DOMINION OF CANADA

DEPARTMENT OF AGRICULTURE

DOMINION EXPERIMENTAL FARMS

EXPERIMENTAL STATION

LENNOXVILLE, P.Q.

RESULTS OF EXPERIMENTS

1931–1935

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DOMINION EXPERIMENTAL STATION, LENNOXVILLE P.Q.

PROGRESS REPORT FOR THE YEARS 1931 TO 1935

METEOROLOGICAL RECORDS

The records show that the average temperature for the years 1931-1935 has been nearly a degree warmer than the 21-year average, this despite the fact that the winter of 1933-34 was the coldest experienced at this station since 1917-18. The lowest temperature occurred in December 1933, when 48° below zero was recorded. The average temperature for February, 1934, was only 0·23 degrees. These abnormally low temperatures were very detrimental to the orchards of this province, and even large blocks of forest trees were damaged. Owing to the good covering of snow, which remained on the ground all winter, clovers and grasses came through in good condition.

The average precipitation for the years 1931 to 1935 was 40·07 inches, which is 1 inch more than the 21-year average. The year 1934 was comparatively dry, with only 34·20 inches of rainfall. Crops and pastures were below average.

The average number of hours of bright sunshine for the years 1931-35 was 1,827·3, which is 72·4 hours above the 21-year average. A table showing the meteorological data for this station follows:—

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METEOROLOGICAL RECORDS AT LENNOXVILLE, P.Q.

—	Temperature °F						Precipitation				Sunshine	
	Mean		Maximum		Minimum		Rain	Snow	Total Precipitation			
	Average 1931-35	Average 21 years	1931-35	21 years	1931-35	21 years	Average 1931-35	Average 1931-35	Average 1931-35	Average 21 years	Average 1931-35	Average 21 years
							inches	inches	inches	inches	hours	hours
January	15·52	12·72	57	57	−35	−48	1·54	22·3	3·77	3·32	74·2	76·8
February	12·81	12·96	49	53	−43	−47	0·55	23·3	2·88	2·16	91·7	95·3
March	24·47	25·15	57	70	−25	−36	1·36	19·5	3·31	2·91	129·7	138·5
April	40·78	39·76	82	83	9	− 5	2·71	5·0	3·21	2·73	159·2	159·3
May	52·30	50·93	89	89	23	19	2·73	0·2	2·75	2·82	231·8	204·4
June	62·81	60·91	93	93	25	25	3·41	.....	3·41	3·77	232·1	211·7
July	67·54	66·18	96	99	38	35	4·61	.....	4·61	4·01	251·3	239·4
August	64·26	63·63	97	97	30	30	2·91	.....	2·91	3·73	236·3	220·5
September	57·93	56·19	93	93	25	16	3·51	.....	3·51	3·70	158·1	159·1
October	45·82	45·25	85	85	15	13	2·35	3·0	2·65	3·71	129·7	126·0
November	32·73	32·67	68	70	−12	−16	2·98	7·6	3·74	3·40	69·8	69·5
December	16·47	17·78	62	62	−48	−48	1·14	21·7	3·31	2·80	63·4	54·4
Total or average	41·12	40·34	97	99	−48	−48	29·80	102·6	40·06	39·06	1,827·3	1,754·9

ANIMAL HUSBANDRY

Beef Cattle

There is no section of southern Quebec better suited to beef raising than the Eastern Townships. As the Lennoxville Experimental Station is located in the centre of this district, certain experiments in feeding and finishing of beef cattle have been carried on, which, at the same time, created a medium through which hay and ensilage produced on the farm could be marketed and the fertility of the soil retained.

In the fall of 1932 the number of feeder steers was reduced on account of the increase in the breeding herds of Jerseys and Shorthorns.

During the first two winters of the 5-year period 1931-1935, 89 stockers were divided into different lots and used in the following feeding experiments:—

Value of barley meal for steer feeding,
Screenings versus meal mixture for steer feeding,
Value of cane molasses for fattening cattle.
Uniform versus gradually increased feeding of meal to fatten steers, and
Winter feeding of steers in pens versus tied steers.

The experiment to compare barley meal with a standard meal mixture was conducted for six years ending in 1934. For the 6-year average, barley meal produced gains at 10·41 cents and the meal mixture at 10·38 cents per pound.

In the experiment on screenings versus barley meal, conducted over a period of 9 years ending in 1932, the average daily gain was virtually the same in each lot, but at a cost of 0·85 cents less per pound for the lot fed screenings on account of the cheaper price of this feed.

Eighteen steers were used in a 2-year test of the value of cane molasses for fattening cattle. These were divided into three groups and were fed, one a meal mixture, one a meal mixture with 8 per cent molasses and the other a meal mixture with 16 per cent molasses. The lot receiving the meal mixture with 16 per cent molasses made the best and cheapest gains—at a cost of 10·90 cents per pound gain, compared with 10·91 cents for the lot fed the meal mixture and 11·93 cents for the lot receiving 8 per cent molasses.

A six-year experiment to determine whether uniform or gradually increased feeding of meal to steers is more practical and profitable ended in 1932.

The feeding of a meal mixture consisting of 100 pounds of barley, 100 pounds of screenings, 50 pounds of bran and 25 pounds of oil meal was begun with two groups on January 1. Lot 1 was fed 5½ pounds of meal mixture per steer per day from January 1 to April 30; lot 2 was started on 4 pounds per steer per day, and was given an increase of 1 pound on the 1st of each month, so that the steers were eating 7 pounds of meal mixture at the finish of the experiment. Each lot received the same amount of meal mixture for the period. The 6-year average shows a slight advantage of 0·18 cents per pound gain for the lot receiving a uniform amount of meal throughout the feeding period.

In the winter feeding test conducted over a period of 12 years ending 1933 to compare the gains of steers in pens with those of tied steers, the average cost per pound gain of the lot running loose was 11·50 cents, and that of the tied lot, 12·46 cents. For the past 12 years the steers that were wintered in a pen made larger and more economical gains than the tied steers and required less time and labour.

On April 10, 1931, one carload of 33 grade Shorthorn, Hereford and Polled Angus stockers was received from Winnipeg. Their average weight in Winnipeg was 714 pounds, off-car at Lennoxville, 655 pounds, when turned to pasture,

May 9, 700 pounds, and from pasture to barn, November 1, 892 pounds. These animals were fed during the winter 1931-32, and were sold April 30, 1932. The 33 head made an average gain of 412·22 pounds per head for the period at a feed cost of 5·96 cents per pound gain from the initial weight at Winnipeg.

PASTURE GRAZING EXPERIMENTS

Fertilized vs. Unfertilized Pasture.—A pasture grazing experiment was started in 1928, when two fields, containing 2·7 acres each, broken from rough pasture the previous fall, were seeded to a mixture of 8 pounds of red clover, 2 pounds of alsike and 10 pounds of timothy. After a crop of hay had been cut in 1929, the grazing experiment started in 1930. One of the fields received no fertilizer, while the other was fertilized with 300 pounds of superphosphate and 75 pounds of muriate of potash every four years. In the spring, and again about June 15, 100 pounds of sulphate of ammonia was applied. Starting with 1935, the sulphate of ammonia was applied only in the spring as the results of another experiment had shown that it is not profitable to apply nitrogen twice a year. In the fall of 1933, 2 tons of ground limestone per acre were applied to the fertilized field.

Steers and Shorthorn heifers have been used to graze these fields. The animals are weighed three days in succession every three weeks and the weights are averaged. The fertilized pasture carries five animals until August, when this number is reduced to three. On the unfertilized field three animals graze until August, when one is removed. The grass is ready for grazing about a week earlier on the fertilized field. The 5-year average gain in animal weight per acre is 174·8 pounds on the unfertilized field, and 226·8 pounds on the fertilized field.

Continuous vs. Rotational Grazing.—In order to test the relative carrying capacity of pasture that is grazed continuously with pasture on which the animals are rotated at frequent intervals, an area of land broken from rough pasture in 1929 was divided into four fields of 2·5 acres each. In 1930 these fields were seeded down to a mixture of 4 pounds of timothy, and 2 pounds each of red clover, alsike, white clover, Kentucky blue, red top and orchard grass. The grazing experiment was started in 1931. These fields were fertilized with 300 pounds of superphosphate and 75 pounds of muriate of potash once in four years. Every year 100 pounds of sulphate of ammonia was applied in the spring, and another 100 pounds about June 15. Starting with 1935, this summer application of nitrogen was discontinued. In the fall of 1932, 2 tons of ground limestone per acre were applied. On one of these fields the cattle are pastured continuously, while on the other three, three times as many animals are rotated weekly so that each field has two weeks' rest. The 5-year average gain in animal weight per acre is 180·4 pounds on the continuous pasture and 160·8 pounds on the rotated.

SHORTHORN CATTLE

The breeding herd of beef cattle consists of Shorthorns, and an endeavour is being made to develop a herd that combines the two outstanding characteristics of the Shorthorn breed: a high degree of beef type, and fair to good, but not extremely high, milk production. If Shorthorns are bred with this object in view, variations occur giving animals of two types, i.e., good type, heavy milkers, and straight beef type cows with low milk production. The problem is to select from these for the breeding herd cows with the beef and milk production factors economically balanced.

The procedure being followed is this: Only those females showing reasonably good type are maintained in the main breeding herd. These females are tested

as early as possible for milk production in the Record of Performance, usually in their two-year-old form. If found to be good milkers, they are retained in the main herd. Poorer type females and those that do not qualify in the R.O.P. are transferred to the beef section of the herd in a separate barn. This section of the herd is run on a semi-range basis, each cow suckling her own calf and occasionally that of one of the cows in the main herd as well. Any promising heifers in the beef section of the herd are given a chance to prove themselves as milkers in the main herd, but the majority of the calves are treated as feeder cattle. All are dehorned by the caustic method when a few weeks old, and the bull calves are castrated at the same time. This beef section of the herd provides an economical outlet for the unprofitable milkers and supplies good quality commercial cattle for experimental feeding and pasture improvement work.

In the development of this breeding program, there has been a gradual swing from strictly dairy bred Shorthorn sires to ones carrying a greater degree of beef conformation, yet from dams that have reasonably good milk production. The following is a list of the sires that have been used in the herd in the period covered by this report in the order in which they have been acquired:——

Neralcam Emperor —191349—. He was sired by Fairy Duke —169764— and out of Valentine Empress —184208— with an R.O.P. record of 12,057 pounds of milk, testing 4·04 per cent. Twenty-two of his daughters qualified in the Record of Performance.

Neralcam Gallant Prince —196886—. Sire, Foxbury Wild Prince 3rd —186725— (215640) won First Senior Champion in 1929 and First Grand Champion at Springfield, Mass., in 1931. His dam was Neralcam Lass —194778—. Of the eleven nearest dams to this bull, seven averaged 13,567 pounds of milk.

Bugler's Archer —211006— from the imported bull, Cruggleton Bugler —200283—, which sired a number of the young prize winners at the Royal in November, 1932. Dam, Augusta Lady —232141—.

Roan Clarion —201936— was sired by Brownwood Clarion —192249— and his dam was Rosewood 94th —205598—, an untested but high-producing cow.

Resolution 5th —216145—. Sire, Resolution —202726—, dam, Rosewood 96th —222880—.

Glastullich Radium —219902— (263909). Sire, Glastullich Bearer —237357—, dam, Rosehaugh Lady Secret —107558—. Glastullich Bearer was by the famous Naemoor Jasper —217761— and out of Stranraer Buttercup 36th, by Cupbearer of Collynie. A half-brother of Glastullich Bearer was sold in Perth at 300 guineas and a full sister of his was the dam of the Stonelands Birmingham Champion, in 1931. Glastullich Radium is the present herd sire.

