died, one developed bad hocks, and the other ten did very well, three of them having grown into heavier animals than their full brothers or sisters born in the spring. The fall foal has the advantage, during its early life, of not suffering from heat or flies, and is often stronger at birth because the dam has worked during the summer.

The main objection has been that mares are difficult to breed except at the natural season, but this experiment proved conclusively that this is far from a general rule. For instance, the mares Chicane, Gem, and Sébastienne were all served twice in the spring, were not in foal, but conceived to the first service of the same stallion the following autumn. Brunette, Gipsy, and Hélène were not in foal to one service in the spring, and were not bred again until fall when they were got in foal at the first service. One other mare, Dorothée, foaled two consecutive autumns with only one service each time.

Two matters requiring attention are that the hoofs of foals should be pared often as they will grow fast on the usually damp litter, also that the mares should not be overfed with very nutritious rations, as the foals may get top heavy and go wrong in the legs. (Project A 333.)

FIELD HUSBANDRY

One of the most important things for the farmer to do, especially during the present period of what is termed agricultural depression, is to cut down cost of production. Good means to this end are better methods of soil management, and better choice of crops adapted to certain districts. The best of live stock will not give the profit it should give, if feeds used to feed it are produced at too high a cost, or are not of the right kinds.

COMPARATIVE YIELDS OF FOUR IMPORTANT CROPS

As yield means quite a lot in the cost of producing farm crops, a table is given showing the yield of four important crops during nineteen years. These figures represent the whole acreage of corn, swedes, oats, and hay, the good, medium, and poor. Every load was weighed, and every field was in a four or five-year rotation, comprising a hoed crop, a cereal, and hay. The table can thus be taken as representing a fair average, and is given in detail to show the fluctuations in yield from year to year, also the relative yearly yield of these four important crops.

FIELD CROPS—AREAS AND YIELDS—1912 TO 1930

Year	Longfellow corn		Good Luck Swedes		Banner oats		Clover and timothy hay	
	Area	Yield per acre	Area	Yield per acre	Area	Yield per acre	Area	Yield per acre
	acres	lb.	acres	lb.	acres	lb.	acres	lb.
1912	4·88	25,190	3·00	29,640	34·36	1,246	58·00	2,707
1913	7·31	5,497	3·00	11,263	25·46	889	48·90	3,555
1914	9·92	14,524	7·67	39,290	10·89	2,659	41·13	4,223
1915	17·35	20,153	10·80	28,671	14·68	2,151	31·40	2,858
1916	17·84	17,264	5·00	36,545	15·00	2,420	29·20	3,006
1917	9·38	18,235	4·00	16,782	21·19	1,377	36·29	5,101
1918	8·60	9,452	4·00	15,189	10·23	1,695	46·66	4,924
1919	18·99	20,929	4·00	11,410	20·79	1,175	30·36	4,400
1920	14·13	14,391	4·00	27,833	21·48	1,504	37·00	4,211
1921	21·07	20,774	4·00	22,296	23·00	1,545	36·53	2,708
1922	21·56	17,913	1·76	20,352	29·00	2,008	26·37	4,783
1923	19·80	24,210	0·70	27,529	26·80	1,238	36·70	3,890
1924	24·83	20,281	1·90	24,842	20·58	1,817	55·74	3,307
1925	20·50	19,990	1·45	19,310	25·95	2,103	43·05	5,469
1926	25·84	18,212	Total failure	Bad seed (a)	16·15	2,127	34·40	6,913
1927	28·98	18,732	0·19	23,263	17·00	1,925	34·56	5,024
1928	27·14	19,695	0·33	33,015	12·50	1,110	44·70	5,466
1929	17·18	13,266	0·10	63,520	15·38	1,225	45·45	5,499
1930	11·11	12,371	0·11	47,391	16·38	1,560	58·36	4,454
Average	17·18	17,425	3·11	27,674	19·83	1,672	40·78	4,342

(a) The average is for 18 years in the case of swedes.

YIELD AND PROFIT FROM ROOT AND SILAGE CROPS

An experiment was conducted during nine seasons, on uniform looking soil, comparing the yield per acre and the cost per ton of total yield and dry matter in Good Luck swede turnips, Longfellow corn, Russian sunflowers, and a mixture of Arthur peas and Banner oats, the three latter grown for ensilage. Every load was weighed, and samples were sent to the Dominion Chemist so that the percentages of dry matter are what they really were under conditions of the experiment. The following figures give details:—

YIELD PER ACRE AND COST PER TON OF ONE ROOT AND THREE SILAGE CROPS

Crop	Total yield per acre	Per cent dry matter	Dry matter per acre	Cost of total yield per ton	Cost of dry matter per ton
	lb.		lb.	$	$
Longfellow corn	26,783	18·22	4,880	3 11	17 05
Russian sunflowers	30,631	20·76	6,359	2 50	12 06
Arthur peas and Banner oats	17,903	32·03	5,734	3 65	11 40
Average for three silage crops	25,106	23·67	5,658	3 09	13 50
Good Luck swedes	31,142	12·34	3,843	4·06	32 90

There is no evidence available indicating that the dry matter in roots is worth over twice that of the dry matter in the above three silage crops, which it would have to be to make it profitable to grow swede turnips. When fed in small quantities, or with silage, roots have a higher feeding value; and they are more or less valuable, according to what they are compared with, roughages or concentrates. But it is an undeniable fact that the crop has too low a

Comparison of peas and oats, corn and sunflowers as silage crops. Peas and oats produce a ton of digestible nutrients at the lowest cost.

percentage of dry matter and takes too much manual labour to be able to economically compete with corn, sunflower, or peas and oats silage. Roots can only be advantageous for farmers having small herds and disposing of manual labour at practically no cost. (Project F 88.)

COMPARISON OF CORN, SUNFLOWERS, PEAS AND OATS FOR SILAGE

To find out which would be the most profitable crop for silage purposes, an experiment was conducted during nine seasons comparing yield per acre and cost per ton of dry matter in Longfellow corn, Russian sunflowers, and a mixture of Arthur peas and Banner oats. The following table gives details:—

DRY MATTER AND PROTEIN IN THREE SILAGE CROPS, 1922-1930

Crop	Total yield per acre	Per cent dry matter (a)	Dry matter per acre	Cost of total yield per ton	Cost dry matter per ton	Per cent digestible protein (b)
	lb.		lb.	$	$	
Longfellow corn	26,783	18·22	4,880	3 11	17 05	1·0
Russian sunflowers	30,631	20·76	6,359	2 50	12 06	1·0
Arthur peas and Banner oats	17,903	32·03	5,734	3 65	11 40	2·8

(a) Determinations made by the Dominion Chemist from samples sent to him.
(b) Figures from Morrisson's "Feeds and Feeding."

The composition of the dry matter in roughages used to feed dairy cattle is a very important thing. When it is seen that peas and oats not only furnish dry matter at a lower cost per ton, but contain nearly three times more protein than corn or sunflowers, it is evident that this mixture should be grown instead of corn or sunflowers. It would mean that a lesser quantity of concentrates could be fed, thus lowering the cost of the ration.

This question of roughages of higher feeding value is certainly, in the writer's opinion, one of the ways by which dairymen can most easily save money. (Project F 177.)

ROTTED VS. FRESH MANURE

An experiment was started in 1925 to compare the effect of rotted and fresh manure not only on the crop to which it is applied, but also on all the crops of a rotation. The procedure was to apply fresh manure at a stated rate per acre in winter for the hoed crop; the same quantity of the same kind of manure was piled at the same time in winter to rot, and this rotted manure was applied in spring for the hoed crops. One half of the area was devoted to each method, and the following table gives details:—

RESULTS WITH ROTTED VS. FRESH MANURE

Crop	Manure applied 1926		Manure applied 1927		Manure applied 1928		Manure applied 1929		Average		
	Rotted	Fresh	Rotted	Fresh	Rotted	Fresh	Rotted	Fresh	Rotted	Fresh	Years
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	
Swede turnips	Bad seed	Failure	19,667	19,958	.....	.....	.....	.....	19,667	19,958	1
Sunflowers	.....	.....	.....	.....	17,583	15,733	7,242	7,400	12,412	11,567	2
Oats—grain	1,650	1,707	907	942	707	856	697	908	990	1,103	4
Oats—straw	1,895	1,976	1,060	980	876	1,011	2,362	2,288	1,548	1,564	4
Clover hay	4,233	4,183	4,825	4,358	4,342	4,633	.....	.....	4,467	4,391	3
Timothy hay	4,794	4,394	4,817	4,633	.....	.....	.....	.....	4,805	4,513	2
Total	12,572	12,260	31,276	30,871	23,508	22,233	10,301	10,596	43,869	43,096	

The direct results of one year for swede turnips show practically no difference, while in the case of sunflowers, for two years, there is a slight advantage in favour of rotted manure. The residual effects show practically no difference for oat straw and clover hay, some advantage in favour of fresh manure for oats, and in favour of rotted manure for timothy.

When the total number of pounds of all crops is compared for the different cycles of the rotation, it is seen that there is practically no difference.

To sum up, it may be said that on clay land, no difference was found between fresh manure applied in winter and the same quantity of the same kind of manure left to rot in the field and applied in the spring. (Project F 80.)

