DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

Dominion Experimental Farm

NAPPAN, N.S.

RESULTS OF EXPERIMENTS

1932 - 1936

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Superintendent

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REPORT OF THE DOMINION EXPERIMENTAL FARM, NAPPAN, N.S.

ANIMAL HUSBANDRY

This report is a brief summary of the breeding and feeding work with dairy cattle, swine, sheep and horses for the five-year period 1932 to 1936 inclusive. Where averages for longer periods than this are available, recommendations made are based on these. In some cases, where the work could not be completed until after December 31, data for 1936 are not included in the averages.

Dairy Cattle

Two herds are maintained, Guernseys and Jerseys. The former herd was established in 1920 and at present consists of 38 females and 9 males. The Jersey herd, established in 1928, at present numbers 32 females and 6 males.

The objects of maintaining these herds are: to provide a source of supply of breeding stock for distribution; to provide material for practical breeding and feeding experiments; to provide material for the compiling of data on the cost of milk production; to procure cost of raising dairy females and maintaining herd sires. The herds are also utilized for pasture experimental work, comparing rotational with continuous grazing and fertilized with unfertilized areas.

During the period covered by this report 13 Guernsey bulls and 22 females have been sold as breeders; also 14 Jersey bulls and 5 females.

All cows are entered in the Record of Performance and all bulls for Advanced Registry inspection, if retained in the herd to a sufficient age. At the present time there is only one female in the herd that, having completed a lactation period, is not qualified in the Record of Performance. During the five-year period, 33 Guernseys have qualified with 52 records and during the same period 15 Jerseys have completed 23 qualifying records.

The average production of the Guernsey herd from date of establishment to the end of 1935, covering 224 completed lactation periods was 6,162 pounds of milk, and 323 pounds of butterfat. In 1935 the average for 22 completed lactation periods was 7,275 pounds milk and 378 pounds butterfat.

The average production of the Jersey herd from date of establishment to the end of 1935, covering 61 completed lactation periods, was 6,723 pounds of milk and 377 pounds of butterfat. In 1935 eleven head completed lactation periods averaging 6,168 pounds milk and 339 pounds butterfat.

Feed Cost of Milk Production.—Data on this subject may best be presented in tabular form. The following table gives the average feed cost of producing both milk and butterfat, along with the average feed consumed per 100 pounds milk produced for each month from January, 1932, until October, 1936. The data for November and December are for 1932 to 1935 only.

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FEED COST OF PRODUCING MILK, 1932-1936

Month.	Feed Cost of Production		Feed Consumed per 100 lb. Milk			
	Milk per cwt.	Fat per lb.	Grain	Hay	Succulent Feed	Pasture
	$	cts.	lb.	lb.	lb.	days
January	1·26	24·6	38·63	81·39	243·9	—
February	1·17	22·7	36·81	73·22	229·7	—
March	1·19	22·8	38·26	73·03	222·3	—
April	1·16	22·3	36·63	72·56	215·9	—
May	1·13	22·0	36·16	65·72	198·5	0·17
June	0·59	10·9	18·41	1·17	10·3	4·75
July	0·58	11·2	17·02	—	5·6	5·21
August	0·90	17·2	21·84	13·28	60·4	6·41
September	1·28	24·1	45·19	11·80	124·9	6·99
October	1·37	25·5	42·45	78·96	188·1	2·30
November	1·31	25·0	39·78	91·26	268·4	—
December	1·18	22·5	35·59	76·30	245·4	—

A study of the data presented above demonstrates clearly the value of pasturage in reducing the cost of production of dairy products. Details on pasture improvement will be found in the Field Husbandry section of this report.

The data given on feed consumption per 100 pounds of milk may be used by the reader to determine the cost of production under his own conditions by using local feed prices.

Cost of Rearing Dairy Heifers.—Data on this project have been compiled on all females raised in both herds since they were established. The following table presents the average data compiled to the end of 1935.

(Should the reader wish details on the cost of rearing either Guernsey or Jersey females, same may be had on application to this farm.)

COST OF REARING DAIRY HEIFERS

Item		Feeds Consumed and Cost per Head		
		From Birth to 1 Year of Age	From 1 Year of Age to Start of First Lactation	Total
Number of head	No.	92	92	92
Average age at end of period	Yr.	1	2·46	2·46
Whole milk consumed per head	Lb.	999	—	999
Skim-milk consumed per head	"	3,253	—	3,253
Meal consumed per head	"	462	791	1,253
Roots and ensilage consumed per head	"	950	4,750	5,700
Hay consumed per head	"	1,381	3,219	4,600
Greenfeed consumed per head	"	59	297	356
Pasture consumed per head	"	0·37	6·42	6·79
Cost of feed per head	$	39·55	50·08	89·63

A study of the above data indicates the value of raising only the best heifers, or those known to be from high producing dams. The high cost of rearing makes it imperative that this policy be followed if profitable returns are to be received from the herd.

Cost of Maintaining Herd Sires.—The average yearly feed consumption of mature herd sires in this herd has been found to be 1,005 pounds meal, 7,439 pounds succulent feed and 4,652 pounds hay, with an average yearly feed cost of $53.94.

Feeding Experiments with Dairy Cattle

A number of feeding experiments have been conducted at this farm with dairy cows and heifers.

Corn Silage versus Swedes for Milch Cows.—Six feeding tests have been conducted, using a total of 60 cows.

The average daily production of milk per cow from silage was 18·86 pounds and from swedes was 19·69 pounds. The cost of producing 100 pounds of milk from silage was $1.33 and from swedes $1.30.

From a study of the data, together with general observation made throughout the duration of these feeding trials, a fair conclusion would seem to be that there is no significant difference in the feeding value of corn silage and swedes, in the production of milk, that is, when the silage is made from corn that has closely approached the ripening stage. The average cost of production of corn is $4.08 per ton and of swedes, $3.87. In districts where it is impossible to grow corn close to the stage of maturity, the growing of swedes for dairy cows would be the logical procedure.

Sunflower Silage versus Swedes for Milch Cows.—Eight feeding trials were carried out with a total of 53 cows. As was the case in all these feeding trials, all other feeds remained constant in the daily rations fed, except the feeds being compared. In this case sunflower silage replaced swedes in the daily ration.

The average daily production of milk per cow for the cows receiving sunflower silage was 17·06 pounds and the feed cost was $1.77 per 100 pounds, while the average daily production for swedes was 18·84 pounds at a feed cost of $1.64 per 100 pounds.

In these tests swedes gave a slightly better daily average production, as well as a lower feed cost per 100 pounds of production. It was also observed that sunflower silage was not only less palatable, but that it caused an excessive action of the kidneys, especially when fed in large quantities.

O.P.V. Silage vs. Swedes for Milch Cows.—Two feeding trials have been conducted, using a total of 15 cows. The average daily production of milk from silage was 22·15 pounds, and from swedes 23·54 pounds. The cost of producing 100 pounds of milk from silage was $1.68 and from swedes $1.50.

The indications from these two experiments are that swedes are superior to O.P.V. silage as a succulent feed for milch cows.

Fish Meal vs. Oil Meal as a Protein Supplement for Milch Cows.—Eight feeding trials have been conducted, using a total of 55 cows. The grain ration used was made up of oats and barley, and sufficient white fish meal or oil meal was added to bring the ration up to a 20 per cent total protein content.

The average daily production of milk per cow from fish meal was 20·00 pounds and from oil meal 20·24 pounds. The cost of producing 100 pounds of milk from fish meal was 89·6 cents and from oil meal 88·1 cents. The cows on the fish meal ration made decidedly greater gains in body weight than those receiving oil meal. On the basis of dry matter consumed per unit of production, there was no significant difference between the two feeds.

A fair deduction to be drawn from the results of these experiments is that white fish meal is a valuable source of protein and minerals for milch cows, when the unit price of protein is comparable with other protein supplements.

Fish Meal vs. Oil Meal as a Protein Supplement for Dairy Calves.—Three feeding trials comparing these two feeds were conducted, using a total of eighteen calves, nine on each feed. The grain ration used was made up of oats and bran and sufficient oil meal or white fish meal was added to bring the ration up to a 16 per cent total protein content.

The feeding period lasted 228 days or until all grain was removed from the ration. The average daily gain on fish meal was 1·33 pounds and on oil meal 1·24 pounds. The average feed cost per pound gain with fish meal was 5·23 cents and with oil meal 5·62 cents.

The results would indicate that a good quality fish meal may be used economically in the feeding of dairy calves. The calves on the fish meal ration had a more thrifty appearance throughout the test in every case than those on oil meal.

Horses

The work with horses at this farm consists chiefly in the development of a stud of high class Clydesdales. Late in 1934, the imported stallion, Precedence (21116) and two registered mares were secured from the Central Experimental Farm, Ottawa. Three mares were also secured from the experimental station, Fredericton, N.B.

In 1935 three foals, two stallions and a filly and in 1936, two fillies and a stallion foal were raised. The quality of these animals is excellent and it is hoped to build up a stud that will be a source of supply of good stallions for distribution throughout Eastern Canada.

Contrary to the experience of many who are raising horses in these provinces, no difficulty has been encountered with joint-ill in young foals. Since this trouble is at least partially due to a lack of iodine in the ration of the mare, the practice followed here of supplying this regularly in all probability is the reason so little trouble has been experienced. The method followed at this farm is to feed one-half teaspoonful of potassium iodide three times each month on the 1st, 10th and 20th. This is done by dissolving one-half teaspoonful in two ounces of water and mixing the solution with bran used in the ration.

Regular exercise is also provided and some time before foaling the mare is placed in a box-stall at night, so she may become accustomed to the change.

Cleanliness is essential, as is a regular supply of feed, sufficient to keep the mare in good condition, but not too fat. A bran mash, once a week, to replace the night feed of grain, is very beneficial. If on heavy work, give this on Saturday nights.

Cost data.—Data on amounts of feed necessary to maintain work horses has been kept over a period of years.

It has been found that, on the average, a heavy draft horse requires 4,000 pounds oats, 600 pounds bran, 300 pounds roots and 6,000 pounds hay for the year, when worked 1,800 to 2,000 hours. These amounts of feed may be reduced considerably if the horse is pastured when not at heavy work during the summer. If not working during the winter, the grain ration may be reduced to a minimum and the horse maintained chiefly on roots and good hay until a month before heavy work starts in the spring.

Sheep

The objective back of maintaining a flock of pure-bred Shropshire sheep at this farm has been to study breed improvement, fleece improvement, cost of maintenance and cost of rearing, as well as providing a medium through which high-class breeding stock may be distributed.

In summarizing the past five years' work, only the main points of interest are submitted in this report.