A large percentage of the females in the herd at present are descendants of three of the females originally purchased in 1919, namely, Village Ruby, Lady Hope and Gem of Maplegrove. All females in the main herd that have finished their first lactation periods have qualified in the Record of Performance. The average production for all cows qualifying in the R.O.P. for the period is 7,321 pounds of milk and 304 pounds of fat in 304 days at an average age of 5 years.

A record has been kept of the feed cost of milk and fat production for 1933-1935, inclusive. The average feed cost of milk and fat over this 3-year period was 73 cents per 100 pounds and 18 cents per pound, respectively. These costs are based on the actual cost of all purchased feeds and the cost of producing home-grown feeds, and include cost of maintaining heifers for one month previous to calving, and all dry cows.

A certain number of the most promising bull calves from the best cows were reared and sold for breeding purposes.

Dairy Cattle

JERSEYS

Jerseys are the only breed of dairy cattle kept at the Lennoxville Station. The herd consisted of 58 head on December 31, 1935. During the past 5 years the following sires have been used:—

Brampton Poppy's Observer —45654— (imp) Class AA. Sire, Poppy's You'll Do (6200) won First Champion R.J.A.S., 1936; dam, Observer's Beauty (30030) with a record of 12,092 pounds of milk, and 662 pounds of fat in 365 days.

Brampton Barette's Standard —59229— Class AA. Sire, Standard of Oaklands —32525 —silver medal sire of 30 tested daughters; dam, Brampton Forward Barette —39317—.

Brampton Favourite Hal —62167— Class A. Sire, Brampton Standard Hal —50219— Class A; dam, Brampton Favorite Nixey —50425—.

Brampton Forward Success —38295— Class A. Sire, Forward —25738— (264028A) Class AA; dam, Successor's Maid —30873—. Brampton Forward Success is the present herd sire.

There are 19 breeding females in the herd that are daughters of the imported bull, "Brampton Poppy's Observer" —45654— Class AA. Of these 12 qualified in the Record of Performance, and 5 have just begun their first lactation period. There are 21 young females in the herd sired by the Advanced Registry bull, " Brampton Favourite Hal " —62167— Class A.

The average production for all cows qualifying in the R.O.P. for the period is 7,888 pounds of milk and 435 pounds of fat in 346 days at an average age of 4 years.

A record has been kept of the feed cost of milk and fat production for 1933-1935, inclusive. The average feed cost of milk and fat over this 3-year period was 74 cents per 100 pounds and 13 cents per pound, respectively. These costs are based on the actual cost of all purchased feeds and the cost of producing home-grown feeds, and include cost of maintaining heifers for one month previous to calving, and all dry cows.

The most promising male calves from the best cows were reared and sold for breeding purposes.

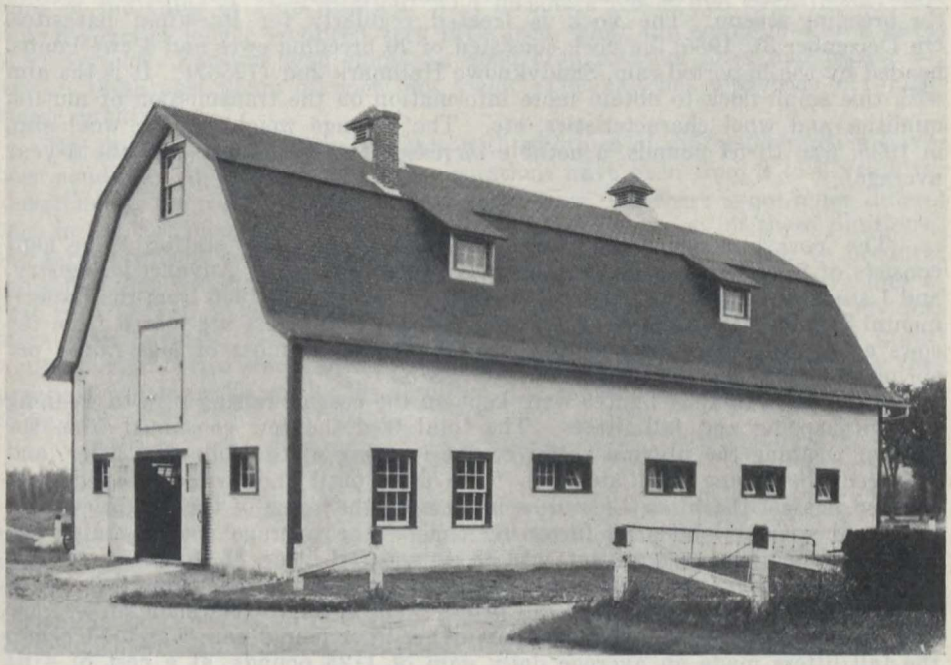
Bang's Disease and Tuberculosis.

In 1928 the Experimental Farm System adopted a policy of blood testing all herds for Bang's disease, and, where possible, of segregating the reactors and forming a positive herd of the well-bred females, in order to salvage calves free from the disease that could be added to the negative herd. The system carried out was as follows: As soon as a calf was born in the positive herd it was disinfected, moved at once to isolated quarters, and reared on milk from the negative herd. When the calves were 6 months old they were blood tested. After 60 days they were retested, and if both tests were negative, they were placed in the clean herd.

In September, 1928, in a test made of the entire herd at Lennoxville, there were 9 positive reactors. At this time the Jersey herd, including 6 reactors, from the Central Experimental Farm, Ottawa, was transferred to Lennoxville. Thus 15 head of positive reactors were completely isolated from the main herd on the Ward farm. They were looked after by a herdsman who did not come in contact with the other herd in any way. The milk from this isolated herd was thoroughly pasteurized and used for feeding pigs.

In the spring of 1929, when the main herd had the second test, 7 more reacted positive to the blood test; these animals were added to the positive herd. After the first year there was scarcely any trouble in this herd, the calves coming normally. All those that were reared passed a clean test, and not one of these calves has reacted since entering the negative herd.

All the reactors remaining in this isolated herd were disposed of for beef in 1933. Since then there has not been a reactor on the farm. The entire herd is tested each spring before the animals are turned to pasture for both Bang's disease and tuberculosis, and the herd is now "fully accredited," and free of both these diseases.



Horse barn, Dominion Experimental Station, Lennoxville, Que. Erected 1935.

Horses

The 13 work horses kept at the Lennoxville Station are necessary to do the work in the various divisions during the spring and summer months. Of these horses, 2 have continuous work during the year, 4 have light work occasionally during the winter, and the other 7 are wintered on hay, roots, and a small amount of bran. They are turned out in the barnyard for exercise. The cost of horse labour is high because there is not work for all the horses during the winter. From records kept during the past 5 years the average cost of feed per horse for one year is $79.95, and the average cost of horse labour for the past 15 years is 13 cents per hour.

Sheep

The Oxford Down is the only breed of sheep kept at the Lennoxville Station. From 1931 to 1933 a flock of 57 head was maintained. In 1934 the flock was considerably reduced, as the sheep barn had to be converted into a calf barn.

A certain number of ewe lambs were kept to replace old ewes that were sold each year and the rest were sold as market lambs. The most promising ram lambs were retained and sold for breeding purposes in the fall; the rest were castrated when young and were sold as market lambs when proper weight.

The flock is wintered on good clover hay with a light grain ration of bran and whole oats, which is increased as the lambing season approaches, when a little oil cake is added to the grain mixture. The ewe lambs that are kept in the flock are not bred until they are 18 months old. The shearing is done in April, and the ewes and lambs are dipped before going to pasture. The lambs are weaned about the 1st of September, and both lambs and ewes are turned on to fresh after-grass, which gives the ewes sufficient time to put on flesh before the breeding season. The flock is treated regularly for intestinal parasites. On December 31, 1935, the flock consisted of 20 breeding ewes and 4 ewe lambs, headed by the imported ram, Sandyknowe Hallmark 2nd (12567). It is the aim with this small flock to obtain more information on the transmission of mutton qualities and wool characteristics, etc. The average weight of the wool clip, in 1935, was 10·54 pounds, a notable increase of 1·90 pounds over the 5-year average.

Swine

The Yorkshire is the only breed of swine kept at this station. The herd consists of 5 brood sows, 3 of which have qualified in the Advanced Registry, and 1 stock boar, Ranche Leader 2—149656—, received in 1935 from the Experimental Station, Ste. Anne de la Pocatière, P.Q. Two litters are reared from the sows each year. For the past 5 years the average number of pigs raised per spring litter was 9·01, and per fall litter, 8·52.

From 1931 to 1934 figures were kept on the cost of raising pigs to weaning age with spring and fall litters. The total feed the sow consumed from the date of weaning the previous litter to the weaning of the following litter, and the feed the young pigs ate with their dam until they were weaned, was charged against the litter, as well as interest on the value of the sow, service of boar and special labour at farrowing time. The average cost to raise one pig to weaning age, spring litter, was $3.12, and fall litter, $3.16.

An experiment was carried on the first three years to determine the cost of pork production with spring and fall litters. The spring litters made an average daily gain of 1·31 pounds, and the cost of feed per pound gain was 5·11 cents; the fall litters made an average daily gain of 1·25 pounds, at a cost of 4·94 cents per pound gain. In both lots the cheapest gains were made in the first 30-day period.

In 1934 an experiment using 26 pigs divided into 4 lots was carried on in feeding different meal mixtures for weanling, growing and fattening pigs to ascertain what percentage of home-grown grain, such as oats and barley, can be used advantageously for this purpose without skim-milk. The pigs were started on test 2 weeks after weaning and were fed the weanling mixture for 4 weeks. Each lot was then put on the growing mixture for 6 weeks, and for the rest of the period on a fattening ration until they weighed 200 pounds and were ready for market. More barley and less oats and middlings were used as the feeding period advanced.

It was proved that a large percentage of barley can be used to advantage in the ration during the whole period. Skim-milk powder was used in the place of skim-milk in the experiment for 3 lots, the fourth having the Quebec Feed Board's protein supplement. The young pigs did not relish the ration containing the protein supplement at first, but after they were used to it they made good gains. Even with the poor start in the weaning stage, the lot fed the protein supplement made the cheapest gains, 1·04 cents per pound less than the cheapest lot on skim-milk powder and mineral mixture. Where skim-milk is available it is always to be preferred to milk powder and other milk supplements, and is more economical.

FIELD HUSBANDRY

The work in field husbandry at this station consists of cultural and fertilizer experiments with field crops and pastures. Cost of producing certain field crops and the eradication of weeds are also being studied. Some very significant results have been obtained which should be of interest to the farmer.

Crop Rotations

The seasons of 1934 and 1935 should have taught farmers in this district some of the value of crop rotation. Old meadows which had been in hay for 5 or 6 years or longer produced very little feed, while the newer meadows gave a good yield. Farmers who employ a good crop rotation have had plenty of hay in these past years of poor hay yield. The hay has also been of much better quality.

For the past 13 years, experiments with rotations of different duration have been conducted at this station. These rotations have been from 3 to 6 years in duration. As the results of the 13-year period show that there is not much difference in the cost of production or in the yield of crops on any of these rotations, the farmer who is considering starting a rotation should lay it out to produce the crops that will supply the necessary feed for his live stock and give him a cash crop as well. Care should be taken to see that land is not left in hay for more than 3 years. The 5-year rotation of corn, grain, hay, hay, and grain would suit most live stock farms. With this rotation a farmer could follow the practices which are shown by the results of the experiments, given in this report to be best.