THINNING ROOTS AT DIFFERENT DISTANCES

The cost per ton of digestible nutrients in roots is so high that it is important to find ways of increasing yields so as to cut down this cost. An experiment was thus started in 1927 with the object of determining the best width between rows of swedes and the most desirable distance between plants in the row. The following figures should be looked upon as only a progress report:—

27736—3½

THINNING GOOD LUCK SWEDE TURNIPS AT DIFFERENT DISTANCES

Good Luck swedes	Rows 18 inches apart			Rows 27 inches apart		
	Thinned to 6 inches. Yield per acre	Thinned to 9 inches. Yield per acre	Thinned to 12 inches. Yield per acre	Thinned to 6 inches. Yield per acre	Thinned to 9 inches. Yield per acre	Thinned to 12 inches. Yield per acre
	lb.	lb.	lb.	lb.	lh.	lb.
1927	18,833	14,333	11,500	24,222	12,277	14,111
1929	51,110	49,368	48,642	50,530	49,658	48,981
1930	35,808	32,205	31,332	34,499	36,829	36,683
Average	35,250	31,969	30,491	36,417	32,921	33,258

The average yield per acre for rows 27 inches apart is 34,199 pounds, and for rows 18 inches apart 32,570; the average yield per acre for plants thinned to 6 inches in the row is 35,834 pounds for plants thinned to 9 inches 32,445 pounds, for plants thinned to 12 inches 31,875 pounds. The highest yield per acre is from plants thinned to 6 inches in rows 27 inches apart.

More work is required before conclusions may be drawn. But the question of digestible nutrients will be looked into by having dry matter determinations made of each lot, as it seems reasonable to believe that roots thinned at 6 inches will be smaller individually than roots grown to 12 inches and may contain a lower proportion of fibre, giving them a higher proportion of digestible dry matter. (Project F 100.)

HAY CAPS—COST AND VALUE

An experiment has been conducted during five seasons comparing hay cured in windrows, in cocks not under caps, and in cocks under caps. A record was kept of the extra labour required to cure hay in cocks, also of putting on and taking off caps. Dry matter determinations were made under the direction of the Dominion Chemist for each of the three lots every year, except in 1926; for this season, the average of the next four years is used. The following table gives details:—

HAY CAPS—COST AND VALUE—RESULTS OF EXPERIMENT

Year	Windrows			Cocks without caps							Cocks with caps								
				Yields			Time and costs of cocking				Yields			Time and costs of cocking and covering					
	Hay per acre	Per cent moisture	Dry matter per acre	Hay per acre	Per cent moisture	Dry matter per acre	Cocking	Opening	Total	Cost	Hay per acre	Per cent moisture	Dry matter per acre	Cocking	Covering	Uncovering	Opening	Total	Cost
	lb.		lb.	lb.		lb.	hr. min.	hr. min.	hr. min.	$	lb.		lb.	hr. min.	hr. min.	hr. min.	hr. min.	hr. min.	$
1926....	4,400	*30·82	3,044	4,400	25·22	3,290	1 31	1 15	2 48	0 84	4,640	21·62	3,637	1 31	1 36	1 00	1 15	5 22	1 37**
1927....	4,855	21·94	3,790	4,556	23·31	3,494	1 30	2 50	4 20	1 30	4,435	13·87	3,820	1 30	2 09	1 13	2 30	7 22	1 89
1928....	3,724	48·94	1,901	3,066	40·73	1,814	1 25	6 15	7 40	2 30	3,531	32·96	2,368	1 25	1 20	0 52	4 00	7 37	2 09
1929....	6,600	23·04	5,070	6,530	21·23	5,144	2 00	1 20	3 20	1 00	7,930	22·32	6,160	2 00	1 40	0 40	1 20	5 40	1 45
1930....	5,455	29·37	3,853	5,065	15·61	4,279	1 30	4 00	5 30	1 65	4,975	17·34	4,112	1 40	1 20	0 50	2 20	6 10	1 65
Average	5,007	30·82	3,464	4,723	25·22	3,532	1 35	3 08	4 43	1 42	5,106	21·62	4,002	1 37	1 37	0 55	2 37	6 46	1 79

* No determination of moisture made; this is the average of the next four years.

** Part of the time is charged at 15 cents per hour when boys were used to cover caps.

The caps cost $97.41, as follows: 288 yards of cotton at 27 cents, $77.76; 5½ gross eyelets at 40 cents, $2.20; wire to hold caps on cocks, $2.30; 50½ hours of work at 30 cents, $15.15. There are enough to cover about 7 tons of hay, as they were used in 1926 on 3 acres when the average yield was 4,630 pounds per acre.

It is interesting to see the notes taken each year about the quality of the hay made different ways.

1926—Weather fine all the time between date when hay was cut and that when it was brought in. Hay in windrows dried up quite a lot and leaves in great quantities were broken when hauled in; what was in cocks did not dry out so much; and what was covered was much the best from outside appearance.

1927—It rained a short while after the hay was cut, a precipitation of 2·10 in 4 days. What was in windrows escaped this rain and thus was in good shape; the cocked hay was wet through and through, leaves getting black and falling off when drying up; the covered hay was only wet at the bottom of the cocks, dried up well when covered and was thus much better than the lot cocked but not covered, the leaves not falling nearly so much as in the other lot.

1928—Weather was bad with 1.76 inches of precipitation during the days during which hay was in the field. What was in the windrows escaped most of the rain, but what was cocked lost quite a lot of its value on account of local showers after cocks had been opened. What was cocked and covered had not been opened when the showers came, so turned out best of all.

1929—Fine weather all the time, but very windy, so that what was in windrows dried up too quick with a comparatively large loss of leaves when brought in; the cocked lot, not covered, was also too dry on top and around the cocks, whilst the covered lot was by far the best.

1930—There was a precipitation of 0·44 inch after the hay was cut, which hurt the lot left flat on the ground more than the one in windrows which did not suffer much, as there was very little sunshine to dry up the leaves; there was another precipitation of 0·48 inch for the cocked lots, the uncovered one having bad looking hay on top and on sides; the covered lot, though looking more moist when caps were taken off, dried up quickly, and, in this case, made the best hay of the lot.

There is no doubt that caps will pay during a bad season; the only question is whether they will pay in the long run. The same thing may be said for cocking. The difference in the yield of dry matter certainly means something, but the really important point would be to find out the per cent of digestibility of the dry matter in hay cured in different ways. And this can only be done with feeding experiments.

The writer's personal opinion is that the most profitable way in the long run, is to make hay in windrows, but to use the best methods of thus making it. (Project F 303.)

COST OF OPERATING TRACTOR

During the last four years, notes were kept on the cost of operating a Fordson tractor. The depreciation was calculated at 10 per cent of the initial cost, and the interest at 6 per cent of half of the initial cost. The cost of repairs, fuel, oil, operator's wages, also the number of hours and the kind of work were kept. The following table gives details:—

COST OF OPERATING A FORSDON TRACTOR—3 YEARS

Costs	1928	1929	1930	Average
	$	$	$	$
Depreciation	60 15	60 15	60 15	60 15
Interest	18 04	18 04	18 04	18 04
Repairs—parts	16 77	46 15	154 08	72 34
expert work	11 00	21 50	62 25	31 58
home work and servicing	70 20	69 13	108 50	82 61
Total fixed charges	176 16	214 98	403 02	264 72
Gasoline	253 21	250 51	367 33	290 35
Oil and grease	13 67	48 89	95 48	52 68
Total fuel and oil costs	266 88	299 40	462 81	343 03
Tractor operator costs	229 80	312 34	448 35	330 16
Total yearly costs	672 85	826 72	1,314 18	937 91
Number work days	76·6	94·6	128·1	99·8
Daily fixed cost	2 30	2 27	3 15	2 57
Daily fuel and oil cost	3 48	3 16	3 61	3 42
Daily operator cost	3 00	3 30	3 50	3 27
Total daily cost	8 78	8 73	10 26	9 26
Total hour cost	0 88	0 87	1 03	0 93

An interesting point is the high cost of repairs for the third year, $403.02, compared with $214.98 for the second, and $176.16 for the first. This has brought up the total hour cost from 88 cents to $1.03, or about 15 per cent, and reminds one of the fact that either the 10 per cent for depreciation is too low or else the total hour cost will gradually and perhaps considerably go up with repairs necessary to keep the machine going during ten years.

HORTICULTURE

Details will be found for 19 projects with fruits in the 1927 report of this Station, for 55 projects with vegetables in the 1925 report, and for 25 projects with ornamental plants, shrubs and trees in the 1926 report. The fact that 99 projects have been reported on in detail shows the amount of horticultural work done at Cap Rouge during the last twenty years.

FRUITS

Apples, raspberries and strawberries are the only fruits of economic importance in Central Quebec. To persons who wish to grow other kinds of fruits, the following varieties are recommended: Black Currant, Climax; Red Currant, Perfection; White Currant, White Grape; Gooseberry, Silvia; Grape, Winchell; Cherry, Montmorency; Pear, none will mature; Plum, Bonne Sainte Anne.

APPLE—VARIETY EXPERIMENT

At best, there is not much money for the farmer of Central Quebec in growing apples, on account of the competition from Southwestern Quebec, Nova Scotia, Ontario, British Columbia, Oregon, and Washington where climatic conditions are more suitable. To make a success, the grower must choose the right varieties, produce fine looking fruit of good quality, and put the crop on the market in an attractive way. It is to help him regarding the first consideration that this project was started in 1911.

Since the above date some 1,200 trees of about 200 varieties have been tested for hardiness, productivity, also size, colour and quantity of fruit. Out of all these, not more than 12 varieties have shown real outstanding merit such as is required to make them profitable in Central Quebec. It would be better for a man wishing to go into commercial apple growing in this district to start with only 6 and possibly only 3 of the above mentioned 12.

Unless one is near a village or a city, it seems advisable not to have more than 5 per cent of the plantation in summer varieties, and among these Rupert, yellow, is the earliest, followed by Yellow Transparent, of the same colour, and Lowland Raspberry, an attractive red. Some 10 per cent of an early autumn variety might be put in, and it is time that Duchess be replaced by Melba, a fine seedling of McIntosh; Okabena is a heavy yielder with poor quality, whilst Petrel has extra quality but poor colour. For late autumn or early winter, Wealthy is still the old standby, but Pedro, a C.E.F. seedling, has undoubtedly better quality and will probably replace it in the near future; about 35 per cent of one of these will be satisfactory. The bulk of the plantation, some 50 per cent should be of a winter variety such as McIntosh or Fameuse, with a market preference for the former. If something later is wanted, Walton will about fill the bill.