During this period, 212 lambs have been dropped, or an average per ewe bred of 1·3. Out of these, 40 rams were graded, 30 grading XXX and 10 XX. The total breeding stock sold during this period was 35 rams and 38 ewes.

The average wool clip from the breeding flock was 7·6 pounds per fleece. Individual grading on each fleece was secured through the co-operation of the Canadian Co-operative Wool Growers' Association. This has made it possible

to not only eliminate the ewes that were off type, or poor mothers, but also those with a low grade of wool. By following this practice during the past few years, a marked degree of improvement has been noted in the flock standard. For example, from 1929 to 1931, 55·3 per cent of the fleeces graded medium staple, (standard for the Shropshire breed). From 1932-36 inclusive 87·7 per cent have graded medium staple. In other words, an improvement of 32·2 per cent has been effected in five years.

This service of having the fleeces graded is open to all breeders and it is one well worth the extra time, that is, if one is desirous of improving the quality of the wool produced.

Another helpful practice followed at this farm is that if weighing the breeding ewes at regular intervals throughout the season. This helps to show up the poor milkers and the unthrifty ewes.

Interesting data are collected each year on lamb weights at birth and at regular intervals throughout the season. This information aids materially in determining the good mothers as well as ascertaining just what one might expect in lamb growth under varying pasture and seasonal conditions.

The following table presents this information in brief and concise form. It shows not only the weights and gains made for 1936, but the average over a period of years.

BIRTH WEIGHTS OF LAMBS AND GAINS FOR THE FIRST MONTH

Year and Grouping	Number of Lambs	Birth Weight Average lb.	Gain for First Month Average lb.
Females 1936	12	8·42	13·80
11-year average	247	7·94	15·24
Males 1936	22	9·20	14·66
11-year average	247	8·40	16·34
Singles—1936	11	10·45	18·68
11-year average	161	8·98	18·72
Twins—1936	23	8·20	12·28
11-year average	303	7·88	15·37
Triplets—1936	—	—	—
11-year average	30	6·29	14·02
All lambs 1936	34	8·93	14·35
11-year average	494	8·10	15·80

Cost of Maintaining Breeding Ewes.—Data on the feed cost of maintaining breeding ewes have been kept since 1920. The average yearly feed cost per ewe from 1920 to 1935 was $8.36, while from 1932 to 1935 the average was $8.02.

Cost of Raising Lambs.—The feed cost of raising lambs, including the cost of feeding the ewes and ram, for the period 1920 to 1935 averaged $5.99 per lamb. From 1932 to 1936 the average cost was $7.16.

Flock Management.—The general rule is to wean all lambs early in September. This allows plenty of time to flush the ewes before the breeding season. Just as soon as the ewes are dried off, they are put on the best pasture available, and given a light grain ration of from one-half to one pound per ewe per day, depending on the condition of the ewes. The grain ration is made up of 300 pounds of oats or oats and barley, 100 pounds of bran and either 50 pounds of oil meal or 20 pounds of fish meal. The object is to have all ewes in a good thrifty, healthy condition at breeding time. This ensures a shorter breeding season, a higher percentage of lambs and a more uniform lamb crop.

The grain ration is usually continued until about the middle of December. This, of course, will depend on the condition of the ewes. From then until late

in February the flock is maintained on clover hay and roots, approximately three pounds of each per ewe per day. Around the last of February or first of March the grain ration is resumed and continued until the ewes and lambs are turned out to pasture. A week or two before lambing the roots are cut down to approximately two pounds per ewe, but as soon as the lambing season is over they are increased to five pounds per ewe per day. Clean water and iodized salt are kept before the sheep at all times.

The lambs are docked at three weeks of age and all ram lambs not promising enough for breeders are castrated.

Two of the most important treatments given the flock are dipping, which is carried out regularly spring and fall and treating with tetrachlorethylene capsules for internal parasites. This, along with frequent changing of pastures, is a material aid in the control of parasites. Sheep infested with ticks and internal parasites can never be expected to give the most profitable returns.

Swine

The work in this department, during the past five years, has been directed toward the development of a high class herd of Yorkshires; the securing of data on the cost of raising young pigs and maintaining breeding stock and the securing of data from nutritional studies in the growing and finishing of bacon hogs.

An average of 12 brood sows is maintained. Seventy-seven litters were farrowed in the herd from 1932 to 1936 inclusive. A total of 645 pigs were weaned, or an average of 8.38 per litter. Of these, 93 were sold for breeding purposes, and 100 as feeders. The balance were either retained for herd replacement, or finished for market. The following statement shows the number sold each year on a graded basis:—

Year	Number Sold	Number of "Selects"	Percentage "Selects"
1932	123	52	42·3
1933	93	44	47·3
1934	90	42	46·7
1935	80	48	60·0
1936	50	25	50·0
Total	436	211	48·4

The average yearly feed cost of maintaining a brood sow from 1932 to 1935 was $33.02, and of raising young pigs to weaning, $2.79. The feed cost to produce 100 pounds of pork, live weight, from weaning to marketing was $5.30, while the average return was $6.80. Considering that the bulk of the feed necessary for brood sows or bacon hogs can be economically produced on the farm, (see the Field Husbandry section of this report for cost of producing farm crops), the returns have been very satisfactory.

These figures show that the bacon hog can be made one of the major sources of cash income from the farm.

The following table gives data on gains and feed consumption of 155 bacon hogs from weaning to finishing, in periods of 30 days:—

FEED CONSUMPTION AND GAINS OF BACON HOGS FROM WEANING TO FINISHING

Item	First 30 Days After Weaning	30 to 60 days	60 to 90 days	90 to 120 days	120 days to Finish	Totals Weaning to Finish
Number of pigs..... No.	155	155	155	155	140	155
Average weight at weaning..... Lb.	25·7	—	—	—	—	—
Age at end of each period.....Days	79	109	139	168	192	192
Average weight at end of each period.. Lb.	57	91·7	134·4	177·3	210·8	210·7
Average daily gain each period..... "	1·04	1·16	1·42	1·48	1·40	1·30
Meal consumed per 100 lb. gain..... "	122·2	251·8	306·8	392·2	470·0	315·1
Milk consumed per 100 lb. gain..... "	250·1	406·8	304·9	140·2	56·5	231·1
Greenfeed consumed per 100 lb. gain..... "	25·4	50·7	66·3	81·9	100·6	66·4
Fish meal consumed per 100 lb. gain..... "	—	2·2	2·6	4·7	12·9	4·5
Minerals consumed per 100 lb. gain..... "	7·1	9·1	8·2	6·9	6·3	7·5

These data, being based on a large number of hogs, should give a fair idea of the amount of feed necessary to finish a bacon hog. Consequently, by using local feed prices, the reader may readily determine the approximate cost in his own locality.

Breeding Studies.—One of the major projects in breed improvement was started in 1935 and involves the testing out of the breeding propensities of a Yorkshire boar imported from Sweden in 1934. The progeny of this boar have been compared with the progeny of a Canadian Yorkshire boar with regard to their ability to utilize feed to advantage, their thriftiness and quality of carcass. The dams of both progeny were as closely related as it was possible to have them.

From data compiled to date on the progeny feeding tests of these two boars, it is found that the progeny from the Swedish boar, on the average consumed more feed per pig per day; made more rapid gains and scored significantly higher in carcass quality than did the progeny from the Canadian-bred boar.

While these results only cover the work of two years, they do, nevertheless, indicate that some improvement has resulted from the introduction of the Swedish Yorkshire blood.

Feeding Experiments With Swine

A number of feeding experiments have been conducted during the past few years, dealing chiefly with comparisons of various protein supplements for bacon hogs. The lack of skim-milk on the average farm is given as an excuse by many for not raising bacon hogs. The experiments undertaken at this farm were for the purpose of determining what substitutes for skim-milk could be used economically in the growing and finishing of bacon hogs.

Skim-Milk vs. White Fish Meal for Bacon Hogs.—Fourteen feeding trials, comparing these two feeds have been conducted, using a total of 158 pigs. The average daily gain with skim-milk was 1·24 pounds and with fish meal 1·20 pounds. The feed cost per 100 pounds gain with skim-milk was $6.05 and with fish meal $6.26.

Mineral supplement was not found necessary when fish meal was fed, but with skim-milk it was found essential for the proper development of the bacon hog. The type and finish secured from the fish meal rations were equal, if not slightly superior to that secured from skim-milk.

No experiments have been conducted at this farm using dark or oily fish meal for feeding bacon hogs.

Skim-Milk vs. Tankage for Bacon Hogs.—Two feeding trials have been conducted, using a total of 24 pigs. The average daily gain with skim-milk was 1·18 pounds and with tankage 1·09 pounds. The feed cost per 100 pounds gain with skim-milk was $8.68 and with tankage $9.44.

Fish Meal vs. Tankage for Bacon Hogs.—Three feeding trials have been conducted using a total of 35 pigs. The average daily gain with fish meal was 1·22 pounds and with tankage 1·05 pounds. The feed cost per 100 pounds gain with fish meal was $4.13 and with tankage $4.71.

In all experiments where tankage has been fed, it was found to produce a shorter, thicker type of hog, that did not grade as high, on the average, as one fed on either skim-milk or fish meal.

Value of Potatoes for Bacon Hogs.—Several feeding trials were conducted to determine the value of potatoes for hog feeding. A value of $3.30 per ton for potatoes and $26 per ton for barley was used in computing the feed costs per hundred.

Two experiments were conducted, wherein barley in a grain ration was replaced by cooked potatoes. A total of 20 pigs were used. The rations were uniform, with the exception that barley, as fed to lot 1, was replaced by potatoes for lot 2.

The average daily gain on both lots was equal, 1·12 pounds per day. The feed cost per 100 pounds gain with barley was $4.92 and with potatoes $3.98.

It was found in these experiments that 462 pounds of potatoes replaced 100 pounds of barley in the ration. In other words, with barley costing $26 per ton, the potatoes were marketed through the hog at 16·9 cents per bushel, or $5.63 per ton.

Two other feeding trials were conducted, using a total of 19 pigs, comparing a balanced grain ration with boiled potatoes. Ground oats were fed with the potatoes until the pigs were 130 pounds live weight. From 130 pounds to finishing at 200 pounds, cooked potatoes only were fed. White fish meal was used as a protein supplement in each case.

Some difficulty was experienced with the lot on oats and potatoes early in the period. Poor gains were made until cod liver oil was supplied at the rate of one ounce per pig daily, along with a mineral supplement.