Preparation of Land for Grain

The use of after-harvest cultivation in preparing land for grain has proved very satisfactory. The land is ploughed as soon as the hay is off and is kept worked once a week or ten days with the disk and spring-tooth or stiff-tooth cultivator. Land which, following this after-harvest cultivation, was ribbed in the fall or ploughed again in October has given results inferior to those given by land which was after-harvest cultivated only. All plots receiving after-harvest cultivation have outyielded those that are either fall ploughed or spring ploughed. The spring and fall ploughed plots are badly infested with couch grass, while those receiving after-harvest cultivation are almost free of this weed. After-harvest cultivation is particularly valuable where no hoed crops are grown, as it is the only chance to clean the land in a hay and grain rotation.

Preparation of Land for Silage Crops

When land is being prepared for corn, consideration must be given to the weediness of the land and to the amount of labour that will be available for hoeing and cultivating. If the land is badly infested with couch grass, after-harvest cultivation will certainly reduce the amount of cultivation and hoeing necessary for the corn crop; but it will also reduce the tonnage of corn that may be expected. In an experiment conducted at this station for the past 14 years, spring and fall ploughing have given virtually the same results, but after-harvest cultivation has reduced the yield by 2 to 2½ tons of corn per acre.

In the fall of the year manure is usually not available for spreading on the corn land, so that in general spring ploughing for corn is more practical.

Dates of Seeding Hay Crops

Failure to get a catch of hay after seeding sometimes causes the farmer to worry about what he is going to use for hay the following year. Remedies which are believed to be good, and which occasionally give good results, are more often failures. These remedies are usually costly, and the farmer cannot afford to take chances on something that works only occasionally.

In order to test some of these beliefs, an experiment was started at this station in 1929. Following a crop of oats, with which no grass seed had been sown, different treatments were used to try to establish a catch of hay. The treatments were:—

(1) In August, after the grain crop was removed, the land was disked and harrowed and the grass seed was sown.

(2) In August, after the grain crop was removed, the land was ploughed and the grass seed was sown.

(3) The land was disked following the oat crop, and, early the next spring, the hay seed was scattered on the surface.

(4) In the spring following the oat crop, the hay seed was scattered on the unworked stubble.

(5) In the spring following the oat crop, the land was ploughed and the hay seed was sown with a nurse crop of oats and peas—the oats and peas to be cut for hay.

The eight years' results show that scattering the seed on the surface and seeding in August give virtually no hay the first year. If the seed is scattered on the surface, weeds form a large part of the crop and account for most of the yield that is recorded. The best yields have been obtained with the oats and peas. The results of this experiment, while mostly negative, should show the farmer that it is lost seed and energy to try to improve a poor catch of hay by scattering seed on the surface, or by seeding in the fall after the grain crop is off.

Depth of Ploughing

In order to compare the virtues of deep and shallow ploughing, an experiment was started in 1923. A 4-year rotation of corn, oats, clover and timothy was used. Two depths of ploughing were practised; 4-inch and 7-inch. The land was spring ploughed for corn and fall ploughed for oats.

The 14-year average shows yields slightly in favour of the 4-inch ploughing. The average yield of corn was 1·11 tons more, of oats 1·3 bushels more, of clover 0·11 tons more and of timothy 0·01 tons less on the 4-inch ploughing. It would, therefore, appear to be a waste of power to plough deeper than is necessary to have enough loosened soil to prepare a seed bed.

Use of Lime

The heavy rainfall of this district, which is so beneficial in most respects, has the disadvantage of removing, by leaching, much of the soluble materials from the soil. One of these soluble materials is calcium. When this calcium is leached, the soil becomes acid or sour and some plants do not make satisfactory growth. Calcium may be returned to the soil by an application of ground limestone.

For the past 14 years an experiment using a 4-year rotation of corn, oats, clover, and timothy has been conducted at this station to find out the value of ground limestone. One set of plots received 2 tons of ground limestone per acre

every 4 years before the oat crop. The other set received no limestone. Sixteen tons of manure were applied to the corn crop on both sets of plots. The 14-year average yields were:—

	Limed	Unlimed
Corn	13·76 tons	10·93 tons
Oats	50·2 bus.	37·6 bus.
Clover	1·69 tons	0·88 tons
Timothy	1·77 tons	0·98 tons

After deducting the cost of the ground limestone, the value of the crops produced on the limed plots has been $5.11 more per acre each year than the value of those on the unlimed plots, or the profit on each 2 tons of ground limestone was $20.44.

Farmers who contemplate liming their land would be well advised to have their soil tested for acidity by their local agronome or experimental station. They should also see their local agronome about the cost of limestone.

Quantity of Manure and Place in Rotation to apply it

How much manure? On what crops should manure be applied? In order to answer these questions for a 4-year rotation consisting of corn, oats, clover and timothy, an experiment has been conducted at this station for 12 years. The different applications were as follows:—

(1) 10 tons of manure applied for the corn and 6 tons used to top dress the clover sod;
(2) 16 tons of manure applied for the corn;
(3) 10 tons of manure applied for the corn.

The results for the 12-year period show that 10 tons of manure in 4 years was entirely inadequate to meet the needs of the crops. The 16 tons of manure, applied to the corn crop, yielded 0·54 tons more of corn, 7 bushels more of grain, 0·24 tons more of clover, and 0·36 tons less of timothy per acre than did the manure when it was put on in two applications. In practice it costs less to spread the manure in one application than in two, and, when slightly higher yields can be expected from every crop except the timothy, the single application is the one to use.

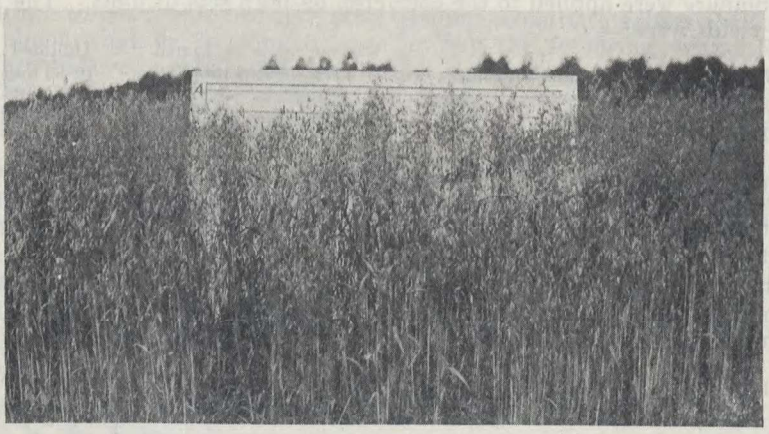
Rates of applying Commercial Fertilizers for Hay

Commercial fertilizers are being used in ever increasing amounts, as farmers realize the benefits that may be obtained from their use. An experiment to test different amounts and formulae for a hay and grain rotation has been conducted at this station for the past 5 years. The treatments are:—

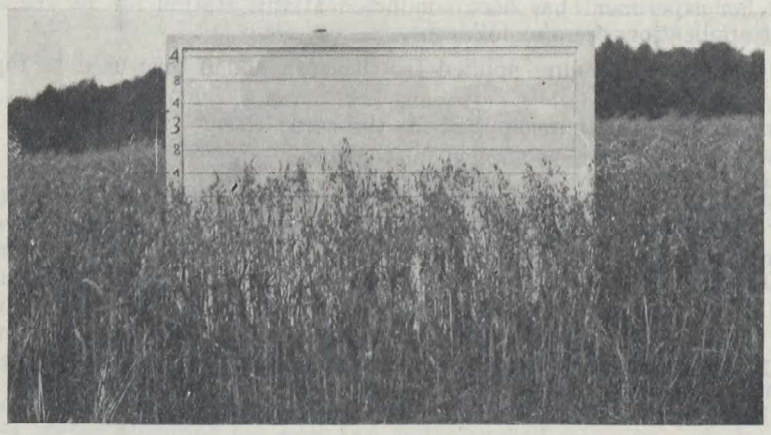
(1) 75 pounds nitrate of soda, 200 pounds superphosphate, 50 pounds muriate of potash;
(2) 75 pounds nitrate of soda, 200 pounds superphosphate;
(3) 150 pounds nitrate of soda, 400 pounds superphosphate, 100 pounds muriate of potash;
(4) 150 pounds nitrate of soda, 400 pounds superphosphate;
(5) 100 pounds muriate of potash;
(6) Check.

The nitrate of soda is applied every year and the minerals every second year to the oats and first-year timothy.

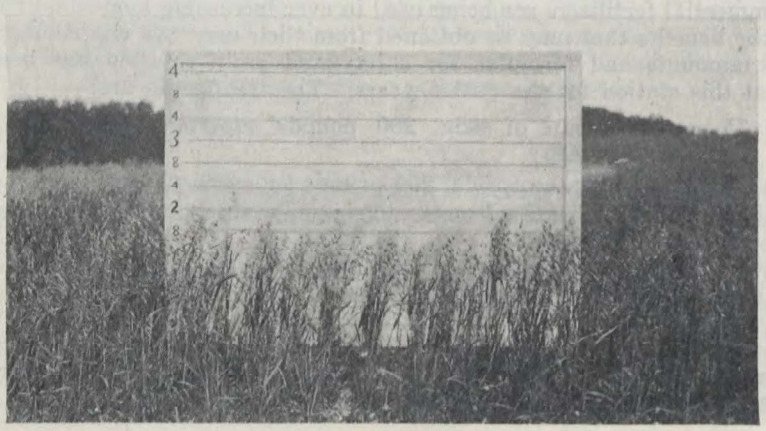
RATES OF APPLYING COMMERCIAL FERTILIZER FOR HAY



Complete fertilizer



Nitrate of soda and superphosphate



Check, no fertilizer.

Results, so far, indicate that potash is necessary on the light sandy loam soil at Lennoxville. The addition of 100 pounds of muriate of potash to 150 pounds of nitrate of soda and 400 pounds of superphosphate nearly doubles the yield over that obtained without it. On the plots that do not receive potash, the oats become straw-broken before they are fully ripe. The quality of hay on these plots is considerably poorer than it is on plots where potash is used.

The highest and most profitable yields have been obtained from the heaviest application of complete fertilizer.

Manure and Commercial Fertilizer Combinations for Potatoes

The growing of potatoes, except for the small plot for home consumption, is gradually becoming a specialist's job, owing to the amount of equipment necessary to look after the crop properly. The correct use of manure and fertilizers is very important in the production of potatoes as a paying crop. An experiment to test the effect of different amounts of fertilizers and manure has been conducted at this station for the past 14 years. The treatments are as follows:—

(1) 450 pounds of fertilizer;
(2) 900 pounds of fertilizer;
(3) 1,800 pounds of fertilizer;
(4) 16 tons of manure;
(5) 10 tons of manure and 450 pounds of fertilizer;
(6) No manure, no fertilizer.

In 1933 two more plots were added, one receiving 2,700 pounds and the other 3,600 pounds of fertilizer. The fertilizer was made up at the rate of:—

100 pounds of nitrate of soda;
300 pounds of 16 per cent superphosphate;
50 pounds of muriate of potash.

In 1934, another plot fertilized with 1,800 pounds of commercial 4-8-10 was added to the experiment.