To persons going into commercial apple growing in Central Quebec, it is recommended to plant 25 per cent of Melba, 25 per cent of Wealthy, and 50 per cent of McIntosh. (Project H 33.)

APPLE—COST OF ESTABLISHING AN ORCHARD

A record was kept of all expenditure and all revenue concerning an orchard of 378 McIntosh and Wealthy apple trees planted in 1913 and 1914. The following table gives interesting information:—

COST OF ESTABLISHING AN ORCHARD AND REVENUE THEREFROM—18 YEARS

—	1913 to 1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	Total
	$	$	$	$	$	$	$	$	$	$	$
Rent of land (2.94)	.....	17 64	17 64	17 64	17 64	17 64	17 64	17 64	17 64	17 64	
Use of machinery	.....	1 18	1 18	1 18	1 18	1 18	1 18	1 18	1 18	1 18	
All labour	.....	83 20	108 70	105 70	123 70	41 80	120 60	125 97	209 42	145 22	
Trees to replace	.....	1 00	.....	.....	17 50	.....	23 50	8 50	12 00	.....	
All cover crops	.....	7 78	9 63	8 25	10 59	7 60	9 25	9 13	8 68	7 25	
All fertilizers	.....	.....	.....	37 80	46 05	55 65	52 38	50 34	51 79	50 37	
All materials for protection	.....	7 81	12 51	7 38	13 54	17 27	23 02	11 71	35 42	34 20	
Containers	.....	.....	.....	.....	.....	.....	.....	.....	.....	70 70	
Total expenditure	741 14	118 61	149 66	177 95	230 20	141 14	247 57	224 47	336 13	326 56	2,593 43
Total revenue	245 00	73 07	284 30	371 75	985 46	166 75	708 26	227 37	878 43	359 97	4,300 36
Expenditure per acre	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	916 13
Revenue per acre	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,462 71
Profit or loss per acre	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	546 58
Profit or loss per acre per year	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30 37
Expenditure per tree	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7 13
Revenue per tree	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11 38
Profit or loss per tree	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4 25
Expenditure per barrel of apples	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2 36
Revenue per barrel of apples	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3 78
Profit or loss per barrel of apples	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1 42

It is seen that it took thirteen years, from 1913 to 1925, before the total revenue exceeded the total expenditure, which shows that commercial apple growing is a long-time proposition.

In 1924, a project was started to determine the effect of fertilizers on production of apple trees. The following table given results for six years:—

NITRATE OF SODA AND SUPERPHOSPHATE VS. NITRATE OF SODA FOR APPLE TREES

Variety	Season	Year planted	Year of first treatment with fertilizers	Five pounds nitrate of soda and six pounds superphosphate per tree					Five pounds nitrate of soda per tree				
				Number of trees in test	Total production per tree		Increase in six years		Number of trees in test	Total production per tree		Increase in six years	
					For four years preceding treatment	For six years under treatment	Total	Per cent		For four years preceding treatment	For six years under treatment	Total	Per cent
					gals.	gals.	gals.			gals.	gals.	gals.	
Duchess	Early autumn	1911	1924	3	53·50	165·67	112·17	210	1	55·75	216·50	160·75	288
Fameuse	Winter	1911	1924	1	4·50	56·00	51·50	1,114	2	8·87	60·00	51·13	576
Lowland Raspberry	Summer	1911	1924	2	9·75	158·00	148·25	1,521	5	10·10	169·55	159·45	1,579
Milwaukee	Winter	1911	1924	2	19·50	81·50	62·00	318	4	35·06	126·56	91·50	261
Montreal Peach	Autumn	1911	1924	6	16·58	170·67	154·09	929	6	26·62	223·66	197·04	740
Red Astrachan	Summer	1911	1924	4	5·00	149·94	144·94	2,899	4	6·06	116·75	110·69	1,826
Average					18·14	130·30	112·16	618		23·74	152·17	128·43	541

The total increase in production was larger when superphosphate was added to nitrate of soda, and the increase was much larger for the summer varieties, as the following figures show:—

EFFECT OF FERTILIZERS ON YIELD OF APPLES OF DIFFERENT SEASONS

Season	Per cent increase of production	
	Nitrate of soda and superphosphate	Nitrate of soda
Summer	2,210	1,702
Autumn	569	514
Winter	731	418
Average	618	541

The most moteworthy result is the very large increase of production of summer varieties compared with autumn and winter varieties.

COVER CROPS FOR AN APPLE ORCHARD

Is it better to leave an apple orchard in sod or have a cover crop? If it is better to have a cover crop, should it be a leguminous or other plant, and should it be sown yearly or rotated with another one? If it is better to leave the orchard in sod, should the hay be left as a mulch around the trees or can it be taken away? It is to help answer these questions that an experiment was started in 1913. The following table gives details:—

APPLE—COVER CROP EXPERIMENT

Cover crop	McIntosh				Wealthy			
	Average circumference of trees, two feet from the ground, in 1922	Average circumference of trees, two feet from the ground, in 1930	Average increase of circumference in 9 years	Average yield per tree, 16 years after planting, in 1930	Average circumference of trees, two feet from the ground, in 1922	Average circumference of trees, two feet from the ground, in 1930	Average increase of circumference in 9 years	Average yield per acre, 16 years after planting, in 1930
	in.	in.	in.	gals.	in.	in.	in.	gals.
Red clover, sown every year	10·50	22·12	11·62	45·75	8·06	14·62	6·56	58 ·1
Vetches, sown every year	10·45	21·90	11·45	112·20	9·54	17·78	8·24	153·36
Rape, sown every year	9·29	20·00	10·71	99·00	9·42	17·12	7·70	121·30
Clover followed by rape in a two-year rotation	10·37	21·04	10·67	87·58	9·19	17·19	8·00	138·25
Permanent sod, hay taken away	7·55	18·65	11·10	62·50	6·25	14·17	7·92	113·33
Permanent sod, hay used as a mulch around trees	7·62	18·25	10·63	69·00	6·37	15·56	9·19	71·12

The effect of a cover crop on size of trees was negligible with the McIntosh, but gave an increase of about 12 per cent with the Wealthy. The cover crop, on an average, gave an increase of production of from 25 to 30 per cent over the sod. The great surprise is to see red clover sown every year at the very bottom of the list, even including sod. When red clover, however, was followed by rape in a two year rotation, it did much better. The best cover crop was vetches. Contrarily to expectation, when the hay from the permanent sod was taken away, the yield increased.

RASPBERRY—VARIETY EXPERIMENT

Some 20 varieties of raspberries have been tested since 1911, and one thing was very clear, that freedom from disease is the most important factor in regard to yield. This means that a new plantation should be started with plants guaranteed sound. A few notes regarding some of the well known varieties may help the farmers of this district.

Brighton has decidedly shown superiority over all the others tested. It is early, a high yielder, firm for shipping, and remains quite a while on the cane after it is ready to pick.

Newman 23 comes second for yield, is fairly firm for shipping but falls off the cane a couple of days after it is ready to pick, which is a disadvantage for the commercial grower.

Herbert comes after Brighton and Newman 23 for yield, is fairly firm for shipping, and holds its fruit on the cane better than Newman 23.

King is not earlier than Brighton, yields quite a bit less, and does not hold its fruit well after it is ready to pick, so that it has not a single advantage over Brighton.

Cuthbert has been such a consistently low yielder that prospective growers are advised not to plant this variety.

St. Regis, a so-called "ever-bearer", may be all right for the home garden, but should never be grown commercially, as consumers are now used to get different kinds of fruits at different seasons, and raspberries out of season find very little sale.

Golden Queen, a yellow variety, should, like St. Regis, only be grown in the home garden, as most buyers want a red raspberry.

Columbian is not in the red raspberry class, but is exceedingly productive, very much liked for canning, and the fruit remains long on the cane after it is ready to pick.

The two varieties strongly recommended are Brighton and Newman 23. (Project H 11.)

STRAWBERRY—VARIETY EXPERIMENT

More than forty varieties of strawberries have been tested during the last twenty years and results show that there is a vast difference between them as far as yield is concerned. For instance, during the same seven seasons, Dunlap averaged at the rate of 7,362 pounds of fruit per acre whilst Nettie only gave 4,292 pounds.

The following table gives details about seven varieties which have been tested alongside of each other during sixteen years:—

SEVEN VARIETIES OF STRAWBERRIES COMPARED—16 YEARS

Variety	Perfect or imperfect	Shipping qualities	Size S=Small M=Medium L=Large	Colour	Eating qualities	Resistance to disease	Yield of fruit per acre	Days to ready to pick
							lb.	
Dunlap	Perfect	Medium	M to L	Deep red	Sub-acid	Medium	7,733	60
Bisel	Imperfect	"	"	"	"	"	6,950	63
Cassandra	"	"	"	"	"	Good	6,548	61
Sample	"	"	L	Red	"	"	6,437	64
Glen Mary	Perfect	"	"	Deep red	"	"	5,929	63
Portia	Imperfect	Firm	M to L	Deep rose	"	"	5,845	64
Excelsior	Perfect	"	M to S	Deep red	Acid	Medium	5,242	53

For Central Quebec, Dunlap, sometimes called Senator Dunlap, is strongly recommended. If a very early variety is desired, Excelsior will best fill the bill, but it is a low yielder of poor quality, and as strawberries from the south-western part of Quebec and from Ontario are early on the markets of the district, it is as well to leave it alone. (Project H 21.)