The average daily gain made by the hogs receiving grain was 1·03 pounds and by those receiving potatoes 1·12 pounds. The cost per 100 pounds gain was $5.22 and $3.80 for each lot respectively. In this feeding test it was found that 773 pounds potatoes and 18 pounds fish meal replaced 252 pounds of the grain mixture. With fish meal costing $60 per ton and the grain mixture $26 per ton, the potatoes were marketed through the hog at 21·2 cents per bushel, or $7.06 per ton.

Heavy vs. Light Barley Ration for Finishing Bacon Hogs.—Two feeding trials, comparing two rates of feeding barley in the finishing ration (60 per cent vs. 80 per cent), were conducted, using a total of 18 pigs. The feed cost per 100 pounds gain was $5.78 on the ration containing 60 per cent barley, and $5.80 for the ration containing 80 per cent barley. The two rations showed the same average daily gain of 1·38 pounds.

CONCLUSIONS

Skim-milk, when available, is the most satisfactory protein supplement for feeding bacon hogs.

When skim-milk is not available, white fish meal and tankage are satisfactory substitutes. These experiments indicate fish meal to be the more economical supplement for use in the Maritimes.

Potatoes have proved to have a definite value when fed to bacon hogs, and a satisfactory return may be secured for the unmarketable potatoes in this manner. Fish meal is an excellent protein supplement when a ration of cooked potatoes with or without grain is fed.

Barley may be fed to bacon hogs up to 50 per cent of the growing ration and 80 per cent of the finishing ration with excellent results, provided the ration is balanced as to protein and mineral requirements.

Mineral supplements are necessary for the proper development of the bacon hog fed on skim-milk or tankage. Though probably not essential for hogs fed on fish meal, they are good insurance against crippling, which frequently occurs in winter-fed hogs. At this farm, no crippling has ever been noted among hogs receiving fish meal at the rate of six per cent or more of the meal ration.

CEREALS

The crops covered in this report are spring and winter wheat, winter rye, oats, barley, flax (for seed), field peas, field beans, buckwheat and combinations of certain of these crops.

In Nova Scotia approximately one-fifth of the cultivated land is seeded to these crops annually. This is a comparatively small proportion and were it increased considerably, a much better crop balance would be effected. Yields secured compare very favourably with those obtained in other provinces of the Dominion and, as a rule, the product would grade higher than the average imported feed grain.

The average person in studying agronomic data sees only the yield column and losses sight of such important characters as number of days to reach maturity, strength of straw, disease resistance, quality, etc. All of these are important factors and it is the aim of the plant breeder to combine in one variety as many of these as is possible.

Usually the medium to late maturing varieties yield better than do the early ones. There are localities, however, in which seeding is so late that early varieties are likely to be more satisfactory. Early varieties are preferred by some because harvesting can be completed earlier, when as a rule weather conditions are more favourable. In certain localities, such as the fruit areas, early varieties are preferred, as they may be harvested before other fall work is pressing. Early varieties may also escape rust infection which may attack later varieties.

Breeding of disease resistant varieties is being given considerable study at the present time. The breeding of smut and rust resistant varieties is receiving particular attention and some very promising material is under test at this farm.

Quality of grain in cereal varieties is important. For example, the percentage hull of Alaska oats is much lower than is that of the two standard varieties, Victory and Banner.

Wheat

Spring Wheat.—The bulk of the wheat grown in the province is used for poultry or other live stock feed, although a portion of it is milled for human consumption.

From a feed standpoint one would naturally choose the variety which is most likely to give the largest yield. On the other hand, bread making quality must be taken into consideration if the wheat is to be made into flour. It is conceded that wheat of the highest bread making quality cannot be produced in the province; nevertheless varieties do differ with respect to the degree of quality which may be attained.

Disease resistance is also an important factor. The two most common diseases attacking wheat in this locality are smut and stem rust. Smut may be very effectively controlled by the use of any one of several seed treatments. Rust, which takes a rather severe toll in some years, is most easily controlled by the use of resistant varieties. Preliminary trials have indicated that several varieties, as yet unnamed, are productive and satisfactorily resistant to stem rust in this locality. As soon as the most suitable one is determined, it will be multiplied and offered for distribution.

Length of time to reach maturity is another consideration when choosing a variety. Where on the average seeding cannot be done until comparatively late in the spring, an early maturing variety is likely to prove more satisfactory.

The following varieties are recommended:

Medium to Late

Huron
Early Red Fife
White Russian

Early

Garnet
Reward

Reward is not so productive as Garnet, but for milling purposes is of better quality.

Winter Wheat.—The acreage of winter wheat grown in the province is very small, only an odd field being devoted to this crop.

Four varieties have been on trial during the past five years. These varieties are Dawson's Golden Chaff, O.A.C. No. 104, Kharkov 22, M.C. and Minturki. Rather severe winterkilling occurred during the winter of 1933-34 and all varieties were completely killed out during the winter of 1934-35.

The average yields obtained, including the year in which no crop was harvested, were as follows:—

Variety	*Yield per Acre* bu.
Minturki	35·2
Kharkov 22 M.C.	33·5
O.A.C. No. 104	33·5
Dawson's Golden Chaff	32·8

Minturki, on the whole, has proved the most winter hardy, closely followed by Kharkov 22 M.C. Dawson's Golden Chaff and O.A.C. No. 104 have shown a greater tendency to winterkilling than their yields would indicate. This may, in part, be accounted for by their prolific stooling ability.

Winter Rye

Winter rye, up to the present time, has not held a very important place among the grains grown in this province, its status being about on a par with winter wheat.

A variety known as Cornell No. 45 has been grown at this farm for five years, while Rosen has been grown for three years. A test, consisting of eight varieties, was seeded in the fall of 1935 and harvested in 1936. The same varieties were again seeded in the fall of 1936.

The winter of 1934-35 was the only season in which winterkilling of any consequence occurred. Rosen and Cornell No. 45, the only two varieties on test, were completely killed out. On the whole, winter rye would appear to be more winter hardy than winter wheat.

These tests have not included a sufficient number of varieties for a long enough period to indicate which are the most satisfactory varieties. Suffice it to say that very good yields have been secured from the varieties tested with the exception of the year in which they were winterkilled.

Oats

The principal cereal crop grown in Nova Scotia is oats and approximately four-fifths of the total cereal area is devoted to this crop. It appears to be particularly well adapted to the different types of soil found in the province and perhaps more especially to the type of farming followed. Hoed crops are not grown extensively and the greater part of the cereal acreage is grown on sod land. Oats are much better adapted to this type of land than either wheat or barley, due probably to their more extensive and deeper feeding root system.

A large number of standard varieties and new productions have been tested in comparative trials over a period of years. These have been carefully evaluated as to yield, time of maturity, strength of straw, quality, disease resistance, etc.

Over this period Victory, Banner and Gold Rain have been consistently high yielders and compare favourably with other varieties in other agronomic characters of economic importance. These varieties belong to the medium to late maturing class.

Legacy and Gopher, which mature midway between the early and medium to late maturing varieties have been giving a very good account of themselves.

Of the early maturing sorts, Alaska and Cartier are probably the best. They have not compared favourably in yield with the later varieties, but mature on the average in just over 90 days and are likely to be very satisfactory where the growing season is short. Banner and Victory require around 100 days to reach maturity.

A number of the newer productions under test are very promising. These, however, require further investigation before they can be recommended for general use. Among these are varieties which have been selected for earliness, disease resistance, quality and strength of straw.

CROP TESTING PLAN

During recent years the quality of the cereal crops grown in Canada has received increased attention. More particularly is this true of the wheat crop in the Prairie Provinces and of the barley crop in those localities where suitable malting types can be produced. Quality is definitely associated with variety and a mixture of unsuitable varieties may result in lower grades and smaller returns to the grower.

The growing of pure varieties has long been recommended, yet few growers seem to appreciate its importance. The oat crop in this province is grown principally for feeding purposes and many a grower cannot see why it makes any difference if the seed he uses is a mixture of varieties. The possible lower grade is not so evident to him as it is to the grower who sells on grade. Unless he can be convinced that this mixture of varieties gives a lower gross yield than would pure seed of a standard variety, he will continue to use it.

In 1935, some 30 examples of oats collected in a seed drill survey were compared with Victory and Banner, two standard varieties, in a yield test. The samples represented the seed used by 30 farmers in the province. These samples were tested along with the two check varieties for yield and other agronomic characters of economic importance.

As it was desired to make a study of the oat crop, weed seeds and seeds of other crop plants were removed before seeding. No attempt, however, was made to improve the quality of the oats. All lots were seeded uniformly and the seed

was not given any treatment for smut, as it was considered advisable to seed as they were on the individual farms and so determine the probable injury due to smut infestation.

Some of the most striking data obtained from this test are tabulated below:—

TABULATED DATA ON CROP TESTING PLAN

Lot No.	Seed Grade*	Germination*	Variety Claimed by Grower	Predominating Type	Days to Mature	Smut	Yield per Acre	Hull
		%					bush.	%
1	No. 1	95	Granary Filler	Granary Filler	87	Trace	68·8	31·43
2	No. 2	92	Granary Filler	Granary Filler	87	Considerable	58·7	29·61
3	No. 1	98	Banner	Victory	87	Trace	66·5	28·97
4	No. 3	92	Granary Filler	Granary Filler	87	Trace	67·4	31·55
5	Rejected	94	Peace River	Abundance	87	Trace	66·3	28·77
6	No. 1	—	Granary Filler	Granary Filler	85	None	71·9	28·83
7	No. 3	97	Peace River	Victory	87	Considerable	67·4	28·97
8	Rejected	98	Unknown	Victory	87	Considerable	62·3	28·36
9	No. 1	80	Unknown	Victory	89	Very bad	48·6	30·45
10	No. 2	85	Unknown	Unilateral	87	Trace	63·9	30·18
11	No. 3	97	Peace River	Victory	87	Considerable	64·2	30·52
12	No. 2	82	Unknown	Banner	87	Considerable	59·1	29·57
13	Elite	98	Banner	Banner	87	None	70·0	29·86
14	No. 1	100	Banner	Granary Filler	87	Trace	65·5	28·56
15	No. 3	99	Fancy Peace River.	Victory	87	Considerable	63·0	28·96
16	No. 3	99	Banner	Granary Filler	87	None	72·1	30·18
17	No. 2	95	Victory	Victory	88	Considerable	63·2	29·45
18	No. 2	99	Victory	Victory	87	Considerable	64·2	29·44
19	No. 2	88	Victory	Victory	87	Trace	60·6	29·47
20	No. 1	100	Victory	Victory	87	Trace	68·9	28·23
21	No. 2	78	Victory	Banner	87	Trace	59·6	29·76
22	No. 1	90	Victory	Victory	87	Considerable	63·0	29·90
23	Rejected	96	Victory	Victory	87	None	65·5	30·14
24	No. 1	99	Victory	Victory	87	Trace	71·4	29·03
25	No. 3	99	Gold Rain	Gold Rain	87	Considerable	66·5	27·31
26	Rejected	93	Banner	Banner	87	Considerable	59·4	28·63
27	Rejected	90	Fancy Peace River.	Victory	87	Trace	62·9	30·04
28	Rejected	100	Victory	Victory	87	Trace	66·2	28·89
29	Rejected	90	Banner	Victory	87	Considerable	65·3	28·28
30	No. 1	97	Banner	Granary Filler	87	Trace	61·1	29·15
31	No. 3	90	Banner	Victory	87	Trace	69·6	28·76
32	No. 2	95	Banner	Banner	87	Trace	64·1	29·76

*Data by courtesy of Dominion Seed Branch, Sackville, N.B.
No. 13 Banner and No. 24 Victory Experimental Farm, Nappan, N.S.