On those plots which have been in operation for fourteen years, the best results have been obtained from the 1,800 pounds of fertilizer, which gave an average yield of 211 bushels of marketable potatoes per acre. The 10 tons of manure and 450 pounds of fertilizer came next with a yield of 208·8 bushels, and this was followed by the 16 tons of manure with 208·4 bushels of marketable potatoes. The average of the check is 69·2 bushels, and it is getting less each year.

The average yields of marketable potatoes for the 4 years since the 2,700 pound and 3,600 pound applications of fertilizer were started have been:—

	Bushels
1,800 pounds fertilizer	207·9
16 tons manure	244·7
10 tons manure and 450 pounds fertilizer	227·4
2,700 pounds fertilizer	269·5
3,600 pounds fertilizer	266·8

For the past 3 years the average yield from 1,800 pounds of 4-8-10 fertilizer has been 27·6 bushels higher than that from 1,800 pounds of the general mixture as noted above.

The potatoes on the fertilized plots have been more uniform in size than those on the plots receiving 16 tons of manure. In 1934 the potatoes were

subject to an attack of common scab. The attack was most severe on those plots receiving a heavy application of nitrate of soda, while the plots receiving the 4-8-10 fertilizer were almost free from scab. This was most likely due to the alkaline reaction of the nitrate of soda. From 1935 when certified seed was purchased, scab has not been bothersome.

Commercial Fertilizer Formulae for Pastures

In order to test different fertilizer formulae, lime, and manure for pastures, an experiment was started at this station in 1927. The fertilizers and lime were applied every 2 years in the early spring. Lime has given very good results, especially when combined with 100 pounds of nitrate of soda and 300 pounds of superphosphate. After the 1933 application of lime, the white clover and most of the weeds disappeared from these plots. Too much lime had been applied and the land had become alkaline. Starting from 1933, lime will be applied only every fourth year.

The highest yields have been obtained from 100 pounds of nitrate of soda, 300 pounds superphosphate, and 50 pounds of muriate of potash, which gave a 10-year average production of 2,378 pounds of dry matter per acre. This is followed closely by 8 tons of manure with a yield of 2,361 pounds dry matter, and by the lime and fertilizer treatment mentioned above with 2,265 pounds.

The whole area of a pasture must be covered with manure, or the cattle will not graze on the manured part.

Nitrate of soda alone has not given good results, in fact, it is very little better than the check.

Effect of Cultural Treatments on Old Pastures

When an old permanent pasture needs improving, should it be broken, or fertilized, or seeded, or given a combination of these treatments? This question must be answered for each individual piece of ground.

Land which is growing very little grass and which is so stony that the cost of breaking would be prohibitive, should be allowed to go back to forest. Land which is covered with moss hummocks and hardhack, but which is not stony, should be broken and seeded. Acid land should be limed and fertilized before seeding. Pasture that has a fair sward need only be fertilized, or, if very acid, limed to improve it.

In an experiment conducted at this station for the past 5 years on a piece of very acid pasture, ground limestone, at the rate of 2 tons per acre, has given better results than complete fertilizer, both in quantity and quality of herbage. In this same experiment, breaking and seeding, while it has not always increased the quantity, certainly has improved the quality of the pasture. Scattering seed on the unbroken sod has been a waste of money, as no improvement was shown.

Date of Applying Commercial Fertilizer for Pastures

The proper time to apply nitrogenous fertilizers to pasture is still an unsettled problem. It is known that nitrogen applied early in the spring promotes a fast, early growth, so that cattle may be turned out sooner; but it also has a tendency to aggravate the June peak, which is a problem in pasture management.

As nitrogen applied in the spring helped the growth of grass, it was felt that a second application about June 15 might stimulate the growth through July and part of August. Accordingly an experiment was laid out in which sulphate of ammonia was applied at the rate of 100 pounds per acre in the spring. On another set of plots, 100 pounds of sulphate of ammonia were applied in the spring and an additional 100 pounds were applied about June 15. Once in 4 years, 300 pounds of superphosphate and 75 pounds of muriate of potash were also applied to both plots.

The plots receiving only one application of sulphate of ammonia a year yielded slightly more than those getting the two applications. Apparently the second 100-pound application was entirely wasted.

Further reports on pasture work in which live stock are used may be found in the Animal Husbandry section of this report.

FORAGE PLANTS

Pasture Species and Mixtures Experiment in Clipped Plots

In this experiment, 9 seeding mixtures and 16 separate species have been tested, in small quadruplicate plots, and clipped with a lawn mower at frequent intervals during the growing season.

The land used was a sandy loam, rather low in fertility, decidedly acid, and otherwise typical of much of the rough pasture land in the Eastern Townships. It had been in sod for 10 years, and when ploughed for this experiment in 1930, about 20 per cent of the surface of the ground was occupied by moss. No manure or fertilizer was used, as it seemed advisable to determine first the response of the several species and varieties to conditions similar to those of average pasture.

In 1931 and 1933 the various plots were clipped 8 times: In 1932, 10 clippings were made, and in 1934, owing to unusually dry weather, only 6 were possible. All clippings were weighed each year and dry matter determinations were made. The experiment was discontinued at the end of the 1934 season.

In the following statement, the various seedings are listed, together with the average yields per acre, for the 4-year period:—

CLIPPED PASTURE EXPERIMENT—1931 TO 1934.

Mixture or Species, lbs. per acre	Average yield per acre	
	Green weight	Dry matter
	tons	tons
1—Timothy 8 lbs., red clover 10 lbs., alsike 2 lbs.	8·662	1·579
2—Timothy 4 lbs., red clover (early) 3 lbs., red clover (late) 3 lbs., alfalfa 4 lbs., alsike 2 lbs., white Dutch 1 lb.	8,449	1·538
3—Alfalfa 4 lbs., red clover (early) 2 lbs., red clover (late) 2 lbs., alsike 1 lb., orchard grass 2 lbs., meadow fescue 2 lbs., white Dutch 1 lb.	6·581	1·272
4—Alfalfa 3 lbs., red clover (early) 2 lbs., red clover (late) 2 lbs., alsike 1 lb., timothy 3 lbs., meadow fescue 1½ lbs., orchard grass 1½ lbs., Kentucky blue 1 lb., red top 1 lb., Reed canary grass 1 lb., white Dutch 1 lb.	6·194	1·194
5—Kentucky blue 10 lbs., red top 4 lbs., white Dutch 2 lbs.	5·573	1·258
6—Canada blue 10 lbs., red top 4 lbs., white Dutch 2 lbs.	5·803	1·312
7—Timothy 6 lbs., Kentucky blue 7 lbs., red top 3 lbs., alsike 2 lbs., white Dutch 1 lb.	5·179	1·100
8—Timothy 6 lbs., Kentucky blue 7 lbs., red top 3 lbs., alsike 2 lbs., Mammoth white Dutch 1 lb.	5·803	1·107
9—Kentucky blue 2 lbs., red top 2 lbs., orchard grass 2 lbs., timothy 4 lbs., red clover 2 lbs., white Dutch 2 lbs., alsike 2 lbs.	4,762	1·202
10—Timothy 15 lbs.	6·003	1·272
11—Orchard grass 25 lbs.	5·728	1·199
12—Meadow fescue, 25 lbs.	4·461	·915
13—Awnless brome 25 lbs.	5·787	1·085
14—Western rye 25 lbs.	5·335	1·117
15—Canada blue 15 lbs.	4,995	1·084
16—Kentucky blue 15 lbs.	4,025	·932
17—Reed canary grass 10 lbs.	5·362	1·105
18—Meadow foxtail 20 lbs.	4·955	1·200
19—Red fescue 25 lbs.	4·403	1·089
20—Red clover (common) 15 lbs.	5·701	1·159
21—Red clover (late) 15 lbs.	6·218	1·150
22—Red clover (early) 15 lbs.	5·776	1·105
23—Alsike 6 lbs.	6·168	1·122
24—White Dutch 4 lbs.	6·002	1·186
25—Mammoth white Dutch 4 lbs.	8·679	1·723

From the foregoing statement it may be noted that yields of dry matter, with few exceptions, vary but little with the different seedings. It was also found, by sod analysis, that only a few species persisted after the first year or two from seeding.

However, ground coverage was maintained, and even increased by native species, which either crowded out or replaced those seeded. Accordingly, at the end of the 4-year period, the stands on many plots were composed of virtually the same species.

A feature of this experiment has been the rapid spread of native wild white clover. Seed of this species was not included in any of the seedings, yet, wherever grasses or white Dutch clover died out, this species filled in a large part of the vacancies; and in stands of strong growing persistent grasses, such as timothy and reed canary grass, it also worked in to a very appreciable extent. The only grass included in this experiment with which it could not make headway was creeping red fescue, and very little native wild white established itself with stands of red clover or after them.

Red top, timothy and Canada blue grass were also good volunteer crops. Timothy filled in chiefly after red clover, and red top and Canada blue grass made their way into every plot where the species originally seeded did not persist.

Of the several species which maintained their stand during the period, timothy and orchard grass were very satisfactory in that they produced substantial yields. In old grazed sods at this station, fairly substantial quantities of these two species are present where soil fertility is fairly high.

The results with reed canary grass were also encouraging. It is a strong, vigorous-growing grass which, owing to its underground root stalk, forms a strong turf.

The results from this experiment, together with observations made throughout the entire Eastern Townships for a number of years, would indicate that pasture seedings may be simple and may be made up of species of which the seed is relatively low in price. Under normal conditions throughout this district, particularly where the soil is acid, native wild white clover will establish itself naturally in grazed sod land. Where the soil is relatively light and well-drained, Canada blue grass will almost invariably work into stands of most grasses and will eventually form a high percentage of the ground coverage. On heavy or poorly drained land, red top will act in a similar manner. In certain sections, usually on high dry situations, a native creeping red fescue is found in abundance; in some pastures it constitutes from 70 to 80 per cent of the stand. It has also been observed that both red top and creeping red fescue are not highly relished by stock and will seldom be eaten when other grasses and native wild white clover are available. Accordingly, it would seem that when a permanent pasture is to be put down, timothy, orchard grass and Canada blue grass should constitute the bulk of the seed sown. If soil conditions are made suitable, native wild white clover will become established without seeding and, with the grasses, will form a tough productive sod that will produce palatable forage and withstand heavy grazing.

Effect of Soil Amendments on Pasture Flora

The area on which this experiment was conducted was part of an old permanent pasture that had not been broken or fertilized for at least 18 years. The soil, although decidedly acid, was moderately productive and the sod was somewhat better than that on most of the unimproved pastures throughout the district.

During the first week in September, 1932, an examination of the sod showed that about 18 per cent of the stand was composed of moss, and 16 per cent of weeds or other plants useless for pasture. Ground coverage was 92 per cent. Later in the same month a portion of the area was divided into one-hundreth acre plots and the following applications were made to duplicate plots·

1—Rock phosphate	800 pounds per acre
2—Superphosphate 20 per cent	500 " "
3—Superphosphate 20 per cent	500 " "
Ground limestone	2 tons "
4—Check (no treatment)	
5—Ground limestone	2 " "
6—Ground limestone	3 " "
7—Sodium carbonate	500 pounds "

The response to all treatments was rather slow, and, in 1933, no apparent change could be noted in the flora. This may have happened partly because the pasture was understocked and not closely grazed in 1933. In 1934, however, more cattle were kept on the pasture and the sod was closely grazed throughout the entire season. Under these conditions the effect of the several treatments was quite apparent.

On both ground limestone plots, and where sodium carbonate had been applied, weeds increased and moss virtually disappeared; moreover, as most of the weeds were Canada thistle, these plots were not grazed closely. On the superphosphate and ground limestone plot, weeds remained about the same, wild white clover increased and moss decreased. Stock grazed it closely.