CEREALS

VARIETY AND STRAIN TESTS OF BARLEY

Oats or peas, for an average of fourteen years, have yielded more grain, digestible nutrients, and protein than barley, so that the latter is only recommended for exceptional circumstances such as when it may advantageously be sold for seed or for malting, where soils are better adapted to it than to other kinds of grain, or when raising hogs for markets is a specialty.

The following table gives information regarding some of the well known varieties:—

RESULTS OF VARIETY AND STRAIN TESTS OF BARLEY

Variety or strain	1930				Variety or strain	Average of six years 1925–1930			Variety or strain	Average of sixteen years, 1915–1930	
	Yield of grain per acre	Days to mature	Length of straw	Strength of straw		Yield of grain per acre	Days to mature	Weight measured bushel*		Yield of grain per acre	Days to mature
	lb.		in.			lb.		lb.		lb.	
Mensury O. 60...	1,475	92	46	10	Bearer O. 457.....	1,755	97	50	O.A.C. 21.....	1,669	89
Pontiac.....	1,314	95	48	10	Mensury O. 60....	1,714	92	51	Early Chevalier..	1,642	88
O.A.C. 21.....	1,275	91	41	10	Charlottetown 80.	1,595	99	55	Manchurian.....	1,583	91
Charlottetown 80	1,180	103	44	10	Star.....	1,582	93	52			
Early Chevalier.	1,176	89	45	10	O.A.C. 21.....	1,580	92	51			
Monek.....	1,132	102	51	10	Manchurian.....	1,562	94	52			
Bearer O. 457....	1,128	96	46	10	Early Chevalier..	1,534	91	52			
Star.....	1,056	93	38	10	Hannchen.....	1,461	98	53			
Manchurian.....	924	95	47	10							
Hannchen.....	868	101	43	8							
Plumage Archer.	576	112	41	10							

*For five years 1926-1930.

Manchurian has been recommended by this Station for a long while; as there is less than five per cent difference in yield between it and the highest producing variety for an average of sixteen years, it does not seem advisable to change this recommendation.

Of the varieties tested during the last six years, Bearer O. 457 has shown itself to be a consistently heavy yielder, but it is three days later than Manchurian, weighs two pounds less per bushel, and has a much thicker hull, so that it is better to wait a few years more before advising farmers to drop Manchurian for it.

BARLEY—PRODUCTION OF SUPERIOR VARIETIES OR STRAINS BY SELECTION FROM OLD SORTS

Compared with oats or with peas, barley has not yielded enough digestible nutrients or protein to make it generally profitable for live stock feeding. In 1913, selection work was started with Manchurian to try and isolate a strain which would produce more than other varieties and strains. The reader is referred to the 1927 report of this Station for details regarding the experiment. From 1918 to 1924, this selection, Manchurian Cap Rouge 14, compared in the test plots with Manchurian Ottawa 50, either equalled or outyielded the parent variety every year, averaging 249 more pounds of grain per acre.

The following table shows that Manchurian Cap Rouge 14 also outyielded the other two highest producing varieties:—

TWO WELL-KNOWN VARIETIES OF BARLEY COMPARED WITH A CAP ROUGE SELECTION

Year	Manchurian C. R. 14 Yield per acre	O. A. C. 21 Yield per acre	Early Chevalier O. 51 Yield per acre
	lb.	lb.	lb.
1918	1,890	1,710	1,740
1919	1,860	990	1,290
1920	2,370	2,160	2,010
1921	1,550	2,000	1,650
1923	1,550	1,775	1,800
1924	1,725	1,775	1,475
1925	1,968	1,932	2,064
1926	2,430	2,208	2,175
1927	1,102	1,281	1,460
1928	1,734	1,569	1,392
1929	1,215	1,215	1,116
1930	924	1,275	1,176
Average	1,693	1,657	1,596

DETERMINATION OF PERCENTAGE OF HULL IN BARLEY VARIETIES

During the last four years, an experiment was conducted to find the percentage of hull in the varieties and strains of barley tested for yield of grain at this Station, and the following table gives details:—

YIELD OF GRAIN AND KERNELS OF DIFFERENT VARIETIES AND STRAINS OF BARLEY

Name	Average of four years 1927-1930			Name	1930		
	Yield of grain per acre	Per cent of kernel	Yield of kernel per acre		Yield of grain per acre	Per cent of kernel	Yield of kernel per acre
	lb.		lb.		lb.		lb.
Mensury O. 60	1,458	88·13	1,285	Mensury O. 60	1,476	92·13	1,360
Bearer O. 457	1,432	88·34	1,265	O. A. C. 21	1,275	92·67	1,182
Charlottetown 80	1,323	91·84	1,215	Charlottetown 80	1,180	93·90	1,108
O. A. C. 21	1,335	89·74	1,198	Early Chevalier	1,176	92·32	1,086
Star	1,253	91·22	1,143	Bearer O. 457	1,128	91·20	1,029
Manchurian C.R.14	1,244	90·03	1,120	Star Sv	1,056	92·64	978
Early Chevalier	1,236	88·92	1,099	Manchurian C.R.14	924	90·72	838
Hannchen	1,139	92·71	1,056	Hannchen Sv	868	93·79	831

The percentage of hull ranged from 7·29 for Hannchen to 11·66 for Bearer, for an average of four seasons. This is important work from a live stock feeding point of view, as hull is mostly fibre. Bearer, which generally comes first for yield of grain, has such a high percentage of hull that it is beaten for yield of kernel per acre by Mensury 0·60. On the other hand, Hannchen has a very thin hull but does not produce enough grain to make it profitable.

VARIETY AND STRAIN TESTS OF FIELD BEANS

Tests during six years have shown that the highest yielding variety of field pea produces some 700 pounds more digestible nutrients per acre than field beans so that the latter cannot be taken into consideration for live stock feeding. Farmers are advised, when growing them for human consumption, to find out if white or coloured beans are required on their particular markets.

The following table gives details:—

RESULTS OF VARIETY AND STRAIN TESTS OF FIELD BEANS

Variety or strain	1930			Variety or strain	Average of four years 1927-1930								Variety or strain	Average of seven years 1920-22 to 24-27 to 29	
	Yield per acre	Days to mature	Susceptibility to disease		Yield per acre	Days to mature	Weight per measured bushel	Susceptibility to disease						Yield per acre	Days to mature
								1927	1928	1929	1930	Average			
	lb.				lb.		lb.							lb.	
Robust	1,475	120	0	Navy (White)	1,838	114	68·4	10	10	10	30	15	Navy (White)	1,722	119
Navy	1,324	116	30	Imp. Yellow Eye (Coloured)	1,689	116	67·1	10	10	10	30	15	Norwegian (Coloured)	1,486	113
Norwegian O. 710	1,167	118	30	Robust* (White)	1,449	118	63·3	50	30	50	0	32	Large White (White)	1,015	120
Imp. Yellow Eye	1,070	120	30	Norwegian (Coloured)	1,243	109	65·9	10	50	10	30	25			

*Did not mature in 1929.

Freedom from disease is the most important factor regarding yield, and it is recommended that beans to be used for seed should not only themselves be free of blotches, but also the pods from which they come. This means that the careful grower must commence to select seed before the beans are threshed.

For an average of fifteen years, oats have given an average of 1,635 pounds digestible nutrients compared with 1,618 for peas, 1,248 for barley, and 1,227 for wheat. It seems clear that for live stock feed, oats are only equalled by peas, and are away ahead of barley and of wheat.

The following table gives details about some of the well known varieties:—

RESULTS OF VARIETY AND STRAIN TESTS OF OATS

Variety or strain	1930				Variety or strain	Average of seven years, 1923-1925—1930			Variety or strain	Average of eighteen years, 1913-1930	
	Yield per acre	Days to mature	Length of straw	Strength of straw		Yield per acre	Days to mature	Weight measured bushel*		Yield per acre	Days to mature
	lb.		in.			lb.		lb.		lb.	
La Salle M. C.	1,696	106	42·0	10·0	Banner 44 M. C.	1,915	106	37·6	Banner O. 49	2,110	103
Gold Rain (Sv.)	1,680	103	47·0	9·0	Victory	1,912	106	38·9	Gold Rain	2,104	100
Banner 44 M. C.	1,676	106	43·9	10·0	Banner O. 49	1,884	106	37·7	Victory	2,092	103
Cartier M. C.	1,577	89	43·7	9·0	Gold Rain	1,769	104	40·5			
Banner O. 49	1,504	106	43·7	9·0	Alaska	1,598	91	39·1			
Legacy Ott	1,468	101	39·3	9·0							
Victory	1,456	102	42·3	9·0							
Banner, Comm.	1,440	106	44·0	9·0							
Alaska G.	1,340	88	41·0	9·0							
Brant M. C.	1,288	107	40·3	9·0							
Brome M. C.	1,252	106	47·0	9·0							

*For six years 1923 and 1926-30.

Banner has been recommended for this district and there seems no doubt that it is the most valuable variety for the farmer of Central Quebec. Gold Rain is on an equal footing for yield, but its colour is against it. Victory also produces as much, but it should produce quite a bit more before a standard variety like Banner is swept aside, especially as the latter is now so extensively grown in the district.

Of the strains of Banner tested during the last six years, 44 M.C. has given a few pounds more per acre, but the difference is negligible. Alaska may be all right where the season is very short, but it does not come near Banner, here, and is not recommended where the season is about the length of that at Cap Rouge.