The table shows that of the 30 farmers' samples, eight graded No. 1, eight graded No. 2, seven graded No. 3 and seven were rejected as being unfit for any seed grade. The total weed seed content ranged from none to 2,208 per pound, with secondary noxious running as high as 144 per pound. Germination ranged from 78 to 100 per cent.

Only ten lots were composed of 90 per cent or over of any one variety or variety type. The other 20 lots were mixtures of desirable and undesirable varieties or types.

Neglecting those lots designated by the grower as unknown and Peace River or Fancy Peace River, 14 out of 21 had their variety correctly named, as determined by the predominating type. Many of these lots, however, were not worthy of any variety name. While a certain variety may have predominated, it did not comprise 50 per cent of the mixture. It will be seen that a large percentage did not know what variety they were growing.

All lots designated Peace River and Fancy Peace River were simply mixtures. Eight lots contained oats of the unilateral or side oat type, which, generally speaking, is undesirable.

Twenty-two lots contained oats of a type designated as "open panicle". This type was characterized by an open type of panicle containing a small number of seeds and which would appear to be definitely undesirable.

Twenty-eight lots yielded less than either Victory or Banner. Of these, the yield of 16 lots was significantly less than that of Victory and the yield of

eight of them was significantly less than that of Banner. The yield of several others was sufficiently below that of Victory and Banner to warrant them being looked upon with suspicion. In this test it was calculated that to be significantly different, yields must differ by 7·1 bushels or more per acre.

The smut content was recorded as follows: three lots none, 14 lots, trace, 12 lots, considerable and one lot, very bad. In the latter case 48 per cent of the heads were destroyed by the smut organism.

A study of this test certainly gives one food for thought. One is struck with the very high percentage of undesirable seed being sown throughout the province; with the amount of weedy and diseased seed sown each year; with the apparent indifference as to the variety or mixtures of varieties sown, regardless of their suitability for the province or district; with the very definite reason why so many farmers meet with failure.

Progress which leads to success cannot be made by sowing unknown, poor, dirty, undesirable varieties or strains of seed.

Barley

Only about one-fourteenth of the total area seeded to cereal crops is devoted to barley. This is a very useful crop and should find a larger place in our cropping system than it has in the past.

Many object to growing barley on account of its rough awns. Awnless or hooded varieties have not proved productive, but there are a number of promising smooth awned sorts under test at present. Further tests are necessary to determine the best smooth awned varieties, but several of them compare very favourably with the varieties that have been recommended in the past. As a rule the two rowed varieties have proved more satisfactory at this farm, but of late years a six rowed sort has been the most productive.

Over a long period of years Charlottetown No. 80 has been a very satisfactory variety, although it is somewhat weak in the straw and lodges where the crop is heavy. It is recommended for general use. It is used commonly for seeding with Victory and Banner oats as mixed grain.

During the past seven years, Trebi, a six rowed sort, has given the highest average yield. This variety possesses rather short straw and its recommendation for general use is questionable because on poorer soils it may not grow tall enough for binding. It has a rather coarse awn which does not break cleanly in threshing.

Where a six-rowed variety is preferred, O.A.C. No. 21 is still recommended. It is earlier than Charlottetown No. 80, but has proved hardly so productive.

It is hoped that in the course of a few years suitable smooth awned varieties will be available, as they are more pleasant to handle and the straw may be fed more safely to live stock.

Buckwheat

The acreage of buckwheat grown in the province is only slightly less than that of barley. It is grown largely on new breaking and on areas that are not in condition for seeding until comparatively late in the season.

Two types are grown, the smooth type, represented by the varieties Silverhull and Japanese, and the rough type by Rye and Tartarian.

Over a period of years Japanese has given the highest returns, yielding considerably more than Silverhull.

Of the rough type, Tartarian has yielded slightly more than Rye. Both of these varieties are about five days earlier in maturing than are varieties of the smooth type. The varieties of the rough type appear to shell more freely than varieties of the smooth type when being handled in the field.

Mixed Grain

A number of varieties of wheat, oats, barley and peas have been grown in combination at varying seeding rates per acre. For a check, Banner oats and Charlottetown No. 80 barley have been seeded as pure varieties.

Banner oats have produced about 12 per cent more than Charlottetown No. 80 barley in gross yield. When the difference in hull percentage is considered they gave about equal yields with the barley having a slight advantage.

In these tests the addition of wheat to oats and barley has not appeared to be of any benefit.

The highest yielding mixture was composed of Alaska oats and Star barley. Star barley, however, is short in the straw and cannot be recommended for general use because on poor soil it probably could not be cut with a binder.

The following mixtures yielded almost as much as the Alaska and Star mixture and are recommended:

1. Mackay peas ($\frac{1}{2}$); Banner oats ($1\frac{1}{4}$); Charlottetown 80 barley ($\frac{3}{4}$).
2. Banner oats (2); Charlottetown 80 barley (1).
3. Gold Rain oats ($1\frac{1}{2}$); O.A.C. No. 21 barley (1).

Note.—The numbers in brackets refer to rate of seeding in bushels per acre.

High Protein Mixtures.—A number of mixtures in which Early Blue, Chancellor and O.A.C. No. 181 peas were seeded at the rate of $1\frac{1}{2}$ bushels per acre in combination with Alaska and Gold Rain oats and Reward wheat have been under test for six years.

Observations indicate that the rate of seeding for peas was too high, as the mixtures invariably lodged badly and were difficult to harvest. The highest gross yield was procured when Early Blue peas and Gold Rain oats were seeded at the rate of $1\frac{1}{4}$ and 1 bushel per acre respectively. The rate of seeding peas in this test will be revised in order to determine the highest rate that can be seeded without resulting in undue lodging.

Field Beans

A number of varieties of field beans have been tested for varying periods of time. They are not an important crop in the province due probably to the danger of frost injury before they reach maturity. Comparatively early varieties are essential.

Norwegian, a coloured bean, has been very productive. It is one of the earliest tested at this farm. It also seems to be very easy to secure a uniform stand of this variety in the field.

Navy, a large white bean, has been the heaviest yielder. This is also a comparatively early variety, but not so early as Norwegian.

White Pea, a small white bean, has done reasonably well, but is a little late for this district. It usually matures fairly well, but sometimes is injured by an early frost.

Field Peas

Field peas provide a high protein supplement to the other home-grown feeds. A number of varieties have been tested for the past seven years and satisfactory yields have been secured.

Early Blue has given the highest average yield. This is an early variety possessing vines of medium length. The peas are blue in colour, of medium size and semi-wrinkled.

Canadian Beauty, a later variety, has been second to Early Blue in yield. This is a large white sort.

O.A.C. No. 181 is a little earlier than Canadian Beauty and has yielded only slightly less. The peas fall in the small white class.

Flax for Seed

Little or no flax is grown in the province. Flax seed is a useful fat supplement in feeding young calves where skim-milk is used. Of the varieties tested at this farm, 8C and Redwing have given the highest yields. These tests, however, have been carried for only a few years and the data are not necessarily conclusive.

CHEMISTRY

Fertilizer Formulae for Potatoes

In 1923 an experiment was laid down to test the value of various fertilizer formulae for potatoes. The rotation followed was a three-year one of potatoes, oats and clover hay.

Ten formulae were used as follows: 6-6-6; 5-6-6; 4-6-6; 3-6-6; 5-8-6; 4-8-6; 3-8-6; 4-8-10; 4-8-8 and 4-8-4. Each formula was applied at three rates, 1,000, 1,500 and 2,000 pounds per acre. All fertilizer was applied previous to planting the potato crop in each rotation.

One-half of the nitrogen was applied in the form of nitrate of soda and one-half as ammonium sulphate. The phosphorus was applied as superphosphate and the potassium as muriate of potash.

Plots which received no fertilizer treatment were used as checks. The test was conducted on two separate areas and four rotations were completed on each area, making in all eight complete rotations.

Within the limits of this experiment in so far as the potato crop is concerned, no one formula has shown marked superiority. The difference in yield per acre between the highest and lowest was 29·1 bushels of marketable and 29·4 bushels of total crop. The 4-8-10 and 4-8-8 formulae gave the highest yields and also the highest percentage of marketable crop, but the differences were not great.

With the oat crop, the highest yield was obtained when the 4-8-10 formula was used. Here again, however, the differences were not great.

It became increasingly difficult to obtain satisfactory hay yields and yields were variable from year to year. The lowest yield was secured where 4-8-10 was used. The highest yields were obtained from the use of 4-8-6, 5-8-6 and 6-6-6.

When considering all crops, the 4-8-8 and 4-8-10 formulae would probably give the most satisfactory results.

The higher rates of fertilizer application resulted in higher yields. The following is a summary of the results from the various fertilizer treatments and the check plots.

YIELDS FROM VARYING FERTILIZER APPLICATIONS ON A THREE CROP ROTATION

Fertilizer Treatment	Potatoes		Oats		Hay
	Marketable	Total	Grain	Straw	Tons per acre
	Bushels per acre	Bushels per acre	Bushels per acre	Tons per acre	
Check. No treatment	49·9	75·5	41·5	0·69	1·01
1,000 pounds per acre	125·5	162·6	49·1	0·87	1·22
1,500 pounds per acre	146·1	185·3	52·7	0·94	1·39
2,000 pounds per acre	166·1	207·0	57·3	1·07	1·53

Sources of Nitrogen

In 1929 a test was laid down to determine, if possible, the relative effectiveness of ammonium sulphate, calcium nitrate, nitrochalk and urea as nitrogen

carriers. Nitrophoska (15-30-15), a high analysis complete fertilizer was also included in this test. All treatments contained an equivalent amount of nitrogen, phosphorus and potash.

Three crops were grown, potatoes, oats and hay.