Both rock phosphate and superphosphate gave similar results. Wild white clover increased, moss was slightly less and stock grazed it closely.

In 1935 the pasture was again well-stocked and a further change in the flora on the several treatments was noted. On the plot which received 3 tons of ground limestone, Canada thistle had spread until it composed most of the stand and almost completely shaded the ground. Where 2 tons of ground limestone had been applied, Canada thistle had not increased and grasses were particularly strong. Wild white clover increased slightly. At no time was this plot very closely grazed.

The most pronounced change occurred in the flora on the superphosphate and ground limestone plot. Wild white clover increased from 15 per cent of the stand in 1932 to 58 per cent in 1935; moss had almost disappeared and native grasses had increased in vigour. Weeds were almost entirely suppressed.

The plots receiving superphosphate and rock phosphate were not changed a great deal from 1934. The turf was somewhat thicker and moss had again decreased. Grazing was very close.

On the sodium carbonate plot, although moss had definitely decreased, conditions were otherwise similar to those on the check.

Treatment of Moss Hummocks

On large areas, used for pasture in the Eastern Townships, where the soil is podsolized and quite acid, a very distinctive type of moss hummock is found. These are usually a square yard or more in area and are often raised more than 2 feet above the ground. In many pastures from two-thirds to three-quarters of the ground is covered by such hummocks. They are of no value as pasture and their presence simply means a waste of land. The land on which they occur is frequently rocky and is expensive to break. If a cheap but efficient method were available to break down such moss hummocks and so enable useful plants to be established in their place, the stock carrying capacity of large areas of pasture could be substantially increased.

As a preliminary trial of methods the following applications were made, each on 3 typical moss hummocks, in the summer of 1932:—

1—Superphosphate	0·25 pound per square yard
2—Superphosphate	0·25 pound per square yard
Ground limestone	1·0 pound per square yard
3—Rock phosphate	0·25 pound per square yard
4—Rock phosphate	0·5 pound per square yard
5—Sodium carbonate	0·5 pound per square yard
6—Nitrate of soda	0·25 pound per square yard

In 1933, the only change that could be noted was that a small amount of moss had been killed on the hummocks where sodium carbonate and nitrate of soda had been applied.

In 1934, the moss on the hummocks where nitrate of soda had been applied was almost completely dead. Where sodium carbonate was used the killing was not as pronounced, but it had definitely increased since 1933. On the other hummocks no change had taken place.

On September 4, 1934, a mixture of timothy, Canada blue grass and red top was sown on all hummocks, and the seed was worked into the moss by scratching the hummock with a fork. Early in the season of 1935 it was noticed that grass seed had germinated on all hummocks. The young grass seedlings, however, died soon after germinating on all hummocks, except on those where sodium carbonate or nitrate of soda had been applied. Only a fair stand was obtained with sodium carbonate, but this persisted throughout the season and may completely cover the hummocks in 1936. On the hummocks treated with nitrate of soda, the grass grew more vigorously and formed a fair sod which stock grazed during the latter part of the season.

Field Roots

Test of Varieties.—During the past 6 years, more than 1,000 so-called varieties and strains of swede turnips have been grown at this station in a co-operative project mainly for verification purposes, and a variety test of both mangels and swede turnips has also been conducted each year for the past 15 years. From the data accumulated from this series of experiments it would seem that, within certain limits, the source of the seed is of more importance than the name of the variety. It is obvious that if sufficient care is not taken in the selection of root seed stock and in the isolation of the growing seed crop, the resulting seed may produce off-type roots and mixtures with other varieties and species. Unfortunately, seed of this nature, of some of the best producing varieties, has in the past been offered for sale, and crops grown from it have proved to be decidedly disappointing in both yield and quality. There are now, however, a number of registered varieties, the seed of which is produced under inspection and is available commercially.

Of such registered varieties that have been tested at this station the most satisfactory are: Swede turnips: Ditmars, Bangholm, Acadia and Laurentian. Mangels: Tip Top, Giant White feeding.

Control of Brownheart of Swede Turnips.—During the past few years, the disease of swede turnips known as brownheart has become increasingly prevalent throughout the Eastern Townships, and heavy losses have occurred over a wide range of soil types in varying states of fertility. It is believed that small applications of borax to the soil will in some measure control this disease.

An experiment at this station started in 1933 has shown that control up to about 85 per cent can be effected by an application of borax amounting to 20 pounds per acre. This rate, however, had a slightly adverse effect, as total

yields of roots were reduced by approximately 10 per cent. With 10 pounds per acre yields were not affected, although brownheart control was somewhat less.

It would seem that for the conditions under which this experiment was conducted the use of borax is not entirely satisfactory for the control of brownheart, and that unless severe attacks of this disease are expected its use is not advisable.

Soybeans

The first experiments with soybeans at this station were conducted in 1924 and 1925. At that time the varieties of which seed was readily available were rather late in maturing, and, in the climate of this district, were of value only as a source of forage.

The tests showed that, although yields of forage were moderately satisfactory, the crop was on the whole unsuitable for the conditions under which the tests were conducted. In both years the crop did not reach maximum size until early in September, at which time the weather is usually unsatisfactory for drying the cut crop, and as soybean leaves are somewhat tough and gummy, they dry slowly even under ideal weather conditions. Accordingly, in both years, more than 2 weeks were required to cure the cut crop thoroughly and it was damaged by rain before it could be stored.

With the introduction of early high-yielding varieties, of which the seed can be ripened in the average season at Lennoxville, experiments with soybeans were started in 1933. Results in the growing of the crop for hay were again unsatisfactory, but for grain or seed production excellent crops have been obtained.

Under average conditions and with suitable varieties it would seem that yields of from 20 to 25 bushels may be expected in a normal season. Moreover, as the grain is an excellent high protein feed, and as the crop is suitable on a wide range of soil types, it is one that farmers throughout the district served by this station could grow to advantage.

Variety Tests.—Of 4 varieties that have been tested for seed production, 3 have consistently ripened satisfactory crops.

Manitoba Brown, which is the earliest, ripens usually about the 1st of September. The plants are about 18 inches high and seed is of a dark brown colour. Its average yield for the past 3 years was 24·67 bushels per acre.

Wisconsin Black is somewhat taller than Manitoba Brown and 4 or 5 days later. The beans are of small size and black colour. The average yield of the variety for the past 3 years was 29·40 bushels per acre.

The variety Mandarin is from 2 to 4 days later than Wisconsin Black, and in the average season it will not ripen at Lennoxville unless grown on fairly light soil, preferably that which has a southern or western slope. The beans of this variety are of medium size and light yellow colour. The average yield from 1933 to 1935 was 28·03 bushels per acre.

Of the 3 varieties, Mandarin is the most desirable, in that the seed is of value commercially for processing as well as for feeding purposes. It is too late, however, for average conditions throughout this district. The seed of both Manitoba Brown and Wisconsin Black is unsuitable for processing, and is of value only for feed. If seeded reasonably early, Manitoba Brown can be depended upon to ripen, but owing to its short growth it is not as convenient to harvest as Wisconsin Black.

Dates of Seeding Soybeans.—In this experiment, seed of Manitoba Brown, Wisconsin Black and Mandarin has been sown as soon as the soil could be worked satisfactorily in the spring and thereafter at intervals of about 10 days

for several subsequent seedings. For the past 2 years the highest average yield has been obtained from the second seeding, which was made on May 15 in 1934 and on May 23 in 1935. In the earliest seedings germination was unsatisfactory and the stand obtained was thin. In the third and fourth seedings only Manitoba Brown produced a thoroughly ripened crop.

Red Clover

During the past 5 years, experimental work with red clover has been confined entirely to the testing of varieties and regional strains. The changeable weather usually experienced during the winter and spring months throughout this district demands extreme hardiness in red clover. Of all lots tested, the variety Dollard, obtained from Macdonald College, Que., and a selection produced at the Central Experimental Farm, Ottawa, were outstanding in hardiness, and so produced the highest yields of hay. If seed of these is not available, it would seem that farmers in the district served by this station would obtain the best results with seed grown in Quebec or in eastern and northern Ontario.

Sweet Clover

Although this species is common as a wild plant throughout the Eastern Townships and grows vigorously along roadsides and on railway embankments, its response to average field conditions at this station has been disappointing. On land which is neutral or alkaline in reaction, with a loose, open subsoil, and which is in a reasonably high state of fertility, sweet clover will produce fair to good crops; and in the western counties of the province, particularly where high lime soils are prevalent, the crop can be grown with very little trouble. Of 12 varieties tested at this station, the variety Arctic appears to be the most satisfactory, although its yield, on very favourable sites, has been somewhat less than that normally obtained from an average stand of red clover.

Timothy

Although seed of named varieties of this valuable forage plant is at present unavailable commercially in the district served by this station, it is believed that within a few years it will be more easily obtainable. A number of varieties and improved strains tested at Lennoxville have proved, as a rule to be superior to ordinary commercial timothy, the most outstanding being the variety Boon originated at the Central Experimental Farm, Ottawa.

CEREALS

Although work with cereals was somewhat curtailed during the past 5 years as a result of lowered appropriations, testing of the most promising varieties and a limited amount of breeding work were continued. In addition, registered seed grain was produced, and, each year, fairly substantial quantities of registered seed of Legacy oats and Charlottetown 80 barley have been disposed of to farmers throughout the district.

Variety Testing

Largely as a result of lowered farm revenue, which has necessarily restricted the purchase of feeds, the production of home-grown grains throughout the Eastern Townships has gradually increased during the past few years. This production, however, is still inadequate, and a relatively large portion of the average farm income goes each year to purchase feed concentrates. It is believed that if varieties more suitable to the peculiar climatic conditions of the

district than those commonly used were generally adopted, the production of feed grains would be substantially increased, so that a portion of the farm revenue at present used for purchasing feeds would be released. Accordingly, the testing of varieties of cereals is of extreme importance to farmers of the Eastern Townships, and for that reason it has been conducted on relatively large scale at this station.

Oats

Of 76 varieties and strains of oats that have been tested during the past 5 years, a large number have proved to be superior to the variety Banner, which is the variety most commonly grown in the Eastern Townships. Although the majority of these are newly-originated varieties that are at present unavailable commercially, there are a number of which seed can be obtained. The 3 most promising are listed, along with Banner, in the following table:—

OATS, 5-YEAR AVERAGE OF RESULTS

Variety	Days to mature	Length of straw	Strength of straw	Yield per acre	Weight per bushel	Kernels per acre
		in.	1-10	bush.	lb.	lb.
Eagle	99·4	40·34	7·04	96·32	38·1	2,453·5
Legacy	95·4	39·63	6·44	92·49	38·0	2,331·8
Cartier	87·6	42·13	7·59	81·76	39·1	2,140·5
Banner, 44 M.C.	102·4	43·36	4·44	86·18	38·1	2,087·4

Over large areas of the Eastern Townships the variety Legacy has proved very satisfactory. It is, as may be noted, 7 days earlier than Banner, less likely to lodge, and has produced substantially higher yields.

Where extreme earliness is required, Cartier is undoubtedly a very valuable variety. Although similar in many respects to the variety Alaska, it has consistently produced larger yields of grain and is less inclined to lodge. The grain is also of good quality—plump, moderately large and thin-hulled.

Eagle, which is a comparatively new variety, has produced excellent yields at this station. It is much stiffer-strawed and higher-yielding than Banner, and, where a late variety is desired, should prove very satisfactory.