OATS—PRODUCTION OF SUPERIOR VARIETIES OR STRAINS BY SELECTION FROM OLD SORTS

This experiment was started in 1916, and the reader is referred to the 1927 report of this Station for details. During six years, the Cap Rouge selection was compared with four leading varieties, with the following results: Banner Cap Rouge 31, 2,410 pounds of grain per acre; Victory, 2,148 pounds; Banner Ottawa 49, 2,125 pounds; Gold Rain, 1,944 pounds; Longfellow Ottawa 478, 1,833 pounds. Each one of the seven years, Banner Cap Rouge 31 was the heaviest yielder, so that it is not the chance high production of one favourable season which gave it any advantage. A limited quantity of registered seed is offered every year at a reasonable price.

DETERMINATION OF PERCENTAGE OF HULL IN OAT VARIETIES

From a live stock feeding point of view, it is not enough to find out which variety of oats yields the largest quantity of grain, but it is also necessary to determine the percentage of hull of each, so as to get at the really important question, that is, which produces the greatest number of pounds of kernel per acre.

During seven years, a side oats, Longfellow, an early one, Alaska, and the three which have proven to be the heaviest yielders of grain during eighteen seasons, were compared, and the following table gives details:—

YIELD OF GRAIN AND KERNELS OF DIFFERENT VARIETIES AND STRAINS OF OATS

Variety	Average of seven years 1922-1928			Variety	1930		
	Yield of grain per acre	Per cent of kernel	Yield of kernel per acre		Yield of grain per acre	Per cent of kernel	Yield of kernel per acre
	lb.		lb.		lb.		lb.
Banner O. 49	2,334	71·47	1,668	La Salle M.C.	1,696	77·77	1,319
Victory	2,306	71·81	1,656	Banner 44 M.C.	1,676	73·36	1,230
Gold Rain	2,160	73·56	1,589	Gold Rain	1,680	72·81	1,223
Alaska	1,815	78·07	1,417	Cartier M.C.	1,577	74·38	1,173
Longfellow	1,970	68·78	1,355	Banner O. 49	1,504	72·91	1,097
				Legacy Ott	1,468	71·22	1,046
				Alaska	1,340	77·12	1,033
				Victory	1,456	70·89	1,032
				Banner Comm	1,440	70·61	1,017
				Brant M.C.	1,288	74·41	958
				Brome M.C.	1,252	75·69	948

This shows that Longfellow, like all side varieties, is not profitable to grow in this district; that Alaska, though having a low percentage of hull, similarly to all early varieties, does not yield enough grain in most of Central

Quebec to show up well; and that Banner, though by only a small margin, is at the top of the list and should be grown preferably to any other, especially because it is already the best known variety of the district.

VARIETY AND STRAIN TESTS OF FIELD PEAS

Field peas, for an average of fifteen years, have given practically as many pounds of digestible nutrients per acre, 1,618 compared with 1,635, as oats, and nearly 400 pounds more than barley or wheat. When it is considered that protein is by far the most costly part of the ration, and that field peas contain 19 per cent, compared with 9·0, 9·2, 9·7 respectively for barley, wheat, and oats, it is easy to see how valuable this legume is for feeding live stock.

The following table gives details regarding the yield of the best varieties and strains tested:—

RESULTS OF VARIETY AND STRAIN TESTS OF PEAS

Variety or strain	One year, 1930			Variety or strain	Six years, 1925–1930			Variety or strain	Average of twelve years, 1911, 1913–1920, 1928–1930	
	Yield per acre	Days to mature	Length of straw		Yield per acre	Days to mature	Weight measured bushel*		Yield per acre	Days to mature
	lb.		in.		lb.				lb.	
Mackay.....	2,811	108	94·2	Arthur.....	2,353	103	66·4	Arthur.....	2,127	99
Arthur.....	2,601	101	54·0	Mackay.....	2,339	110	65·5	Prussian Blue...	1,789	104
Prussian Blue..	2,352	112	73·7	O.A.C. 181.....	2,185	101	66·0	Golden Vine....	1,753	101
O.A.C. 181.....	2,334	110	69·2	Prussian Blue...	2,093	111	66·0			
Golden Vine...	2,220	109	68·2	Chancellor O. 26	1,936	102	65·7			
Chancellor O...	2,122	98	65·4							

*For five years 1926–1930.

Arthur has been recommended since a number of years and there seems no doubt that farmers will make no mistake in choosing this variety.

Much more field peas should be grown, not only for human consumption, but for live stock feeding. If about 30 per cent of the total concentrates given is composed of field peas, the ration may be used for dairy cows, sheep, lambs, brood sows, growing hogs, horses, colts, poultry, to furnish the required protein at a low cost. Mixed with oats, they can be used for soiling, cut for hay, put in the silo, or left to mature.

FIELD PEAS—PRODUCTION OF SUPERIOR VARIETIES OR STRAINS BY SELECTION FROM OLD SORTS

Field peas have given more pounds of protein per acre than barley, oats, or wheat and should be grown in larger quantities for live stock feeding. Arthur has shown itself to be the highest yielder of all varieties tested, and work was started in 1921 to isolate good strains. That there was quite a difference in the yielding power of strains is shown by the following figures: in 1922, the lowest gave 1/16 ounce and the highest 6/16 ounce; in 1923, the figures were respectively 1 3/16 and 4 14/16; in 1924, they were 19 and 32 ounces. In 1926, this strain was placed in the trial plots and yielded 23·00 pounds compared with 22·00 for Mackay, 20·50 for O.A.C. 181, 18·50 for Prussian Blue, and 17·67 for Chancellor. In 1929 another selection was started from this high yielding strain with the idea of eliminating peas from lower yielding plants which might possibly have crept in some way or other. (Project Ce 19.)

VARIETY AND STRAIN TESTS OF SPRING WHEAT

Spring wheat, during fifteen years, has produced some 400 pounds less digestible nutrients per acre than oats, so that it will not pay farmers of Central Quebec to grow it for live stock feeding. The following table is given showing that Huron is the best variety to use when, for certain particular reasons, it is thought advisable to grow spring wheat:—

RESULTS OF VARIETY AND STRAIN TESTS OF SPRING WHEAT

Variety or strain	Average of four years, 1925-1928			Variety or strain	Fifteen years average, 1911-12, 1914-23, 1925-1928	
	Yield per acre	Days to mature	Weight per measured bushel*		Yield per acre	Days to mature
	lb.				lb.	
Huron O. 3	1,503	109	62·8	Huron O. 3	1,450	102
Huron C. R. 7	1,419	109	62·7	Marquis O. 15	1,195	101
Pringle's Champlain 307 M.C	1,416	109	63·5	Early Red Fife O. 16	1,133	101
Marquis O. 15	1,252	106	62·4			
Red Fife O. 17	1,234	109	60·6			
Early Red Fife O. 16	1,118	107	61·3			

*For three years 1926-1928.

IMPORTATION AND TESTING OF FOREIGN VARIETIES OR STRAINS OF CEREALS

This experiment was started in 1923. The object is to try out, in a preliminary way, new or widely advertised varieties or strains of cereals and legumes grown for their seed. This is done alongside of the variety of the same class which has shown up the best for the district. Only the ones showing probable merit are kept for further observation, all those with obvious defects being immediately rejected.

The following table gives information regarding the 22 varieties and strains tested during the last 8 years:—

PRELIMINARY TESTING OF NEW OR WIDELY ADVERTISED CEREALS 1923 TO 1930

Kind of grain	Name	Source of seed	Remarks
Barley	New White	K. W. Buckbee, Rockford, Ill.	Hulless; low yielder; rejected.
"	Pold	Sweden	Nothing special to recommend it; rejected.
"	Volvet Minn. 447	University of Minnesota, St. Paul, Minn.	Smooth-awned; kernels uniform; tested 28-29-30; promising.
"	Wisconsin No. 55	H. W. Buckbee, Rockford, Ill.	Mixed sample; did not mature uniformly; rejected.
Field peas	New Early Snowflake	" "	Did not mature; rejected.
Oats	Bumper	M. Savard, Cap R., and J. Harris, Coldwater, N.Y.	Side oats, large kernels; did not produce as much as Banner; rejected.
"	Cornell	J. Harris, Coldwater, N.Y.	Very productive; kernels uniform in size; tested 1928-29-30; promising.
"	Cornellian	" "	Kernels small; mixed sample, rejected.
"	C. R. 426	Experimental Station, Cap Rouge, P.Q.	Rejected—yellow grain from Banner plant—small kernel; poor yielder.
"	C. R. 427	Jos. Robitaille, Cap Rouge, P.Q.	Rejected—splendid plant of side oats in field of Banner. Medium yielder, nothing extra.
"	Empire	J. Harris, Coldwater, N.Y.	Spreading oats, nothing special to recommend it, rejected.
"	Iowa	" "	Heads light; grain small; rejected.
"	Ithacan	Cornell University, Ithaca, N.Y.	Very productive; tested 1928-29-30; promising.
"	Mammoth	K. McDonald, Ottawa, Ont.	Side oats, nothing special to recommend it; rejected.
"	Markton	State College of Wash., Pullman, Wash.	Low yielder; rejected.
"	Quaker	H. W. Buckbee, Rockford, Ill.	Nothing special to recommend it; rejected.
"	White Bonanza	" "	Mixed sample; rejected.
"	Yellow Russian	Steele Briggs, Toronto, Ont.	Nothing special to recommend it; rejected.
Wheat (Emmer)	Early Emmer	Central Experimental Farm, Ottawa.	Rejected because very poor yielder compared with Huron wheat.
" (spring)	Aurore	Central Experimental Farm, Ottawa.	Did not produce as much as Huron in 1927; tested 1928-29-30; promising.
" "	Charlottetown No. 123	Experimental Station, Charlottetown, P.E.I.	Small heads; rejected.
" "	Medford	R. A. Kolb, Medford, Wis.	Too late; poor heads; rejected.
" "	Velvet Chaff	H. W. Buckbee, Rockford, Ill.	Not uniform; too late; small heads; rejected.