Within the limits of this test it would appear that the fertilizers tested are equally effective as nitrogen carriers.

Sources of Lime

Since 1926 a test has been under way to determine the effect of applications of calcitic and magnesian limestone, hydrated lime and gypsum on crop yields. The rotation followed has been a three-year one of oats and two years in hay. Two swede turnip crops were grown at the beginning of the test, but have since been discontinued.

Calcitic and magnesian limestone were applied at the rate of two and six tons per acre, hydrated lime at one and three tons per acre and gypsum at one-half and one and one-half tons per acre.

It would appear that calcitic and magnesian limestone and hydrated lime, at the rates applied, have been equally satisfactory as measured by their effect on crop yields.

Gypsum has had a tendency to reduce yields as the plots receiving gypsum have yielded less than the check plots which received no treatment.

FIELD HUSBANDRY

The work in this division includes the projects dealing with rotation experiments, comparisons of cultural and cropping methods for various farm crops, the collection of data on cost of production of farm crops, fertilizer and manure treatments, as well as pasture experiments.

Crop Rotations

Seven rotations are being compared, four containing hoed crops, grain and hay, and three containing grain and hay only. These include:—

1. Three-year rotation—roots, oats, clover hay.
2. Four-year rotation—roots, oats, clover hay, timothy hay.
3. Five-year rotation—roots, oats, clover hay, timothy hay, oats.
4. Five-year rotation—hoed crops (roots and silage crops), barley, clover hay, timothy hay, grain (oats and wheat).
5. Three-year rotation—oats, clover hay, timothy hay.
6. Three-year rotation—grain, grain, clover hay.
7. Four-year rotation—oats, followed by three years in hay.

The following summary is based on a study of data collected from rotations and on observations made during the past 11 years:—

Speaking generally, it is not practical to adopt a single rotation to cover the entire cultivated area on the average farm. The reasons for this are: That the drainage, and frequently, the type of soil would be entirely unsuited to the successful growing of hoed crops on a fairly large scale. On many farms, one-fifth of the farm in roots or hoed crops would be a larger area than the farmer could handle profitably. The single rotation would not permit a proper balance of the live stock feed requirements.

A study of the various rotations covering a period of 11 years leads one to believe that under average mixed farming conditions it is more logical to adopt a five-year rotation as the principal rotation, selecting, of course, those areas on which hoed crops can be grown successfully. The area should be

sufficiently large that one-fifth will supply all the hoed crops necessary for the needs of the farm in question.

At this farm it has been found that a five-year rotation has many commendable features. It has permitted a more satisfactory distribution of crops for live stock purposes. The crop values balanced the production costs more closely than did the crops from either a three- or four-year rotation, and what is perhaps the most important feature, the unit cost of production, on the average, was lower.

There may be the occasional farm on which a six-year rotation would serve better than a five-year, especially where there is a shortage of good pasture or hay. The sixth field may be used for hay or pasture, as desired. It is not advisable, however, to leave land in sod longer than three years, if soil fertility, yield, and quality of hay are to be maintained.

On the remainder of the areas where the soil is a heavy clay or poorly drained and unsuitable for hoed crops, a three-year rotation of grain and hay will be found satisfactory. If more grain than hay is needed, two years of grain and one of hay may be adopted, or if hay is a factor, one year of grain and two years of hay may be adopted.

To obtain economical yields of grain and hay of good quality, the fertility of the soil must be maintained. At this farm the following methods of fertilization have thus far maintained the soil fertility on a three-year rotation of grain, grain seeded, clover hay; and excellent yields of grain and hay of good quality have been secured:

(*a*) By using 400 pounds per acre of a 2-12-6 fertilizer on the grain crop which is seeded down.
(*b*) By top-dressing with ten tons of barnyard manure once every six years on the stubble previous to the clover crop.
(*c*) By correcting the acidity with ground limestone when required.
(*d*) By ploughing under the heavy clover aftermath which has been made possible by correcting the acid condition of the soil and by the application of fertilizer and top-dressing.

Cultural and Cropping Experiments

Nine projects are being studied under this heading. These include various cultural methods for the production of grain, roots, sunflowers, and hay grown on upland soils, as well as rotations, fertilization and limestone treatments for the improvement of dyke lands.

The following summaries are based on a study of the data secured and from observations made on the various treatments over a period of years.

PREPARATION OF SOD LAND FOR OATS

The data collected over a period of 14 years indicate that there is a significant advantage in favour of fall ploughing over spring ploughing of medium to heavy clay soils for the production of oats.

Where weeds are prevalent, the land should be ploughed early and top-worked for the remainder of the season. Naturally, top working increases the cost of production. Therefore, if the land is free from weeds, it is more economical to plough later in the fall to overcome the necessity of top-working. If, however, early fall ploughing is found to be more advantageous, top-working should be carried out to keep down grass as well as to kill the weeds.

PREPARATION OF HOED CROP LAND FOR GRAIN

The highest average yields over a 14-year period have been obtained from those plots on which the seed bed was prepared, just previous to seeding, with

a disk or spring-tooth harrow, followed by the smoothing harrow. Where the hoed crop land was ploughed either in the fall or spring, there was no significant increase in yield. By not ploughing, a saving of approximately $3 per acre is effected in the unit cost of production. If the hoed crop has been kept clean, the following grain crop will be freer of weeds than it would had the land been ploughed.

SEED-BED PREPARATION FOR OATS

Three methods of preparing the land for an oat crop have been tested over a 14-year period. The treatments used were as follows:—

1. "Poor" preparation:—Disk once, seed, smooth harrow.
2. "Good" preparation:—Double disk, smooth harrow, seed, smooth harrow.
3. "Good" preparation plus rolling:—Double disk, smooth harrow, seed, roll, smooth harrow.

The land was ploughed shallow in the fall in each case.

The yields of oats secured, following different crops, are given in the following table:—

YIELDS OF OATS FOLLOWING VARIOUS METHODS OF SEED-BED PREPARATION

Treatment	Following Swedes		Following Oats		Following Clover	
	No. of Years	Yield per Acre Ave. Bush.	No. of Years	Yield per Acre Ave. Bush.	No. of Years	Yield per Acre Ave. Bush.
"Poor"	7	42·8	7	41·8	6	48·6
"Good"	7	40·1	7	44·8	6	49·7
"Good" plus rolling	7	41·6	7	42·7	6	45·8

The results secured to date in this experiment would seem to indicate that the amount of cultivation required is merely sufficient to give a good seed-bed. The condition of the soil will govern the number of times it should be harrowed. Rolling has not increased the yield of oats on this type of soil.

PREPARATION OF SOD LAND FOR SWEDE TURNIPS AND SUNFLOWERS

The average results over a period of 14 years are as follows:—

PREPARATION OF SOD LAND FOR HOED CROPS

Plot No.	Treatment	Yield per Acre—Tons			
		1936		14-yr. Ave.	
		Swedes	Sunflowers	Swedes	Sunflowers
1	Manure and plough in August—top work	12·90	12·81	18·81	16·45
2	Manure and plough in August—top work—replough in spring	13·95	13·41	18·33	16·61
3	Manure and plough late in fall	13·92	15·36	16·96	15·78
4	Manure and plough in spring—seed on flat	13·80	16·29	14·67	15·20
5	Same as plot 2	12·45	14·04	18·32	16·22

The data given in above table would seem to substantiate the following recommendations:—

(1) Early fall ploughing, followed by top-working is the most economical practice on land reasonably free from weeds.

(2) Replough in the spring only when grass or weeds render it impossible to secure a good seed-bed with the disk or harrow.

(3) Late fall ploughing is preferable to spring ploughing for increased yields, earlier seeding and greater ease of cultivation.

DEPTH OF PLOUGHING SOD LAND FOR OATS

A test of different depths of ploughing sod land has been carried on for 12 years. The average yields of grain and hay obtained following the ploughing of sod five, seven, and nine inches deep show that no appreciable increase was realized from the deeper ploughing of medium to heavy clay soil. This leads to the conclusion that from five to six inches is sufficient depth of ploughing on this type of soil.

RATES OF SEEDING OATS AS A NURSE CROP

Three rates of seeding oats have been compared, both as to the yield of grain secured and the yield of the subsequent clover and timothy crops. The results are presented in the following table:—

YIELDS FROM VARYING RATES OF SEEDING OATS

Plot No.	Crop	Treatment	Yield per Acre	
			1936	14-Yr. Average
1	Oats	Seeded at the rate of 2 bush. per acre.....bush.	61·9	52·4
2	"	Seeded at the rate of 2½ bush. per acre..... "	77·2	51·1
3	"	Seeded at the rate of 3½ bush. per acre..... "	69·6	54·4
4	"	Seeded at the rate of 2¼ bush. per acre..... "	67·5	54·1
1	Clover	Following 2 bush. seeding of oats..... tons	2·8	1·89
2	"	Following 2½ bush. seeding of oats..... "	2·9	1·74
3	"	Following 3½ bush. seeding of oats..... "	2·8	1·75
4	"	Following 2¼ bush. seeding of oats..... "	2·7	1·77
1	Timothy	Following 2 bush. seeding of oats..... "	2·5	2·11
2	"	Following 2½ bush. seeding of oats..... "	2·2	1·92
3	"	Following 3½ bush. seeding of oats..... "	1·9	1·79
4	"	Following 2¼ bush. seeding of oats..... "	2·2	1·90

The results indicate that practically as good yields of oats might be expected from a two-bushel per acre rate of seeding as from heavier rates on medium clay loam, in a fair to good state of fertility. Hay yields following the light seeding of oats have been superior to those secured from areas where the rate of seeding has been heavier.

THINNING SWEDE TURNIPS TO DIFFERENT DISTANCES

The yields have been averaged over a five-year period from plots of swede turnips thinned six, nine, twelve, and fifteen inches apart in the row. The results have not shown any appreciable difference in yields from those thinned six, nine, and twelve inches, but the plots thinned to fifteen inches averaged about one ton less per acre. For table stock, a distance of from six to eight inches is preferable, while for live stock purposes a distance of from ten to twelve is recommended.

DYKE LAND RENEWAL

During the past 14 years, various fertilizer and cultural treatments have been carried out on the dyke lands of this farm. The object of these tests has been to determine practical methods of not only increasing the yields, but improving the quality of the crop grown. A study was also made of the

possibilities of growing various kinds of farm crops in addition to clover hay, such as oats, wheat, barley, flax, sunflowers, and swede turnips.

The results of these tests should be of much interest to the dyke land owners of Nova Scotia and New Brunswick, because the dyke lands of these two provinces represent a very large capital outlay in addition to a heavy annual tax for dyke maintenance.