Barley

With good cultural practice, and on land that is neither wet nor extremely heavy, suitable varieties of barley will usually produce more pounds of grain per acre than will oats. From the standpoint of actual feeding value the difference is even greater, as the barley contains a much higher percentage of kernel than does oats, and accordingly is a more valuable feed for certain classes of live stock. Among the varieties of which seed is commercially available that have been tested during the past 5 years, those listed in the following statement are the most satisfactory:

BARLEY, 5-YEAR AVERAGE OF RESULTS

Variety	Days to mature	Length of straw	Strength of straw	Yield per acre	Weight per bushel
		in.	1-10	bush.	lb.
Charlottetown 80	98·2	35·43	5·04	55·96	52·9
Himalayan	85·4	29·79	4·55	41·60	62·1
O.A.C. 21	90·8	35·92	7·55	59·09	51·2
Pontiac	90·4	37·44	6·98	63·18	50·3
Velvet	93·2	37·19	6·54	59·17	49·8

Charlottetown 80, a rather small two-rowed variety which has been grown as a field crop at this station for a number of years, seems to be particularly well-suited to the soil and climatic conditions of the Eastern Townships. It has consistently produced moderately high yields of grain on a wide range of soil types, and is apparently less affected by excessive moisture in the soil than are other varieties at present available. A rather desirable characteristic of this variety is that, if it is allowed to mature well before cutting, most of the awns will drop off in the field and the remainder are readily removed in threshing. Moreover, as it is intermediate in season and length of straw, it has proved very satisfactory to mix with Legacy oats for the production of mixed grain.

The variety Himalayan, a rather short-strawed, hulless variety, has produced very satisfactory yields. Where this type of barley is required, it is the most satisfactory variety of those at present available.

O.A.C. 21 is well known throughout the district served by the station, where it is the most commonly grown six-rowed, early variety. It has proved to be an excellent variety to sow with early oats, such as Cartier, for the production of mixed grain.

Pontiac, originated at Macdonald College, Que., is one of the newer varieties. It has produced very satisfactory yields on several distinct soil types, and is apparently suited to a variety of seasonal conditions, except that of excessive precipitation.

The use of the variety Velvet has increased throughout this district during the past few years largely as a result of its very smooth awn. So far, when included in mixtures at this station, it has not proved entirely satisfactory. When grown alone, however, on soil well-suited to barley, it has produced satisfactory yields.

Wheat

Under average farm conditions in the Eastern Townships, high quality varieties of wheat are not dependable; they seldom produce yields comparable to those usually obtained from suitable varieties of other grains. The variety Huron, however, whose grain is of poor to average milling quality, seems well-adapted to the prevalent conditions of soil and climate and has consistently produced very satisfactory yields. Following is a statement showing the average results for the past 5 years obtained with Huron and 3 other varieties of normally high milling quality.

WHEAT, 5-YEAR AVERAGE OF RESULTS

Variety	Days to mature	Length of straw	Strength of straw	Yield per acre	Weight per bushel
		in.	1–10	bush.	lb.
Marquis, Ott. 15	102·8	39·35	8·29	24·78	58·8
Reward, 22-42	98·0	35·23	8·97	25·77	63·9
Garnet, Ott. 652	98·0	34·68	6·90	26·95	61·7
Huron, Ott. 3	103·4	41·10	8·59	34·10	60·8

Field Peas

In the average Eastern Townships season, which is relatively cool and moist, suitable varieties of field peas will almost invariably produce large yields where soil conditions are satisfactory. Furthermore, as peas, owing to their high protein content, are a valuable feed for live stock, they could be more generally grown as a protein supplement to be used with other home-grown grains, such as barley and oats, in the making of feed rations.

FIELD PEAS, 5-YEAR AVERAGE OF RESULTS

Variety	Days to mature	Length of straw	Yield per acre	Weight per bushel
		in.	bush.	lb.
Arthur, Ott. 18	100·8	42·67	38·59	64·2
Chancellor	100·2	48·78	33·31	65·3
Early Blue	91·6	30·32	47·34	62·9
Early Raymond	98·6	45·14	34·35	63·9
O.A.C. 181	102·4	48·10	34·42	64·7

As indicated in the foregoing statement, the variety Early Blue has produced exceptionally high yields of grain and is also much earlier than the other varieties tested. The seed is blue in colour, wrinkled, and, as grown at this station, is relatively small in size. Apparently because of its short vine, the variety has not proved entirely satisfactory for sowing along with other grains in mixtures. When grown alone, however, for the production of grain, it seems to be the highest-yielding variety available.

Of the other varieties, Arthur has proved to be the most satisfactory. It produces peas of fine quality, clear yellow colour and medium size. As the vine is of the crown type, the variety has proved very satisfactory for combining with other grains in grain mixtures, for the vines do not spread and tangle into the crop to the same extent as the ordinary type.

Field Beans

Under average farm conditions throughout this district, very satisfactory yields of field beans may be expected annually, provided that moderately early varieties are used. Occasionally anthracnose, or pod spot, is troublesome—particularly with late varieties. This, however, has not proved to be a serious difficulty, as fair to good crops of beans have been obtained each year at this station, for the past 15 years.

FIELD BEANS, 5-YEAR AVERAGE OF RESULTS

Variety	Days to mature	Yield per acre	Length of vine	Weight per bushel
		bush.	in.	lb.
Navy, Ott. 711	102·8	34·2	17·2	64·1
Imp. Yellow Eye	108·8	39·8	16·1	63·6
Burbank	108·0	36·3	15·5	66·0

Of a moderately large number of varieties of beans tested during the past 5 years, the 3 listed in the foregoing statement are the most suitable for this district. Of these, Navy is probably the most satisfactory on account of its earliness, as, in seasons when early fall frosts occur, both Improved Yellow Eye and Burbank are usually damaged before the crop reaches full maturity.

Breeding Work

Breeding for the production of varieties of oats, barley and peas more suitable to soil and climatic conditions of the Eastern Townships than those at present available was continued during the past 5 years. More than 200 apparently fixed lines have been isolated from hybrid material obtained from crosses made at this station. A number of these have been tested for periods of from 1 to 3 years, and a few seem to be decidedly superior, in some respects, to all other varieties that have been tested here.

HORTICULTURE

As a necessary economy, enforced by decreased appropriations, only a very small amount of experimental work in horticulture has been conducted at Lennoxville during the past 5 years. The variety apple orchard, one experiment with raspberries and the ornamental grounds were maintained. All work with vegetables, small fruits and experimental work with flowers was discontinued.

Variety Apple Orchard

This orchard, which was planted in 1915, originally contained about equal numbers of common hardy varieties and promising seedlings. In the winter of 1917-18, almost all trees of such varieties as Wealthy, McIntosh and Fameuse were killed, as well as a large number of the seedling varieties. Most of these and a few additional varieties were again planted, and, with fairly mild winters, only moderate injury was experienced until the winter of 1924-25.

In this winter, temperatures of 45 degrees below zero were recorded twice and −48 degrees once. Under such conditions, winter injury was again general and all trees of the commonly-grown varieties, such as Duchess, Milwaukee, Wealthy, Montreal Peach, McIntosh, and Fameuse, were either completely killed or severely injured. A number of the newer seedlings, however, chiefly those originated at the Central Experimental Farm, Ottawa, were only slightly injured. The most outstanding of these were Trenton, Melba, Joyce, Luke, and Winton.

In replanting, which owing to the gradual dying out of severely injured trees was continued until the season of 1927, a number of high quality seedlings originated at the Central Experimental Farm, Ottawa, were used. Among these were the varieties Lobo, Newtosh, Lawfam, Toshkee, and Gerald. The trees of these varieties made excellent progress and all had borne fairly substantial crops by 1933.

Following a season characterized by excessive precipitation and relatively high temperatures, the winter of 1933-34 was the most severe recorded at this station. On two occasions the temperature dropped to 48 degrees below zero and minimums of 40 to 45° below occurred frequently during the months of January and February. Under such conditions a great deal of winter injury occurred, and the trees of many varieties which had heretofore proved fairly hardy were completely killed.

As in other portions of the province, the season of 1934 was unfavourable for the recovery of injured trees, and, as a result, further serious injury occurred in the comparatively moderate winter of 1934-35.

Over the period 1933 to 1935, only 1 tree out of a total of 683 escaped injury of any kind. This was a fairly large bearing tree of Columbia crab that had borne a heavy crop in 1933. Thirty-six 8-year-old trees of *Pyrus robusta*, a species believed to be of value as a source of apple root stock, were only slightly injured. The trees of all other varieties were more or less severely injured, although a number made a good recovery in 1935 and were about normal at the close of that season.

If a point value of 0 to 100 is given to represent the hardiness of trees, the following table shows the relative hardiness of varieties, of fair to good quality, from 1933 to 1935.

Variety	Number of trees in 1933	Average age of trees	Relative hardiness
Lobo	9	8·0	76·2
Joyce	11	10·3	71·6
Trenton	2	15·0	70·1
Lawfam	6	4·1	70·0
Atlas	5	7·2	65·0
Pedro	5	8·8	65·0
Melba	15	8·5	60·2
Gerald	7	4·8	54·1
Winton	8	4·2	53·9
Melvin	8	10·1	52·1
Newtosh	2	6·0	49·9
Keetosh	3	6·3	49·8
Hume	5	3·0	49·1
Linda	4	2·0	41·0
Mendel	10	5·5	27·1
Luke	4	16·0	26·0
Honora	7	7·6	24·0
Montreal Peach	2	12·0	21·0
Fameuse	8	2·3	6·1
McIntosh	7	1·4	0

In general, any of the varieties listed in the foregoing statement with a relative hardiness above sixty should prove satisfactory on good orchard situations throughout the Eastern Townships. Those of the best quality and colour, in order of season, are Trenton, Melba, Joyce, Atlas, Lobo, and Lawfam.

For the commercial apple-growing district of western Quebec, where winter conditions are much less severe than at Lennoxville, other high quality varieties, such as Linda and Hume, should prove hardy enough.

Raspberries—Mulch and Fertilizer Experiment

The object of this experiment was to obtain a comparison of mulch and clean cultivation, in conjunction with applications of fertilizer in spring and summer, for raspberries.

A strong uniform plantation of the variety Latham, set in 1929, was used for the experiment, one-half of the area being mulched heavily enough to suppress weeds and the other half being kept in clean cultivation. The spring applications of commercial fertilizer and manure were made before growth started, and those in the summer, when the fruit crop was finished.

The several applications were duplicated in one-hundredth acre plots on the mulch and clean cultivation areas.

Following is a statement showing the results obtained for the 5-year period 1931-35.

RASPBERRIES—MULCH AND FERTILIZER EXPERIMENT AVERAGE OF RESULTS, 1931 TO 1935

Fertilizer per acre and time of application	Height of canes		Yield per acre	
	Mulched	Clean cultivation	Mulched	Clean cultivation
	inches	inches	quarts	quarts
5–5–7, 600 lbs., spring	47·6	43·0	2,148·2	2,068·0
5–5–7, 1,200 lbs., spring	58·0	.....	3,206·7	.....
5–5–7, 600 lbs., summer	47·3	40·1	2,097·2	2,109·7
Nitrate of soda, 200 lbs., spring	51·7	49·0	2,108·0	2,103·5
Nitrate of soda, 200 lbs., summer	50·5	48·0	2,102·5	3,792·7
Manure, 12 tons, spring	.....	59·0	.....	3,792·7
Check	44·1	37·2	1,847·5	1,328·0

From the foregoing statement it may be noted that the tallest growth of cane and the best crop of raspberries were obtained where 12 tons of manure had been applied in the spring and worked into the ground with clean cultivation. The next highest yield was obtained with 1,200 pounds per acre of 9-5-7 commercial fertilizer, applied in the spring with mulch.