COMPARISON OF SELECTED AND UNSELECTED SEED

During five seasons, selected seed oats of Banner Cap Rouge 31, Banner Macdonald College 44, and Banner Ottawa 49 were grown in the trial plots in comparison with commercial No. 1 Feed oats, and the following table gives details:

COMPARISON OF SELECTED AND UNSELECTED SEED—FIVE SEASONS—BANNER OATS

Kind of seed	1923		1926		1927		1929		1930		Average	
	Yield per acre	Days to mature	Yield per acre	Days to mature	Yield per acre	Days to mature	Yield per acre	Days to mature	Yield per acre	Days to mature	Yield per acre	Days to mature
	lb.		lb.		lb.		lb.		lb.		lb.	
Selected	1,968	107	1,950	95	2,147	112	1,386	110	1,608	106	1,812	106
Unselected	1,875	94	1,600	97	2,328	114	1,470	112	1,440	106	1,743	105

The number of days to come to maturity is practically the same while the difference in yield, about 4 per cent, is negligible. The lesson learned from this experiment is that strains must constantly be improved or at least kept pure if it is desired that they be used to increase the yield of grain on the farms of

the country. Registered seed of approved strains can now be had in sealed bags, and it is strongly recommended that farmers pay the price to get something extra good, and afterwards be careful to keep up the purity of the crop. Otherwise, they may as well procure commercial No. 1 Feed oats, clean it up well, and sow it.

PRODUCTION OF REGISTERED GRAIN

It would be useless to find out, in the trial plots, the varieties and strains best adapted to some particular part of the country, if some means were not taken to afterwards multiply and disseminate what has shown up best. At Cap Rouge, the varieties which have been the most satisfactory are Manchurian barley, Banner oats, Arthur peas, and Huron wheat. Each year, these are grown on areas relatively free from weeds and other grains, the crop is thoroughly rogued on the field, carefully harvested, threshed, cleaned, and what is offered for sale is put up in sealed bags, to prevent tampering in transit. Farmers should take advantage of this well bred grain, which they can buy at reasonable prices, because if they use seeds without potential possibilities, a part of the labour and money spent in the growing and harvesting of the crop is lost, since these low grade seeds lack something vital to give a maximum crop under the circumstances.

INVESTIGATION OF METHODS OF OBTAINING ACCURATE DATA IN VARIETY TESTING

The object of this experiment is to determine a method of plot testing that will reduce experimental error to a minimum. In this particular case, work was done to find effect of border on yield of different varieties, and the following table gives details:

EFFECT OF BORDER ON YIELD OF CEREAL PLOTS

Method	Per cent decrease below full width of seeder									
	Barley—7 years		Oats—7 years					Wheat—5 years		
	Early Chevalier	Manchurian C.R. 14	Alaska	Banner M.C. 44	Banner O. 49	Gold Rain	Victory	Huron C.R .7	Huron O. 3	Marquis O. 15
Leaving out two outside rows	15·6	17·2	16·5	19·0	21·5	18·4	17·6	14·1	16·2	13·1
Leaving out four outside rows	19·5	17·3	20·5	20·5	23·6	20·6	19·3	18·1	18·7	19·7

There is surely a border effect, as yields are much higher for the outside rows, and higher for the two rows next to the outside ones, than for the inside rows. But a very disturbing factor is no doubt the lack of uniformity of the soil, as the border effect was neither the same for all varieties one year nor for the same variety every year. It may as well be admitted that the problem of finding out methods of obtaining accurate data in variety testing is practically an impossible one, as it seems improbable that soil may be found of such uniformity, on areas of the size generally used for trial plots, that the results may be absolutely comparable. A better plan than the usual trial plots would probably be to plant a small number of seeds representative of the weight of the variety per measured bushel at equal distances and at as near the same depths as possible.

FORAGE CROPS

ROOT CROPS

During thirteen seasons, more than 200 varieties and strains of field carrots, mangels, swede turnips and fall turnips were tested, with the result that carrots have shown the lowest yield, mangels and fall turnips producing more but still behind swede turnips which have been at the top of all roots. Sugar beets have not yielded as well as swede turnips so that only the latter may be recommended, as a general rule, for this district. However, as will be seen in the part of this report dealing with field husbandry, dry matter in roots costs a great deal more than in silage crops or in hay, so that roots should only be grown by farmers who have small herds and can dispose of manual labour at practically no cost.

FIELD CARROTS—VARIETY TESTS FOR YIELD AND PURITY

Thirty-two varieties were tested during thirteen years and the following table gives a summary of the average production of three different types, also of three different varieties of the highest yielding type:—

COMPARATIVE YIELD OF DIFFERENT TYPES AND VARIETIES OF FIELD CARROTS

Type	Variety. All of "long" type	Yield per acre	Percentage of dry matter	Dry matter per acre
		lb.		lb.
Long		25,676	11·49	2,950
Short		23,360	11·18	2,612
Intermediate		23,817	10·83	2,579
	White Belgian	31,036	11·34	3,519
	Long Red Surrey	26,005	11·62	3,022
	Yellow Belgian	18,108	12·30	2,227

The lack of uniformity was remarkable, a "variety" often containing a mixture of four or five distinct types.

MANGELS—VARIETY TESTS FOR YIELD AND PURITY

Fifty-seven varieties were tested during thirteen years, averaging 26,164 pounds green weight per acre, and the result of 56 analyses showed an average percentage of 13·43 of dry matter, giving 3,514 pounds of dry matter per acre. During the same seasons, all the varieties of swede turnips averaged 38,613 pounds green weight, with a percentage of 12·20 of dry matter, giving a total of 4,711 pounds of dry matter per acre. This shows that mangels cannot be recommended for Central Quebec. For those who wish to grow them, Yellow Intermediate will probably be the most satisfactory. The trueness to name of varieties was unfortunately not always what it should have been, and ranged all the way from 34 to 94 per cent.

FALL TURNIPS—VARIETY TESTS FOR YIELD AND PURITY

Fifteen varieties and strains of fall turnips have been tested during the last fourteen years. Compared with swede turnips for six seasons, they have not yielded enough dry matter per acre to warrant their use, especially when the

fact is taken into consideration that they are such poor keepers. The following figures give details:—

COMPARISON OF SWEDE TURNIPS AND FALL TURNIPS DURING SIX YEARS, 1925-1930

Variety or kind of root	Best variety			Eleven varieties		
	Yield of roots per acre	Per cent dry matter	Dry matter per acre	Yield of roots per acre	Per cent dry matter	Dry matter per acre
	lb.		lb.	lb.		lb.
Bangholm	44,003	12·63	5,556	.....	.....	.....
Pomeranian	37,922	9·22	3,497	.....	.....	.....
Swede turnips	.....	.....	.....	39,462	12·77	5,041
Fall turnips	.....	.....	.....	34,124	9·34	3,187

SUGAR BEETS—VARIETY TESTS FOR YIELD AND PURITY

Twenty-six varieties and strains were tested from 1911 to 1930 with an average yield of 16,529 pounds green weight per acre. As swede turnips averaged more than twice this quantity per acre, with a percentage of 12·20 of dry matter, it is easily seen that sugar beets cannot be recommended for feeding live stock, in this district.

According to the Dominion Chemist, the per cent sugar in juice ranged from 16·78 (1921) to 23·53 (1927), with an average of 20·01 for nine years, whilst the coefficient of purity ranged from 83·56 (1929) to 91·18 (1927), with an average of 87·64 for nine years.

SWEDE TURNIPS—VARIETY TESTS FOR YIELD AND PURITY

More than one hundred varieties and strains of swede turnips have been tested during the last twenty years, with the result that they have produced more raw material and dry matter per acre than any other kind of root—carrots, fall turnips, mangels, or sugar beets—the difference being such that positively no doubt remains about their superiority over the others.

Ovals and rounds in purple tops, bronze tops, and green tops were tested. The purple tops have generally been at the head, and the following table gives details about some of the best:—

SIX HIGHEST YIELDING VARIETIES OF SWEDES, 1925-1930

Variety	Source	Yield of roots per acre	Dry matter per acre
		lb.	lb.
Bangholm	Hartmann	44,003	5,556
Good Luck	Steele Briggs	40,469	5,181
Perfection	Dupuy & Ferguson	41,221	5,107
Ditmars	McNutt	41,181	5,064
Sutton's Champion	Dupuy & Ferguson	36,999	5,055
Favourite	Dupuy & Ferguson	41,852	5,053

The determinations of dry matter, made by the Dominion Chemist, are very important. Favourite, which would come in second place if only the yield of roots was taken into consideration, is sixth for production of dry matter.

Either Bangholm or Good Luck will give satisfaction to the man whose special circumstances make it advantageous to grow roots.

HAY CROPS

In Eastern Canada, hay represents about 30 per cent of all field crops, and in Central Quebec timothy and clover exclusively are grown for hay. By far too much timothy is fed, especially to growing animals, and too much stress cannot be placed on the importance of legumes.

ALFALFA—VARIETY TESTS FOR HARDINESS, YIELD, AND SUITABILITY

During five years, data have been gathered on six crops of Grimm, Variegated, and Yellow-flowered (medicago falcata) alfalfa. The last mentioned has been a practical failure all the time and is left out of consideration. Variegated has averaged 17,987 pounds of green material and 5,824 pounds of hay with 15 per cent moisture, whilst the figures were respectively 16,815 and 5,368 for Grimm. Either will give good satisfaction.

With such a valuable crop, there has been a tendency for over-enthusiastic propagandists to pass slightly on the necessary requirements for success. Alfalfa must have a deep, reasonably dry, rich, well tilled, inoculated soil with enough lime, and should not be cut or pastured too closely or late in the season. Farmers having these conditions can sow alfalfa, but others had better stick to red clover, with alsike for wet acid ground.