Many of the treatments have demonstrated clearly that the returns from these dyke lands can be economically increased. The importance of good drainage was brought out in these tests, as was the beneficial effect of correcting the acidity of the soil by the use of ground limestone. The increase in yield and quality of clover hay produced on these areas was very marked, more especially following the use of limestone. It was also proved that these dyke lands respond profitably to economical applications of barnyard manure or commercial fertilizer. In addition to being able to grow excellent crops of good clover hay on these dyke lands, it was found that profitable crops of oats, barley, sunflowers, swede turnips, and flax could be produced when the land was properly drained, cultivated, and fertilized. Wheat did not respond so well from the trials thus far made.

One of the first points investigated was the effect of applications of ground limestone, basic slag, and wood ashes. The following table gives a brief summary of the averages compiled from five crop years of grain and 22 crop years of hay.

EFFECTS OF LIME, SLAG AND WOOD ASH ON DYKE LAND SOIL

Treatment	Oats		Hay		Ave. Value of Crop per Acre After Deducting Cost of Treatment
	No. of Crop Years	Ave. Yield per Acre bush.	No. of Crop Years	Ave. Yield per Acre tons	
					$
2½ tons ground limestone per acre	5	40·9	22	2·58	23·62
1½ tons ground limestone per acre	5	38·4	22	2·56	24·11
Check—no treatment	5	25·2	22	1·95	18·73
½ ton basic slag per acre	5	37·4	22	2·64	23·91
1,400 lb. wood ashes per acre	5	38·3	22	2·53	23·95

The above treatments were carried out on duplicate plots of an acre or more in area. The different treatments were applied each time the areas were reseeded, making five treatments in all.

The average results shown in the above table are significant and are a fair indication of what may be expected under similar soil and climatic conditions.

The following table gives, in brief form, the average yields from the five crop years; also the average return value, after deducting the cost of fertilizer applied per acre annually from each of the three four-year rotations carried out under the dyke land renewal studies.

EFFECTS OF FERTILIZERS ON YIELD AND VALUE OF CROPS ON DYKE LAND

Crop and Treatment	Number of Crop Years	Average Yield per Acre	Value of Crop per Acre after Deducting Cost of Fertilizer or Manure
			$ cts.
Four-year rotation—			
Sunflowers—16 tons manure per acre	5	14·74 T.	31 52
Oats	5	49·6 bu.	22 93
Clover	5	2·38 T.	15 02
Timothy	5	2·33 T.	17 69
Total			87 16
Four-year rotation—			
Oats	5	27·1 bu.	18 09
Clover. No treatment	5	2·25 T.	21 84
Timothy. No treatment	5	2·61 T.	20 24
Timothy. No treatment	5	1·82 T.	15 25
Total			75 42
Four-year rotation—			
Oats	5	28·9 bu.	19 95
Clover—			
100 lb. nitrate of soda, per acre in spring 150 lb. slag "	5	2·53 T.	20 84
Timothy—			
1st. year fertilized as for clover	5	2·64 T.	19 84
2nd. year fertilized as for clover	5	2·29 T.	15 73
Total			76 36

In this, as in many other cultural tests, it is rather difficult to show the true return values of the crops harvested. The reason for this is that the true feeding values of the different crops harvested from the fertilized and unfertilized areas are not available. If these were available, there are reasons to believe that the contrast would be very much greater.

Keeping in mind that the cost of all fertilizer and manure applied has been deducted from the values of the crops harvested, and that the unit value of these crops, per ton or per bushel has been the same, irrespective of whether they were grown on fertilized or unfertilized land, the following would seem to be fair deductions to be drawn from the preceding figures:—

(1) That profitable returns may be obtained from dyke land by following a systematic rotation of crops, by an application of barnyard manure, or a light application of mixed fertilizer.

(2) That from a 16-ton application of barnyard manure an average yield of sunflowers may be expected. While excellent yields of the succeeding crops in the rotation were secured, the oats lodged severely after the first rotation, smothering the clover. This would indicate that a lighter application of manure after the rotation was established would give more economical returns.

(3) That after deducting the cost of the manure, the return values per acre annually were on the average slightly better than those from the untreated area.

(4) That the average yield of oats per acre was almost double that of either of the other two rotations.

(5) That a comparison of the average crop yields and the net return values compiled for the last two rotations shows but a very slight difference

in favour of the fertilized area. There was a small increase in average yield of oats, along with a more consistent yield of hay. There is little doubt as to the superior feeding value of the hay harvested from the treated areas over the untreated. It is well to mention that the first year hay cut from the untreated area carried a higher percentage of couch grass. To a degree this accounts for rather high average tonnage cut from the untreated area.

(6) That the ploughing of dyke land every four years has, up to date, shown beneficial rather than injurious results.

TOP-DRESSING HAY LAND

At this farm, over a period of 11 years, the following results were obtained on dyke land in continuous hay:—

(1) Plots top-dressed early each spring with 100 pounds of nitrate of soda plus 150 pounds basic slag per acre gave an average yield of 2·77 tons of hay per acre having a return value of $24.55 per acre annually after deducting the cost of the fertilizer treatment.

(2) Plots top-dressed with eight tons of barnyard manure late in August once every four years gave an average yield of 2·61 tons, having a return value of $25.74 per acre annually after deducting the cost of manure applied.

(3) Plots that were untreated gave an average yield of 1·95 tons of hay, having a return value of $21.04 per acre annually over the same period.

Comparing the results of the three treatments, it will be noted that there was no significant difference in the returns from plots one and two, but that the return from plot three was definitely lower.

The hay from all three plots was given the same value. Had the true feeding or graded value been shown, the difference would have been still greater. Furthermore, the quality of the hay from plot three is getting poorer each year. There is, up to date, very slight difference in the quality of the hay from plots one and two. There are a few more weeds showing in the manured plot but not sufficient to appreciably affect the quality as yet.

The treatments accorded plots one and two offer a splendid means of maintenance or improvement of dyke lands, especially on areas where ploughing may not be a practical undertaking, or on dyke land where the area is too large to permit an annual reseeding of all the acreage requiring improvement.

The major points of interest established by a study of these cultural and fertilizer treatments on dyke land and upland areas are: (1) That good dykes and drainage are of major importance in any dyke land improvement policy. (2) That short rotations will give increased yields and additional grain for feeding purposes. (3) That neither dyke land nor upland should be left down to sod too long. For upland, the average should not be over three years and for dyke, six to eight, depending on the acreage under cultivation. (4) That the acid soils should be neutralized by the use of ground limestone if good clover crops are desired. (5) That barnyard manure, supplemented by either mixed fertilizer or basic slag, judiciously applied to the respective crops, will be found a profitable means of maintaining soil fertility, which in turn assures not only a higher yield, but a higher quality of product. (6) That barnyard manure may profitably be used as a top-dressing, or ploughed under for the production of roots, sunflowers and corn, either on dyke land or upland. (7) That basic slag and mixed fertilizer have proved profitable when applied as a top-dressing on dyke lands.

Manure and Commercial Fertilizer Experiments

Sixteen projects are being studied under this heading. Nine of these were started in 1936 on a 16-acre field containing 1,008 plots. They include: comparisons of commercial fertilizer formulae; rates of applying fertilizer; rates of applying manure and combinations of manure and fertilizer for potatoes, swedes and mangels.

Sufficient data are not yet available on these projects to warrant any recommendations.

The results obtained from the remaining seven projects are summarized as follows:—

Green Manure Crops.—A soil improvement test has been carried on for the past 14 years. The soil was medium to heavy, poor clay loam. The object was to learn whether or not poor soil could be improved or built up profitably by ploughing under clover or buckwheat without additional manure or fertilizer.

The results indicate quite definitely that this is not a practical means of soil improvement, especially where the soil is very poor. In neither case was the growth, when ploughed under, sufficient to effect an appreciable soil improvement. There was no apparent difference in the average yield obtained from either the clover or buckwheat from that of the check plot for the 14-year period.

Use of Lime.—Where applications of two tons of ground limestone per acre have been applied as a top dressing on sod land, the yields of grass or hay have been more or less depressed. The same treatment applied to ploughed land and harrowed in has shown beneficial results. These results indicate that a surface application of two tons of ground limestone per acre on sod land causes too high a concentration of lime in the top layer of soil. This would tend to tie up some of the available plant food for a time. It might be more economical to apply one-half ton per acre every year than two tons once every four years.

The reader is referred to the Chemistry section of this report for further details on lime experiments.

Place in Rotation of Applying Manure.—Sixteen tons of manure per acre, applied to the hoed crop in a four-year rotation has increased the returns over an untreated area, for a period of 13 years, to the extent of $3.01 per ton of manure applied.

When the manure was divided, eight tons applied to the hoed crop and eight tons applied as a top dressing on the oat stubble before the clover crop, the value of the manure was $3.17 per ton. When the entire application was made on the clover sod, the value of the manure dropped to $2.63 per ton. It is recommended that half of the manure be applied to the hoed crop and half on the oat stubble.

Rate of Applying Manure for Root Crops.—In a comparison of 12-, 16-, and 20-ton applications of manure per acre in a four-year rotation for a period of 13 years, the increase in crop over the untreated area has resulted in the following values being received for the manure applied:—

12 tons per acre, $3.09 per ton
16 tons per acre, $2.88 per ton
20 tons per acre, $2.64 per ton

The indications are that it is not profitable to apply more than 16 tons of manure per acre on a four-year rotation, or at the rate of not more than four tons per rotation year.

COMMERCIAL FERTILIZER FORMULAE FOR HAY

Three experiments are being conducted under this heading on medium clay loam soil.

Top Dressing Hay Land with Nitrate of Soda and Basic Slag.—This experiment has been conducted for 13 years, on a four-year rotation of one year in oats and three years in hay.

Following are the yields and returns secured to date:—

EFFECTS OF TOP DRESSING HAY LAND WITH NITRATE OF SODA AND BASIC SLAG

Treatment	13-Year Average Yield per Acre				Average Value of Crop per Acre per Year After Deducting Cost of Treatment
	Oats	Clover	Timothy	Timothy	
	bush.	tons	tons	tons	$ cts.
75 lb. nitrate plus 200 lb. slag per acre on hay areas in spring	52·8	1·16	1·79	1·72	17 39
150 lb. nitrate plus 400 lb. slag per acre on hay areas in spring	52·2	1·24	1·92	2·04	16 28
Check—no treatment	44·8	0·72	1·26	1·30	15 45

It is evident from these results that the fertility of the soil to which the application of fertilizer is to be made must be taken into consideration if greatest returns for money invested are to be secured. In the above test there is no appreciable increase in the average yield of oats from the heavier application of fertilizer, as compared with the light application, but there is a consistent increase in yield of clover and timothy. Yet in this case it was not quite sufficient to cover the entire increase in cost; that is, if all things are equal. In this case it is fair to say they were not. The quality of the hay from the heavy application was superior to that taken from the lighter application and it was very much superior to that taken from the untreated area. Consequently where the soil fertility is low, the heavier application would seem to be advisable and on soil of fair fertility, the lighter application would be sufficient. The application has been profitable in either test.