Except on the check plot, mulching did not induce an increase in crop over that obtained with clean cultivation. This, in part, is not surprising, as precipitation is normally sufficient in the Eastern Townships to provide adequate moisture for the requirements of a raspberry crop. Accordingly, conservation of moisture by a mulch would seem to be unnecessary. Actually, in 2 out of the 5 years that this experiment has been conducted, the plants on the mulched area exhibited unmistakable signs of too much moisture. This caused a falling off in crop, which was apparently compensated for by increased soil fertility due to decayed mulch, in the more normal seasons.

Both spring and summer applications of fertilizer have given approximately the same result, and no difference in yield was obtained by using either 600 pounds of complete fertilizer or 300 pounds of nitrate of soda.

From the results obtained, it would seem that the best crops of fruit may be expected from moderate, annual applications of barnyard manure.

Where it is necessary to use commercial fertilizer in moderate quantities, an application, either in summer or spring, of nitrogen only, equivalent to 200 pounds of nitrate of soda per acre, will prove the most profitable. With heavier applications of 1,200 pounds or more per acre, it is advisable to use a complete fertilizer—such as that used in the experiment, which contained 9 per cent of nitrogen, 5 per cent of phosphoric acid and 7 per cent of potash.

Co-Operative Experiments in Commercial Orchards

Two co-operative experiments in commercial apple orchards have been conducted since 1925. These are located in the orchards of Mr. S. R. Jack at Châteauguay Basin, Que., and Mr. A. W. Buzzell at Abbotsford, Que.

At Châteauguay Basin, the experiments from 1925-30 consisted of a comparison of nitrate of soda and sulphate of ammonia fertilizers with leguminous and non-leguminous cover crops. During this period, the differences in crop yield and tree growth promoted by the two fertilizers, although slightly in favour of sulphate of ammonia, were insignificant and the experiment was discontinued. In its place, a new series of experiments was begun in 1931. In these, half of the orchard was seeded to a leguminous sod and the other to a mixture of grasses. On each half, experiments were started with various fertilizer combinations and mulch.

Owing to severe winter-killing of fruit buds in the winter of 1933-34, the 1934 crop was virtually a failure and was of no experimental value; and in 1931, the first year of the applications, the crop was also of little value for comparisons. In the other three years of the past five, however, normal crops have been obtained; and, although this period is too short for the results to be considered conclusive, very interesting information has been obtained. The total yield of fruit from the orchard has substantially increased, and the trees, even with moderate injury in the severe winter of 1933-34, have put on substantial growth and are generally in a strong, thrifty condition. Furthermore, the yields of fruit and increases in trunk girth have been somewhat greater where a complete fertilizer, high in potash, has been used. Differences in the response from similar amounts of nitrogen in sulphate of ammonia and nitrate of soda have been very slight, and the use of phosphorus with nitrogen has had no apparent effect.

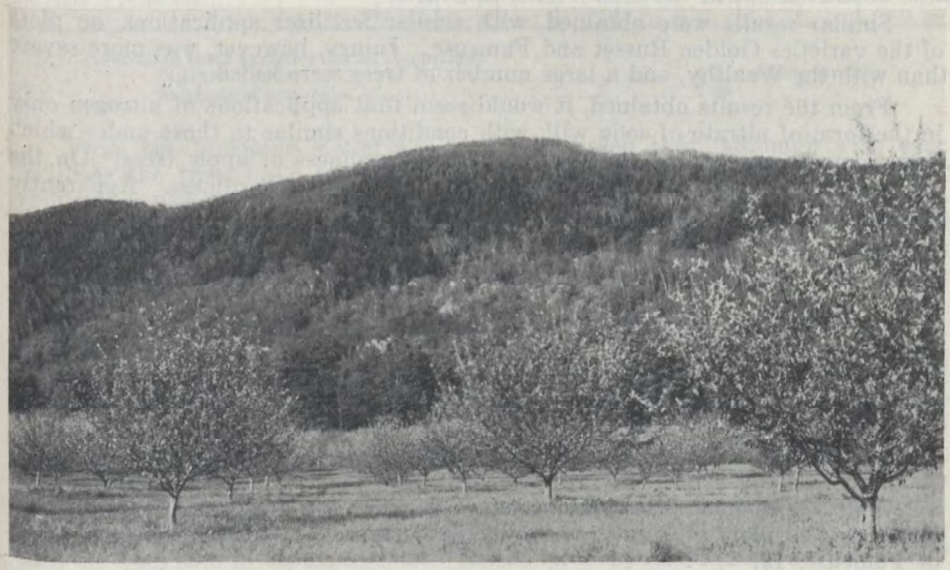
The experiments at Châteauguay Basin are being continued and will be more fully reported when more definite results are available.

Winter Hardiness in Relation to Fertilizer Applications at Abbotsford

The orchard used for the experiments at Abbotsford, like most orchards in this district, suffered very severe injury in the winter of 1933-34. Owing to the weakened condition of surviving trees and to the unfavourable season of 1934, further serious injury occurred in the normal winter of 1934-35, and only a moderate recovery was apparent during the season of 1935. Under such conditions, very valuable information was obtained on the effect of fertilizer applications on winter hardiness of apple trees.

The most outstanding results were obtained in a fertilizer experiment with Wealthy trees. In this experiment are 5 plots, of 9 trees each, which since 1925 have received annual applications of fertilizer as follows:

	Pounds per tree
Plot 1—Sulphate of ammonia	4
" 2—Nitrate of soda	5
" 3—Nitrate of soda	5
Superphosphate	5
" 4—Nitrate of soda	5
Superphosphate	5
Muriate of potash	1
" 5—Check—No fertilizer.	



Young orchard experiment, Abbotsford, Que.

In addition to the above, 2 pounds of muriate of potash was drilled into the ground around each tree in plot 4 in the seasons of 1931 and 1932; and beginning in 1931, all surface applications were increased 50 per cent.

In the winter of 1933-34, all trees on the nitrate of soda plot were severely injured, 3 being completely killed. Where sulphate of ammonia was used, the injury was somewhat less, no trees being killed and several producing light crops of fruit. In the following winter, 3 more trees were killed on the nitrate of soda plot, and, of the remaining 3, 1 was moderately injured and the other 2 barely

survived. In the sulphate of ammonia plot, 8 trees wintered moderately well and 1 was severely injured. Although such results are hard to explain, it is nevertheless apparent that continued applications of nitrate of soda to the Abbotsford soil, which is typical of large areas of orchard soils in the province of Quebec, may create a soil condition which would materially lessen the hardiness of apple trees. Apparently, on such soils nitrogen can be more safely applied in the form of sulphate of ammonia.

With the addition of minerals to the nitrate of soda application, very pronounced differences in winter hardiness were obtained. Injury to trees on the complete fertilizer plot in the winter of 1933-34 was confined to partial fruit bud killing, black-hearting of the wood back to three years old, and a few scattered bark splits and scalds. In the winter of 1934-35, 1 tree on this plot was severely injured. The remaining 8 were almost normal in the season of 1935 and bore excellent crops of fruit. On the plot receiving superphosphate and nitrate of soda, injury over the 2-year period was only slightly less than that observed on the nitrate of soda plot. Injury to trees on the check plot, where fertilizer had not been applied, was severe, but, yet, was somewhat less than on the nitrate of soda plot. In the winter of 1933-34, 4 out of 8 trees were completely killed and the remainder were severely injured. Further injury occurred in the following winter, although 4 trees were living in the spring of 1934. During the season, 1 died, 2 others made a fair recovery, and the remaining tree was about normal at the close of the season.

Similar results were obtained, with similar fertilizer applications, on plots of the varieties Golden Russet and Fameuse. Injury, however, was more severe than with the Wealthy, and a large number of trees were killed.

From the results obtained, it would seem that applications of nitrogen only in the form of nitrate of soda will, with conditions similar to those under which these experiments were conducted, lessen the hardiness of apple trees. On the other hand, adequate applications of potash will increase hardiness. Apparently superphosphate did not materially increase the resistance to winter injury.

Fertilizer Experiments at Abbotsford, Que.

As a result of severe winter injury to the apple trees, described in the foregoing paragraphs, the crops of apples obtained in 1934 and 1935 were of little or no value from an experimental standpoint. Accordingly, in the statements relative to the 3 following experiments, yields obtained up to 1933 only are used.

NITRATE OF SODA VS. SULPHATE OF AMMONIA

This experiment has been conducted with the varieties Wealthy and Fameuse, the plots of Wealthy trees being composed of 9 trees each and those of Fameuse, 12.

As far as could be determined the trees of both varieties were 25 years old at the beginning of the experiment, and had been in sod for some time previously. The same method of culture was continued, the grass being cut two or three times each year, as necessary, and allowed to lie where cut. The fertilizers were applied each spring, when the leaf buds were opening, the material being spread evenly over the ground from about 2 feet from the trunk to a distance of 2 to 4 feet beyond the spread of the branches.

Owing to the difference in the analysis of the two fertilizers (sulphate of ammonia contains 20 per cent of nitrogen in the form of ammonia, and nitrate of soda, 15 per cent as nitrate nitrogen), larger amounts of nitrate of soda were

used, so that the amount of nitrogen supplied by each fertilizer was approximately the same. From the beginning of the experiment in 1925 until 1930, the Wealthy trees received 4 pounds of sulphate of ammonia, or 5 pounds of nitrate of soda annually. On the Fameuse trees, which were somewhat larger, the annual application was 5 pounds of sulphate of ammonia, or 6½ pounds of nitrate of soda. In 1931, the trees having made comparatively heavy growth and being consequently somewhat larger than at the beginning of the experiment, all applications of fertilizer were increased 50 per cent.

Although a record has been kept of all yields from 1925 to 1933, the very uneven crop in 1925 was of little value from an experiment standpoint. Accordingly, the following statement has been compiled from results obtained from 1926 to 1933.

APPLES—NITRATE OF SODA VS. SULPHATE OF AMMONIA AT ABBOTSFORD, P.Q.—AVERAGE OF RESULTS, 1926–1933

Fertilizer application	Variety	Yield per tree								Average
		1926	1927	1928	1929	1930	1931	1932	1933	
		bush.	bush.	bush.	bush.	bush.	bush.	bush.	bush.	bush.
Nitrate of soda	Wealthy..	8·60	1·54	6·61	4·56	5·75	2·75	6·72	5·53	5·26
Sulphate of ammonia	"	10·62	0·63	10·11	3·06	7·08	0·56	10·03	6·67	6·09
Nitrate of soda	Fameuse..	15·44	0·00	13·12	0·40	14·82	0·00	14·68	0·50	7·37
Sulphate of ammonia	"	16·17	1·46	13·42	1·62	16·58	0·89	12·00	2·50	8·08

Average of the 2 varieties during the period:
Nitrate of soda ..... 6·31 bushels per tree
Sulphate of ammonia ..... 7·08 " "

From the foregoing statement it may be noted that, although with each fertilizer the trees have remained decidedly biennial in bearing habit, larger yields of apples were obtained where sulphate of ammonia was used. Although this difference in yield may not be sufficient to be considered significant, it would at least indicate that, under the conditions of this experiment, the nitrogen in sulphate of ammonia is fully equal to that contained in nitrate of soda for apple trees.