RED CLOVER—VARIETY TESTS FOR YIELD AND GENERAL SUITABILITY

A large number of farmers would be better off financially if they replaced half of the timothy now grown by red clover to be fed to young stock and milch cows.

During six seasons, fourteen strains of red clover were tested, seed having been procured from Northern and Southern Europe, Western Canada, Northern Ontario, and Quebec. For the strains compared during the same seasons, the figures are as follows:—

FOUR HIGHEST YIELDING STRAINS OF RED CLOVER—4 YEARS

Variety or strain	Source	Number of cuttings	Date in bloom	Height at harvest	Yield hay per acre (15% moisture)
				in.	lb.
Late Swedish	Sweden	1	July 24	32	7,047
Dauphine	Southeastern France	2	" 4	25	6,851
St. Clet	Quebec	2	" 3	26	6,791
Medium Late Swedish	Sweden	1	" 24	32	6,666

It is remarkable that three out of the four highest yielding varieties or strains came from Europe, and extraordinary that the second best came from Southeastern France. The most plausible reason is that these strains were well bred.

The safest thing to do, however, is to procure seed grown under conditions as similar as possible to those under which it will be sown for hay.

TIMOTHY—VARIETY OR STRAIN TESTS

Different strains of timothy were tested in triplicate plots during six years. Three of them came from institutions where, no doubt, they were well bred, one from Svalof, one from the Ohio Experiment Station, and one from the Central Experimental Farm, Ottawa, while four others were procured from well known seed merchants. The strain which gave the best results was No. 3937 from Ohio,

but seed was not sent from Ottawa to Cap Rouge after 1926, so that no figures are available for comparison with other strains after the hay crop of 1928. The following figures give details for the others:—

TIMOTHY STRAINS COMPARED FOR HAY PRODUCTION

Strain	Source	Yield of hay per acre—15% moisture						
		1925	1926	1927	1928	1929	1930	Average
		lb.	lb.	lb.	lb.	lb.	lb.	
Gloria	Svalof, Sweden	2,776	4,155	3,673	4,317	4,016	4,317	3,876
Commercial	Different seedsmen	2,885	3,964	3,580	4,312	3,737	4,423	3,817
Boon	C.E.F., Ottawa	3,008	4,285	3,328	3,762	3,950	4,340	3,779

The above table shows that the average yield of hay was practically the same in the three cases. Two deductions may be arrived at: the seed from the two public institutions is not yet well bred enough to show decided advantage over the commercial seed, or else the latter is so good that not much improvement may be expected from breeding work such as has been carried on up to date.

SILAGE CROPS

A number of varieties and strains of corn and sunflowers were tested, the first mentioned during 18 years and the last during 8 years. Details are given here, but the reader is referred to that part of the present report, in the Field Husbandry section, where it will be seen that a mixture of peas and oats will give more digestible nutrients per acre, especially the costly protein, than either corn or sunflowers.

INDIAN CORN—VARIETY TESTS FOR ENSILAGE PURPOSES

The reader is referred to project F 177 " Comparison of corn, sunflowers, peas and oats for silage " in the Field Husbandry section of this report for information regarding the value of Indian corn for ensilage purposes in this district. During the first years, it was thought that the small varieties would be the most advantageous to grow because they reached the glazed stage practically every season, but it was soon found out that they did not yield enough tonnage to be profitable, and they were transferred to another experiment where the production of grain is the important point. The next move was to recommend the flint varieties because they generally came nearer to the glazed stage than the dents in this district. The following table shows that our presumptions were wrong again, and that the dents head the list for quantity of dry matter per acre, the really important point:—

INDIAN CORN—VARIETY TESTS FOR ENSILAGE PURPOSES

Variety	Source	Dent or Flint	Yield of green corn per acre						Average for 6 years		
			1925	1926	1927	1928	1929	1930	Green corn	Per cent dry matter	Dry matter
			lb.	lb.	lb.	lb.	lb.	lb.	lb.		lb.
Eureka	Harris	D	40,427	37,629	54,819	49,612	34,346	39,394	42,704	13·54	5,782
Sweepstakes or Excelsior	Harris	D	38,427	30,439	52,882	38,814	29,472	31,909	36,990	15·22	5,630
Northwestern Red Dent	Disco	D	31,578	29,760	40,944	35,479	25,202	23,005	31,040	17·02	5,283
Wisconsin No. 7	Duke	D	35,095	29,567	54,659	25,419	21,624	29,214	32,596	15·93	5,193
90 Days White Dent	Disco	D	33,566	33,410	42,642	36,925	23,993	23,795	32,388	15·98	5,176
Longfellow	Disco A	F	34,767	35,565	50,570	32,319	18,603	23,788	32,269	15·91	5,134
Hybrid	Wimple	D	36,528	31,441	45,870	40,103	21,746	26,546	33,706	15·19	5,120
North Dakota	Steele, Briggs,	F	36,297	32,367	43,977	40,142	22,617	25,587	33,498	15·09	5,055
Bailey	Duke B	D	33,652	23,058	44,924	33,946	24,750	25,889	31,036	16·20	5,028
Hall's Gold Nugget	Harris	F	37,063	30,395	34,975	43,007	28,158	30,915	34,085	14·68	5,004
Minnesota 13	Disco	D	38,641	20,894	39,726	27,558	24,657	23,735	29,202	17·21	5,026
Leaming	Duke	D	33,459	31,334	42,481	36,010	25,582	23,856	32,120	15·01	4,821
Davis Imp. Early Huron	Harris	D	30,003	21,360	35,712	29,169	26,028	21,949	27,370	17·35	4,748
Compton's Early	Duke	F	36,785	22,084	48,801	28,871	17,418	22,949	29,485	15·96	4,705

A—From Johnston in 1928, 29 and 30; B—From D. Bondy in 1926, tested in Seed Board Tests.

The writer firmly believes that, in the light of carefully conducted experimental work, corn should be replaced by peas and oats or even by red clover in most of Central Quebec, and that if, for some reason or other, corn is grown, it is better to have the ground ready as early as possible, sow by the middle of May, wait till the beginning of October to cut the crop, and use a large growing dent variety.

SUNFLOWERS—VARIETY TESTS

Where corn will come to the glazed stage practically every year, on areas having fairly good drainage, sunflowers are not recommended. For persons wishing to grow them, the following figures will give information regarding the choice of a variety. The word variety does not mean much when one speaks of sunflowers, as there are really no pure varieties.

SUNFLOWERS—VARIETY TESTS

Variety	Source	Yield of green material per acre						Average for 5 years			Average for 6 years		
		1923	1924	1925	1926	1928	1930	Green material	Per cent dry matter*	Dry matter	Green material	Per cent dry matter*	Dry matter
		lb.	lb.	lb.	lb.	lb.	lb.	lb.		lb.	lb.		lb.
Giant Russian	Disco	27,068	49,166	39,769	24,339	45,544	51,489	37,179	18·38	6,834	39,564	18·08	7,153
Mammoth Russian	K. McDonald	28,713	41,785	37,364	31,403	43,136	38,301	36,480	16·19	5,906	36,784	17·13	6,301
Ottawa 76	C. E. F.	17,187	34,148	26,418	17,259	32,739	.....	25,550	14·20	3,628	.....	.....	.....
Mixed Mennonites	Rosthern	13,617	27,703	25,290	13,489	27,132	.....	21,446	13·06	2,801	.....	.....	.....

*Average since 1924.

An unexpected thing happened when the small varieties, Ottawa 76 and Mixed Mennonites, not only yielded much less green material per acre but had a lower percentage of dry matter. Giant Russian is recommended, but it must be clearly understood that there is a large difference amongst strains of this so-called variety. Three years' average show that a strain from Disco produced dry matter at the rate of 7,436 pounds per acre, a strain from McDonald 5,778 pounds, and a strain from the Canadian Pacific Railway 4,233 pounds.

As mentioned when discussing results with corn, it is firmly believed that peas and oats or red clover will give better results for ensilage purposes in most of this district than either corn or sunflowers.

FERTILIZERS

BASIC SLAG EXPERIMENT

An experiment was started in 1925 to compare different slags with superphosphate and ground limestone on a six-year rotation of corn for silage, oats, clover, timothy, timothy, timothy. In 1926 a five-year rotation was started, with the idea of cutting out one year of timothy, and in 1927 a four-year rotation was started with the intention of dropping out two years of timothy. The following table is a summary of results:

INCREASED VALUE OF CROPS OVER CHECKS, DEDUCTING COST OF FERTILIZERS

Rotation	Superphosphate and ground limestone	Ground limestone	Fortified basic slag	Ephos	Bessemer slag	Superphosphate
	$	$	$	$	$	$
Six-year	35 85	27 60	5 89	9 52	8 50	9 10
Five-year	19 17	38 14	23 00	24 70	3 75	−8 81
Four-year	51 31	37 70	27 59	16 98	27 16	25 93
Total	106 33	103 44	56 68	51 20	39 41	26 22

There seems no doubt that the soil on which the experiment was conducted required lime, as shown by the plots which received ground limestone, and by the poor showing made by superphosphate alone compared with superphosphate and ground limestone. The loss for superphosphate on the five-year rotation is not easily explained. The most important conclusion is that no chemical fertilizer should be applied before it is found out if the soil needs lime.

POULTRY

Some 300 Barred Rocks are kept for experimental work in breeding, feeding, housing, and management. About 1,000 chicks are raised every year. The flock passed one test for pullorum with only two reactors. The reader is referred to the 1928 report from this Station for details on fifteen experiments conducted with poultry.