Value of Potash for Top Dressing Hay Land.—This experiment has been conducted in conjunction with the one above during the past five years. The results to date are as follows:—

EFFECTS OF POTASH ON HAY LAND

Treatment per acre as top dressing on hay areas in the spring	5-year average yield per acre				Average value of crop per acre per year after deducting cost of treatment
	Oats	Clover	Timothy	Timothy	
	bush.	tons	tons	tons	$ cts.
1. 75 lb. nitrate plus 200 lb. slag	58·5	1·22	2·07	1·80	17 05
2. Same as (1) plus 75 lb. muriate of potash	61·4	1·26	2·23	1·86	16 72
3. 150 lb. nitrate plus 400 lb. slag	54·4	1·29	2·10	2·06	14 52
4. Same as (3) plus 75 lb. muriate of potash	64·3	1·54	2·44	2·34	16 58
5. Check—no treatment	46·9	0·47	1·22	1·21	13 12
6. 75 lb. muriate of potash	49·8	0·36	1·03	1·10	11 52

The above data indicate that the addition of potash to the treatment has increased the yields, but so far the increase has not been sufficient to pay for the extra cost of treatment, with the exception of treatment (4).

Top Dressing Old Sod Land with Commercial Fertilizer.—This experiment has been conducted for six years on old sod land depleted of available fertility. It compares nitrogen alone in different forms, nitrogen in combination with phosphoric acid, potash, lime, and combinations of these constituents.

The following treatments have shown a profitable increase in crop yields:—

(*a*) Five hundred pounds superphosphate per acre once every four years, with or without 250 pounds nitrate of soda per acre annually.

(*b*) The above, together with 100 pounds muriate of potash once every four years, and also with two tons ground limestone once every four years.

(*c*) Superphosphate plus muriate of potash with or without limestone.

In no case was there a profitable increase in yield recorded unless superphosphate was included in the treatment, and in every case where this was done, profitable increases were secured.

Value of Manure for Hay and Oats.—Data are collected on this project from a three-year rotation of oats, clover, timothy. One area received 12 tons of manure per acre as a top dressing on the clover sod. Another area is untreated.

The results, over a period of 11 years, are as follows:—

VALUE OF MANURE FOR HAY AND OATS

Treatment	11-year average yield per acre			Average value of crop per acre per year after deducting cost of treatment
	Oats	Clover	Timothy	
	bush.	tons	tons	$ cts.
12 tons manure per acre on clover sod	52·2	2·45	2·96	22 37
Check—no treatment	48·9	1·76	1·87	22 37

The increased yields have been just sufficient to pay for the treatment to date. However, considering the poor quality of hay that is being secured from the untreated area as compared with the one receiving manure, the results would warrant the recommendation that this treatment is a satisfactory one to adopt on this type of rotation.

Weed Control Experiments

King Devil.—This weed is very prevalent on old pasture or hay areas low in fertility. Top dressing with a complete fertilizer once every four years has given almost complete control. No trouble is experienced where a short rotation is practised, provided soil fertility is maintained. King devil will not stand competition from clover or grasses, and when conditions are right for their growth, it will soon be crowded out.

On small areas, an application of a five per cent solution of sodium chlorate at the rate of 100 gallons per acre gave a fair degree of control when applied before the blossoming period. This treatment is too expensive to recommend for any large scale control policy.

Perennial Sow Thistle.—This weed is becoming very prevalent on the marsh areas in this district. It is extremely difficult to control, due to the large amount

of waste land on the dykes and ditch banks and the ease with which the seed is carried by wind and birds.

Where cultivation is possible, ploughing in early summer and continued top-working have proved to be a practical means of control. Waste areas should be mowed early before the weed blossoms, and it should be pulled from all grain areas and burned.

By following this procedure, it has been kept under a fair degree of control at this farm, and to date has not spread to the upland areas to any extent.

The use of sodium chlorate has given fair control when two or three applications of a five per cent solution were used at intervals of ten days.

Pasture Weeds.—The use of complete fertilizer on pasture areas has proved to be a practical means of controlling moss, daisies and king devil.

Pasture Experiments

Three projects are being studied in pasture fertilization and management, in co-operation with the Animal Husbandry Division.

Rotated vs. Continuous Grazing of Pastures.—A comparison of these two methods of pasture grazing has been conducted at this farm over a period of eight years. In 1929, sheep and lambs were used for grazing, and the continuously grazed area was slightly superior in carrying capacity that year. Since that date, dairy cows and heifers have been used. The seven-year average carrying capacity of the rotationally grazed area was 1·58 animal units per acre, over an average period of 136 grazing days. The continuously grazed area averaged 1·54 animal units per acre over an average period of 132 grazing days.

Starting in 1933, small areas in each field were protected from grazing and were clipped frequently. Records were kept of the growth secured. The average green weight of grass harvested from the rotationally grazed areas was 9,683 pounds and from the continuously grazed area, 7,653 pounds.

The results would indicate that rotational grazing will give slightly more forage, but considering the extra cost of fencing, the data to date do not warrant recommending this procedure for general adoption.

Commercial Fertilizers for Pastures.—A comparison of continuously grazed fertilized pastures with unfertilized areas showed the former to have an average carrying capacity of 1·54 animal units per acre, as compared with 1·20 units on the unfertilized pasture. Clippings on the fertilized area averaged 7,653 pounds per acre and on the unfertilized 6,327 pounds.

The fertilization method followed was to apply 300 pounds superphosphate and 75 pounds muriate of potash every four years and 100 pounds sulphate of ammonia every year. The results secured at this farm do not indicate so great a difference between the treated and untreated plots as has been found in other localities where larger amounts of superphosphate and potash were used.

It is proposed to start an experiment in 1937 to determine if larger amounts of these materials may be used profitably.

Ground Limestone for Pastures.—Another experiment has been conducted on small plots, cut frequently, to determine the value of complete fertilizer, on pastured areas and ground limestone at the rate of two tons per acre as a top dressing on old sod. The six-year average green weight of grass harvested from the fertilized areas was 5,905 pounds per acre; from the limed areas 2,817 pounds and from untreated areas 2,847 pounds.

The complete fertilizer gave a much superior type of herbage. Moss and king devil were practically eliminated and their place taken by white clover and fine grasses.

The limestone was slow in showing any effect; in fact, it tended to depress yields for the first two years following its application. Eventually it stimulated

to some extent the growth of clover, but appeared to increase rather than decrease the king devil. A combination of these two treatments would possibly prove more satisfactory.

Effect of Cultural Treatments on Old Pastures.—In 1929 small areas were set aside to compare: (1) Ploughing and reseeding old pasture areas; (2) Disking and harrowing the sod without ploughing; (3) Check area, receiving no cultural treatment.

The average yields of grass per acre over a period of six years on these areas are given in the following table:—

CULTURAL TREATMENTS OF OLD PASTURES

Fertilizer treatment	Cultural treatment		
	Ploughed reseeded	Sod disked and harrowed	Sod untreated
	lb.	lb.	lb.
Complete fertilizer	6,606	6,184	5,627
Ground limestone	2,683	2,813	2,822
Check—no treatment	1,558	2,960	2,733

The results do not indicate sufficient difference between these treatments to warrant the expense of ploughing and reseeding, provided there is a fair sod to begin with.

Cost of Production of Farm Crops

Data on this subject have been compiled at this farm during the past 14 years.

The following table presents the average yield per acre and cost of producing various crops for all years for which data are available. In addition, details are given of the various items involved in the production cost of any crop. It should be noted that the grain crops, with the exception of wheat, can be produced at a much lower average cost, than the average market value.

During the past few years there has been a definite increase in the acreage sown to grain and roots, yet there still remains room for improvement along this line. If definite progress is to be maintained, the objective must be to grow a sufficient amount of grain, roots and clover hay to permit the judicious feeding of all classes of live stock. Moreover, data collected through the field husbandry studies, indicate definitely that this is not only possible but a profitable practice. An increased tonnage of good, well-cured clover hay will reduce materially the amount of protein supplements usually purchased on the average farm.

COST OF PRODUCING FARM CROPS—AVERAGE 1922-1936 INCLUSIVE

Item of Expense		Oats	Barley	Wheat (Huron)	Mixed Grain	Corn	Sun-flowers	O.P.V.	Swedes	Mangels	Hay first year	Hay second year
Number of years	No.	15	15	15	14	14	15	7	15	5	15	13
Rent and taxes	$	4 00	4 00	4 00	4 00	4 00	4 00	4 00	4 00	4 00	4 00	4 00
Manure-fertilizer-limestone	$	9 95	10 39	9 95	8 09	13 77	13 92	15 43	14 74	12 73	7 27	3 55
Seed	$	2 97	2 89	3 44	3 49	1 40	1 43	6 11	1 31	3 36	1 74	1 75
Machinery	$	2 85	2 85	2 85	2 85	4 56	4 45	3 28	2 85	2 85	2 85	2 85
Twine	$	0 44	0 34	0 33	0 40	0 27	0 36	0 09	.....	.....	.....	.....
Manual labour	$	4 77	4 20	4 06	5 10	23 97	25 22	12 41	38 88	47 79	5 10	4 20
Horse labour	$	1 28	1 21	1 10	1 51	3 89	4 16	2 61	4 65	3 62	0 89	0 74
Tractor labour	$	1 41	1 21	1 39	1 57	5 34	5 50	5 22	4 21	2 61	.....	.....
Threshing	$	2 21	1 66	1 46	2 34	.....	.....	.....	.....	.....	.....	.....
Total cost per acre	$	29 88	28 75	28 58	29 35	57 20	59 04	49 15	70 64	76 96	21 85	17 09
Yield per acre	bush.	55·30	33·54	20·85	46·37	14·03 tons	15·42	6·26	18·24	16·09	2·34	2·22
Yield per acre—straw	tons	·99	·86	·86	1·10	.....	.....	.....	.....	.....	.....	.....
Value per acre	$	32 63	29 15	27 60	36 50	46 01	50 33	26 95	34 68	26 63	22 79	21 22
Value per acre—straw	$	3 53	3 08	1 54	3 84	.....	.....	.....	.....	.....	.....	.....
Total value per acre	$	36 16	32 23	29 14	40 34	46 01	50 33	26 95	34 68	26 63	22 79	21 22
Profit or loss per acre	$	6 28	3 48	0 56	10 99	−11 19	−8 71	−22 20	−35 96	−50 33	0 94	4 13
Cost per ton or bushel—considering value of straw	$	0 49	0 73	1 30	0 57	4 08	3 83	7 85	3 87	4 78	9 34	7 70
Average return value per ton or bushel	$	0 59	0 87	1 32	0 79	3 28	3 26	4 31	1 90	1 66	9 74	9 56