COMPARISON OF FERTILIZER COMBINATIONS

This experiment consists of a comparison of nitrogen only with nitrogen and phosphoric acid, and with nitrogen, phosphoric acid and potash as fertilizers for apple trees. Three varieties have been used: Wealthy, Golden Russet and Fameuse. The plots of Wealthy and Golden Russet consisted of 9 trees each; the Fameuse, of twelve. The trees of each variety were about 25 years old at the beginning of the experiment. Previous and subsequent treatments, except in the ingredients and amounts of the fertilizers applied, were similar to those followed with the trees used in the experiment "Nitrate of Soda vs. Sulphate of Ammonia."

From 1925 to 1930 the annual applications of fertilizers per tree were as follows. With the variety Wealthy, the nitrogen was supplied by applying 5 pounds of nitrate of soda. Where the applications contained nitrogen and phosphoric acid, 5 pounds of nitrate of soda and 5 pounds of superphosphate were used. The complete fertilizer was made of the same amounts of nitrate of soda and superphosphate, to which was added 1 pound of muriate of potash. For the Golden Russet and Fameuse trees, the various applications were the same, with the exception that nitrate of soda was applied at the rate of 6 pounds per tree. As in the preceding experiment, all applications were increased 50 per cent beginning with the season of 1931.

Following is a statement showing the average yields per tree from each application for the years 1926 to 1933.

APPLES—COMPARISON OF FERTILIZER COMBINATIONS AT ABBOTSFORD, P.Q.—AVERAGE OF RESULTS, 1926-1933

Fertilizer Application	Variety	Yield per tree								Average
		1926	1927	1928	1929	1930	1931	1932	1933	
		bush.	bush.	bush.	bush.	bush.	bush.	bush.	bush.	bush.
Nitrate of soda	Wealthy	8·60	1·54	6·61	4·56	5·75	2·75	6·7[illegible]	5·53	5·26
Nitrate of soda and superphosphate	"	6·25	5·07	6·75	9·25	3·94	7·69	4·03	12·56	6·94
Nitrate of soda, superphosphate and muriate of potash	"	9·67	3·31	10·28	9·28	6·17	3·86	10·64	13·53	8·34
Check—no fertilizer	"	5·32	2·63	3·16	3·87	3·31	3·97	2·45	5·34	3·76
Nitrate of Soda	Golden Russet	4·17	0·13	1·78	4·17	3·17	4·39	1·98	2·67	2·81
Nitrate of soda and superphosphate	"	4·33	0·75	2·78	4·33	3·44	6·86	4·00	5·33	3·98
Nitrate of soda, superphosphate and muriate of potash	"	5·37	0·50	3·94	4·22	5·06	5·50	6·25	5·83	4·58
Check—no fertilizer	"	3·46	0·29	1·50	2·44	2·83	4·39	2·89	3·39	2·65
Nitrate of soda	Fameuse	15·44	0·00	13·12	0·40	14·82	0·00	14·68	0·50	7·37
Nitrate of soda and superphosphate	"	13·79	2·33	11·94	3·89	13·89	1·67	9·17	1·50	7·27
Nitrate of soda, superphosphate and muriate of potash	"	16·19	0·0	16·46	1·08	16·92	0·00	14·46	0·54	8·21

Average yield per tree of the 3 varieties:

Nitrate of soda	5·15 bush. per tree.
Nitrate of soda and superphosphate	6·06 " "
Nitrate of soda, superphosphate and muriate of potash	7·04 " "

With the 3 varieties, very satisfactory results followed the use of a complete fertilizer. With both Wealthy and Golden Russet, the fertilizer containing nitrogen and phosphoric acid proved to be superior to one composed of nitrogen only, and nitrogen only gave better results than no fertilizer. Furthermore, with the same varieties there was a tendency towards annual bearing by the trees receiving a complete fertilizer. This had become fairly well established with Wealthy by 1930, and possibly would have continued had not a severe infection of fire-blight occurred in that year. This, with the necessary heavy pruning, may have been the cause of the light crop in 1931. With Golden Russet, the crop was fairly steady with all treatments, including the check, since 1928. With Fameuse, the biennial habit of bearing continued with all 3 applications. From the results of this experiment, it would seem reasonable to expect that a satisfactory response would follow the use of a complete fertilizer in sod orchards, under similar conditions, throughout the province of Quebec.

LIGHT VS. HEAVY APPLICATION OF NITROGEN

This experiment was conducted with the variety Golden Russet, which, in the opinion of many fruit growers, requires high soil fertility. The trees used were in the same block and had been handled in the same manner as those used in the foregoing project. During the course of the experiment, the general treatment, other than the amount of fertilizer applied, was also the same. Two plots of 9 trees each were used, one receiving a comparatively light application of nitrate of soda and the other double the amount. No other fertilizer ingredients were used in this experiment. From 1925 to 1930, the respective applications were 5 and 10 pounds per tree.

Following is a statement of the results obtained:—

APPLES—GOLDEN RUSSET—LIGHT VS. HEAVY APPLICATION OF NITROGEN AT ABBOTSFORD, P.Q.—AVERAGE OF RESULTS, 1926-1933

Application	Yield per tree								Average
	1926	1927	1928	1929	1930	1931	1932	1933	
	bush.	bush.	bush.	bush.	bush.	bush.	bush.	bush.	bush.
Light	4·17	0·13	1·78	4·17	3·17	4·39	1·98	2·67	2·65
Heavy	4·05	0·38	3·19	3·69	3·72	4·97	4·77	5·00	3·42

By doubling the application of nitrogen a slight increase of crop was obtained. This increase, however, was somewhat less than that obtained in the experiment. "Comparison of Fertilizer Combinations" where superphosphate was added to nitrate of soda, or where a complete fertilizer was used.

POULTRY

The flock at this station consists of Barred Plymouth Rocks, the breed most generally kept in the district served by this station. For the 5 years under consideration, an average of approximately 35 hens and 140 pullets have been wintered.

Breeding

The breeding policy is designed for the study and improvement particularly of egg-production, egg-size, hatchability, vigour and type of bird. All birds are individually pedigreed and all females are trap-nested as long as retained. Progeny testing permits the selection of those families most prepotent for the desired qualities. At the same time, constant rigid selection of the individual birds is maintained, on the basis of standard qualifications for the breed.

Experimental Work

A number of projects are carried on, covering different phases of poultry keeping, and with such objects as the determination of costs, the comparison of different feeds or methods, and the testing of new practices.

Hatching Results

During the 5 years, incubation was started between March 5 and 15, and the last chicks were taken out between May 19 and 29.

The average hatching results for the 5 years were as follows:

Average number of eggs set	Average number fertile	Average percentage fertility	Average number of chicks hatched	Average percentage of fertile eggs hatched	Average percentage of total eggs hatched
3,095	2,288	73·9	1,011	44·1	32·7

The average chick mortality to 3 weeks of age was less than 6 per cent. Much of the credit for the low chick mortality is due to the fact that the flock is blood-tested periodically for pullorum and has been maintained free from this disease for the past 8 years.

Eggs from both hens and pullets were incubated each year, and almost invariably better results were obtained with those from hens, both in fertility and hatchability of the eggs and in low mortality of the chicks.

Rearing Costs

The chicks were brooded each year with coal-burning brooders, the average cost of coal varying from 2½ to 3⅓ cents per chick, with chicks brooded in lots of 300.

During the 5 years, considerable difference was noted in the average cost to feed a chicken up to 6 months of age, the lowest being 56 cents in 1934 and the highest, 81 cents in 1933.

Dissemination of Stock

For foundation stock, each year a number of hatching eggs and day-old chicks (and in the fall, the surplus pullets) are sold in small lots to farmers throughout the district. A select number of breeding cockerels are also sold. The rest of the cockerels, beyond those required for breeding, are marketed, usually in Montreal.

Egg Production

During the past 5 years, an increase in egg production has been obtained. In 1931, 64 pullets completed their full year of laying, the average production being 191·7 eggs with a weight of 23·9 ounces per dozen, in 1935, 68 pullets, with a year's production, had an average of 213·9 eggs weighing 23·8 ounces per dozen.

Number of Eggs Required to Pay Cost of Feed

The average number of eggs that a bird must lay in a year to pay the feed bill will vary with the cost of feed and with the selling price of eggs. At this station, the average number of eggs per bird required to pay cost of feed only, varied between the low point of 51 eggs in 1931 and the high figure of 92 eggs in 1935.

Egg-Laying Contest

The Quebec Western Egg-Laying Contest, which is conducted at this station, operated each year at its full capacity of 20 pens of 10 birds each. Registration is granted to those birds, not otherwise disqualified, which during the contest year lay 200 or more eggs averaging in weight not less than 24 ounces per dozen. Of all the birds entering the contest during the 5 years, 26·7 per cent qualified for registration.

Sanitation is carefully maintained, and feeding and general care are of the best. Yet, in the 5 contest years 1931 to 1935, inclusive, the average mortality was 25 per cent. Such a high mortality would seem to indicate that particular attention must be directed towards the building up of more rugged strains. It is of the utmost importance not only to follow the best practices in the rearing of the young stock, but also to breed only from strong, vigorous families and individuals.

APICULTURE

The years 1931 to 1935 have not been very profitable from the standpoint of honey production. This has been due to adverse weather conditions either for nectar-producing plants during the winter or for the bees during the honey-flow. The main sources of nectar in this district are, in the order in which they appear, willows, dandelions, fruit bloom, clovers and golden rod.

Comparison of Types of Hives

For the past 10 years an experiment has been carried on at this station with four different types of hives. The types used were the 8, 10 and 12-frame Langstroth and the 10-frame Jumbo. Two colonies in each type were prepared for the winter, according to their needs, and placed in the cellar. Records of their performance in the following summer have been kept.

The results for the 10-year period show very little difference between the 10- and 12-frame Langstroth hives. These were followed closely by the 8-frame Langstroth, with the 10-frame Jumbo making a poor fourth. Because it is easily manipulated, we recommend the 10-frame Langstroth hive for general use.

Swarm Control

Three methods of swarm control are being tested at this station:

(1) Remove the queen from the colony and destroy all queen cells. Nine or ten days later, again examine the hive, destroy all queen cells and introduce a new queen;

(2) Remove all the brood to a new super and place this on top of the colony, leaving the queen below on a complete set of empty combs. At least 2 full-depth supers and 2 queen excluders should be between the queen and the brood;

(3) Treatment the same as No. 2, except that the queen is replaced with a new queen.

Results for the years 1931-35 show that all three methods give effective swarm control. The first method, while giving swarm control, has reduced the yield of honey very materially, no doubt because the colony is without a queen for nine or ten days. The other two methods are very similar. Replacing the queen gives more positive control, but production of honey is less than with treatment No. 2. The age of the queen should be taken into consideration when deciding which method to adopt.

Wintering of Bees

Bees may be successfully wintered in a cellar, or outside, in cases packed in planer shavings. An experiment has been conducted at this station for the past 10 years to see which of these methods was the better. Four colonies were placed in the cellar and eight in two quadruple outside wintering cases. Four of these outside hives were given a shallow super as a food chamber. The hives used were all 10-frame Langstroth.

In the 10 years that this experiment has been running, there has been virtually no difference in honey production between the groups. The colonies that were wintered outside with a shallow super for a food chamber came through the winter in the strongest condition; those wintered in the cellar were weakest. It is advisable to see that colonies being wintered outside have about 10 pounds more stores than those kept in the cellar.