DRY VS. WET MASH FOR EGG PRODUCTION

During four winters, from the beginning of November to the middle of February, three groups of pullets were housed, handled, and fed alike, except that one group received dry mash constantly in hoppers, the second wet mash

fed in troughs, and the last dry mash constantly in hoppers with wet mash fed in troughs. The following table gives details:—

RESULTS WITH DRY VS. WET MASH FOR EGG PRODUCTION

Kind of mash	Number of birds	Weight gained	Eggs laid	Value of products	Value of feed	Cost of one dozen eggs	Cost of one pound eggs
		lb.		$	$	cts.	cts.
Dry	88	72	3,872	235 32	71 04	22	16
Dry and wet	85	79	3,088	178 08	70 64	27	20
Wet	81	56	2,420	137 68	67 92	38	25

It is seen that the lot receiving dry mash, while not consuming food which cost much more than the other lots, laid a great many more eggs, which fact brought down the cost per dozen. (Project P 80.)

BEST DATE FOR INCUBATION

The early pullet is more profitable as a layer than the late one. This has conclusively been shown by an experiment conducted during many years at this Station. But can she be commercially and profitably produced in a district like Central Quebec where the spring is generally late and snow covers the ground well on into April? It was to throw light on some phase of this problem that the present project was started. The following figures give details:—

EFFECT OF DIFFERENT DATES OF INCUBATION ON FERTILITY, HATCHABILITY, AND LIVABILITY

Eggs set in	Average for 8 years					Average for 11 years					Remarks
	Number eggs set	Per cent fertile	Per cent hatched	Per cent living at 3 weeks	Eggs for 1 chick at 3 weeks	Number eggs set	Per cent fertile	Per cent hatched	Per cent living at 3 weeks	Eggs for 1 chick at 3 weeks	
March	6,448	87·5	35·9	81·0	3·9	10,989	89·5	44·2	89·1	2·8	No eggs set in May after 1927.
April	7,384	90·1	46·9	85·4	2·8	9,636	91·0	49·9	89·2	2·5	
May	2,512	90·8	44·2	80·2	3·1	.....	.....	.....	.....	.....	

From practically every point of view it is seen that April is the best month for incubation in this district. (Project P. 3.)

EFFECT OF MALE IN PEN ON EGG PRODUCTION

The object is to determine whether the presence of a male bird in the pen affects egg production. This experiment was conducted during five winters with a total of 235 birds, and the following table gives details:—

EFFECT OF MALE IN PEN ON NUMBER AND COST OF EGGS LAID—5 YEARS

Presence or absence of male	Number of layers	Weight gained	Number eggs laid	Value of products	Cost of feed	Cost one dozen eggs	Cost one pound eggs
		lb.		$	$	cts.	cts.
Male	110	83	4,805	265 15	91 60	22·9	16·9
No male	115	59	4,775	256 45	87 95	22·1	16·1

There is practically no difference all through. It is thus strongly recommended that no male bird be left with the layers, this preventing the fertilization of eggs, which would be inadvisable from the point of view of their keeping qualities. (Project P 63.)

COST OF EGG PRODUCTION DURING WINTER

During 16 winters, for an average of 108 days, a record was kept of all feed given to a total of 3,610 layers, which amounted to $2,487.89. Valuing the increase in weight of the birds, 3,496 pounds, at 30 cents per pound, there is an amount of $1,048.80 to be deducted from the total cost of feed, leaving $1,439.09 to be debited against the eggs laid, which brings their cost to 22·34 cents per dozen. (Project P 62b.)

PREVENTION OF FROZEN COMBS

The object of the experiment is to prevent the combs of male birds from freezing during extreme weather. Three methods were used during six winters, dropping cotton fronts before roosts at night, painting with collodion, and coating with vaseline. The following figures give information:—

PREVENTION OF FROZEN COMBS

Protection	Four winters				Two winters			
	Injured			Not injured	Injured			Not injured
	Point of comb	All comb	Total		Point of comb	All comb	Total	
	%	%	%	%	%	%	%	%
Cotton front	13	7	20	80	29	0	29	71
Collodion	16	16	32	68	.....	.....	.....	.....
Vaseline	.....	.....	.....	.....	14	14	28	72
None	11	22	33	67	43	29	72	28

The use of collodion was discontinued after four winters because the birds protected with it were not much better than the ones which were not protected at all. It seems that the use of collodion for this purpose has been merely a fad. Vaseline has not given better protection than the cotton fronts and, commercially, cannot yet be recommended. It is possible that, for valuable breeders, using it in the day time, with cotton curtains during the very cold nights, is a good method to follow. (Project P 143.)

TIME TAKEN FOR TRAP-NESTING

In these times of keen competition, it is important for a poultryman or a farmer to cut down cost of production. With poultry as with live stock, only the best producers should be kept, and the trapnest is the surest way of eliminating the marginal producers and the boarders. But some poultrymen pretend that it takes too long to trapnest. The following figures show that this pretention is not correct:—

TIME TAKEN FOR TRAP-NESTING—7 YEARS

Season	Number of birds	Number of eggs	Dates		Number of days	Number of minutes		
			Beginning	Ending		Total	Per day per 100 hens	Per day per hen
1924–25	100	2,805	Nov. 17	Feb. 14	90	912	10·1	0·10
1925–26	100	3,710	" 1	" 8	99	967	9·8	0·10
1926–27	100	3,180	" 1	" 10	102	805	7·9	0·08
1927–28	100	2,415	" 1	" 13	105	679	6·5	0·06
1928–29	100	1,804	" 1	" 10	101	738	7·3	0·07
1929–30	100	2,151	" 1	" 10	102	880	8·6	0·09
1930–31	100	2,109	" 1	" 10	102	863	8·5	0·08
Average	100	2,596	Nov. 3	Feb. 11	100	835	8·3	0·08

Group of poultrymen on a special poultry excursion to the Cap Rouge Experimental Station.

For a 25 per cent egg yield, with 100 birds kept in a 32- by 16-foot house, it took an average of about 8½ minutes per day to trap-nest. Though no account was taken of the time to go to the poultry house, but simply what was spent in actual trapnesting, it is nevertheless evident that nobody should be deterred from thus culling the flock and improving it by the extra time required to do so. (Project P 154.)

HEATED VERSUS COLD HOUSES

The advantages of the cold poultry house are that it is not costly to build or operate, and it generally has lots of pure air for fowls to breathe. But will hens lay as well in a cold house as in a warm one? It is to help gather information on this point that the present project was started in 1926 and continued for five seasons. The following figures give information:—

WINTER EGG PRODUCTION IN HEATED VERSUS COLD HOUSES—FIVE YEARS

Treatment	Number of layers	Weight gained	Eggs laid	Value of products	Cost of feed	Cost per dozen eggs	Cost per pound eggs
		lb.		$	$	cts.	cts.
Cold	100	95	3,400	198 40	80 30	28·3	20·4
Heated	95	108	4,383	251 65	82 55	22·6	16·4

The average maximum temperature was 32·7 F. in the cold house and 44·4 in the heated house; the average minimum temperature was 21·2 in the cold house and 31·5 in the heated house. It is seen that the house was heated reasonably, and kept about 12 degrees above the freezing point.

It is clear that hens laid better in the heated house, but to the cost of eggs for this kind of house should be added fuel, time to attend to the stove, and fire hazards. (Project 245A.)

EARLY LAYING AND ANNUAL PRODUCTION

Is there any relation between annual production and the month when laying commenced? It was to throw light on this question that a compilation of records was made, and the following figures are certainly interesting:

EARLY LAYING AND ANNUAL PRODUCTION—12 YEARS

Month during which laying commenced	Number of birds which commenced to lay	Average annual production as pullet
September	590	196
October	505	198
November	505	199
December	130	189
January	165	181

According to the above figures, there is no difference, for annual production, if a pullet begins to lay in September, October, or November. And the difference is very small indeed, if she only begins to lay in December or even in January. However, it is very probable that the pullets which commenced to lay early produced eggs which sold for more money and were thus more profitable. (Project P 58.)

EGG PRESERVATIVES

The object is to determine the most satisfactory method of preserving summer eggs for winter use. Since 1916, the following methods were tested: 1—Wrapping in paper and leaving alone; 2—Wrapping in paper and turning daily; 3—Putting away in oats; 4—Putting away in sawdust; 5—Composé Gaulin; 6—Armstrong Paste; 7—Columbus Preservative; 8—Barral Combine; 9—Waterglass; 10—Lime water.

Any of the three last named will give satisfaction. As Barral Combine and waterglass are commercial articles, farmers are advised to use lime water. A good method to prepare and use this is as follows: Take one pound of good freshly burnt quicklime for five gallons of water. Slake the pound of lime with a small quantity of water, just about enough to cover it, and then stir the milk

thus formed into the five gallons of water. Keep well stirred for a few hours, allow to settle, and pour the saturated water over the eggs. All eggs should be perfectly fresh, from flocks having no male bird in them, and they should be completely immersed during the whole period of preservation. (Project P 150.)

GENERAL NOTES

Excursions of farmers came to the Station, as usual, accompanied by clergymen, members of parliament and officials of the Quebec Department of Agriculture. The most interesting point to note is that farmers nowadays seem a great deal more interested in experimental work than they were a few years ago.

Correspondence is gradually but surely getting heavier, and the general tone of it shows that inquiries are not idle ones but made to get information. The numerous bulletins of the Experimental Farms system, in most cases, are used to answer these inquiries.

Articles were prepared for the press, also for Seasonable Hints, based in each case on results obtained at the Station.

The Superintendent attended seventeen meetings during the year, of Breeders' and Farmers' Associations, and of the Provincial Exhibition Commission.

An implement shed was built at Cap Rouge.

OTTAWA: Printed by F. A. ACLAND, Printer to the King's Most Excellent Majesty, 1931.