RECOMMENDED RATES OF SEEDING FARM CROPS

Crop		Rate of seeding per acre
Oats—for grain on good land	bush.	2–2½
Oats—for grain on poor land	"	3–3½
Oats—for hay or greenfeed	"	3–3½
Oats—hulless (50 lb. per bushel)	"	1–1½
Barley	"	2–2½
Wheat	"	2
Mixed Grain—		
(1) Oats	"	2
(1) Barley	"	1
(2) Oats (Banner)	"	1½
(2) Barley (Charlottetown 80)	"	¼
(2) Peas (Mackay, Early Blue or Chancellor)	"	½
Hay—on neutral soils: Timothy	lb.	8
Hay—on neutral soils: Red clover	"	8
Hay—on neutral soils: Alsike	"	2
Hay—on neutral soils: Timothy	"	7
Hay—on neutral soils: Red clover	"	8
Hay—on neutral soils: Alsike	"	2
Hay—on neutral soils: Alfalfa	"	3
Hay—on acid soils: Timothy	"	8
Hay—on acid soils: Alsike	"	6
Swede turnips	"	2- 3
Mangels	"	8–10
Corn	"	25–30
Sunflowers	"	12–15

NOTE.—If the seed of any crop is above average in size, increase the rate of seeding; if below average decrease the rate.
Sow only seed that is known to be high in germination.

FORAGE CROPS

Forage crops, in so far as this report is concerned, include all of those crops which are grown primarily as food for live stock and of which the animals consume all or most of the herbage or roots or both. They are of considerable importance in this province in that it is estimated from crop reports that they occupy a little more than two-thirds of the cultivated area. This does not include pasture and cereal grains grown for feeding live stock.

ENSILAGE CROPS

Silos are not used to any great extent in the province, but certain crops have been tested and found suitable for this purpose. They are discussed in the following sections of this report.

Corn for Ensilage.—Where yields of ten tons or more per acre can be secured, corn is the most satisfactory crop for ensilage purposes. Not only can it be ensiled, but it may be used as a soiling crop (green feed) as it remains in a succulent condition for a fairly long period. Any overflow from the silo may be shocked in the field, drawn in and fed as required, without serious waste.

The flint varieties in general are somewhat earlier maturing, but on the average they have produced slightly lower yields than the dents. The dent varieties do not tiller as much as do the flints and are often preferred for this reason in that they are somewhat easier to harvest.

All things considered, one should choose those varieties which best combine yield and maturity, when expressed as total yield of dry matter per acre. Many late southern-grown varieties are entirely unsuited to conditions as they exist in Nova Scotia.

The following commercial varieties, seed of which is readily available on the market, are recommended:—

Longfellow (yellow flint).
Golden Glow (yellow dent).
Wisconsin No. 7 (white dent).
Compton's Early (yellow flint).
Salzer's North Dakota (white flint).

In addition to these, Algonquin and Iroquois, two varietal hybrids, produced by Macdonald College, Quebec, have given very satisfactory yields. A limited quantity of seed of these has been distributed in Quebec by that institution. Burr Leaming, another and later varietal hybrid, has also done well.

Sunflowers for Ensilage.—Sunflowers have proved very reliable for ensilage purposes since yields have not fluctuated as greatly as have those of corn. No difficulty has been encountered in having them reach a degree of maturity suitable for making ensilage.

True, sunflower silage is neither so palatable nor so nutritious as is well-matured corn silage, but it can be produced successfully in areas where corn is at best a doubtful venture.

Sunflowers lodge and break down in wind storms much more readily than does corn. The stems are more brittle and the entire plant is not as well braced by its root system.

There does not seem to be much difference in the suitability of commercial varieties other than from the standpoint of yield. No difference has been noted in leafiness, disease resistance or other agronomic characters of economic importance.

Mammoth Russian (sometimes called Russian Giant) has given the highest yields of both green and dry matter and is recommended as the most suitable variety for ensilage purposes.

Root Crops

Root crops are grown much more extensively than are ensilage crops. This is probably due primarily to the fact they are particularly well adapted to soil and climatic conditions as they exist in this province and that less machinery is necessary to satisfactorily grow, harvest and store this crop.

The acreage devoted to these crops still leaves much to be desired and it is hoped that improved methods of growing will result in a greater appreciation of the value of roots and that greater acreages and better crops will be produced.

It is admitted that a large amount of hand labour is required to grow these crops. However, in addition to their being a valuable live stock food, the increased cultivation necessary to their successful production not only leaves the land in better condition, but results in the destruction of many weeds on the farm.

Mangels.—There are six types of mangels: long, half-long, intermediate, tankard, ovoid (oval) and globe. These again are subdivided according to colour, such as red, white and various shades of yellow and rose.

Comparative tests have shown the general superiority of those varieties which fall into the half-long and intermediate classes, either yellow, white or red. The rose types have proved rather variable, in many cases growing deep in the ground and being rooty and hard to harvest.

Varieties of the half-long and intermediate types usually are smoother and more uniform than those of the long type. They do not break as badly during pulling and handling, which means that as a rule they keep better in storage.

Pulling tests have demonstrated that it requires considerably more energy to harvest varieties of the long type than it does varieties of any of the other types. The globes and tankards are the easiest to pull as they grow nearer the surface of the ground.

From the standpoint of yield and general suitability, the half-long and intermediate types are recommended for fairly deep, moderately rich soils, while on shallow soils the shallow-rooted types as represented by the globes and tankards will probably be more satisfactory, with the tankards preferred.

The tankards and globes usually give reasonably large green yields, but contain a smaller percentage of dry matter than do the other types, resulting in a lower yield of dry matter per acre.

Due to the multiplicity of varieties and so-called varieties, it is difficult to make specific recommendations. The following varieties, however, have demonstrated their general adaptability in comparative trials:—

Half-long and intermediate

Danish Sludstrup
Tip Top (C.E.F.)
Half Sugar White

Tankard

Yellow Tankard.

Swedes.—There are four types of swedes: globe, flat, ovoid (oval) and tankard. These are subdivided as to colour: purple, bronze and green. Considerable variation in colour may occur with green shading to bronze and bronze to purple.

Unlike mangels, no definite type has demonstrated marked superiority. The better varieties, however, belong to the globe and ovoid classes irrespective of the colour factor. There does not appear to be much difference in the average depth in the ground between the various types. All are capable of being harvested with about the same amount of labour.

The choice of variety would appear to depend largely on yield, disease resistance and the purpose for which the crop is grown. For stock feed the total yield and yield of dry matter per acre coupled with keeping quality are of first consideration. Where club-root is a factor, resistance to this disease is of prime importance.

When growing swedes for table purposes, varieties which satisfy the market requirements should be selected. Some markets demand purple tops while others will take bronze tops. A variety to meet market requirements should, of course, be capable of producing roots which are as smooth and uniform as possible. Uniformity of colour is just as important as is that of shape.

A study made at this farm over a period of years of a large number of varieties of field roots suggests that the variety name means but little. The same variety may be offered under different names, or the name may be changed from year to year. This is not as it should be, and makes it very difficult to recommend specific varieties. However, there are some varieties which have been more or less outstanding. Seed of a number of these is grown within the province and these varieties have become standardized.

Varieties recommended where club-root is not a factor are as follows:—

Bronze or Green Tops	*Purple Tops*
Ditmars Bronze Top	Acadia (C.E.F.)
Cornings Green Top	Hall's Westbury
Invicta Bronze Top	Laurentian
	Bangholm Olsgaard
	Best of All

Seed of Ditmars Bronze Top, Cornings Green Top, Acadia and Laurentian is produced within the province, and all are reasonably smooth and uniform varieties. Laurentian is recommended particularly for table purposes.

Club-Root Resistant Swedes.—Club-root is becoming very prevalent within the swede growing areas of the province and many farmers are finding it increasingly difficult to obtain satisfactory yields. The crop may be partially or wholly destroyed by this disease.

Club-root is caused by a soil organism which may be spread by using manure from animals that have been fed on diseased roots. Consequently all diseased roots should be boiled before using. The disease may also be carried from one field to another on harrows and other farm implements.

As early as 1922 a variety resistant to this disease, known as Christensen's selection of Bangholm, was introduced by the experimental farms, and has since been multiplied and distributed annually. This has been known in the province as Bangholm Club-Root Resistant.

This variety is looked upon with considerable favour by those farmers who are unable to grow a susceptible variety, although many claim it is not a high yielder. It is characterized, however, by a very high percentage of dry matter which largely offsets its comparatively low green yield.

Occasionally reports were received to the effect that it was not standing up in certain localities. This coupled with the fact that it was not giving entire satisfaction with respect to yield, led the officers of the experimental farms to search for higher yielding, more resistant varieties.

In 1933 a test containing a number of so-called resistant varieties was conducted on an area of land which was definitely known to be severely infected with the club-root organism. A susceptible variety was used as a check in order that the severity of infection might be measured accurately. This test was continued in 1934, 1935 and 1936 on the same area as it was considered advisable to give these varieties a very critical test.

During this time a number of varieties, which did not exhibit enough resistance to be of commercial importance, were discarded and others for which resistance was claimed were introduced. The susceptible variety used as a check was almost wholly destroyed in each year of the test, indicating that the area used was satisfactory for testing resistance to club-root.

This test was carried as a co-operative project and in addition to the test at Nappan, similar tests were conducted on the experimental stations at Kentville, N.S., Fredericton, N.B., and Charlottetown, P.E.I., as well as on 11 illustration stations and private farms in the Maritime Provinces.

In this way data concerning the behaviour of these varieties in widely separated localities have been obtained. In the four years 37 commercial varieties and strains were tested.

The results may be summarized briefly as follows:—

1. In the majority of cases a number of varieties demonstrated their ability to produce satisfactory yields under conditions where the susceptible variety, used as a check, was wholly or almost wholly destroyed by the club-root organism.
2. The same varieties did not always exhibit the same degree of resistance to club-root in different localities.
3. In certain localities no variety was sufficiently resistant. While not destroyed as early in the season as was the check variety, by harvest time they were partially or wholly destroyed and could not be considered as having produced a satisfactory crop.

Wilhelmsburger has proved the most generally resistant variety. Strains of this variety obtained from different sources and from the same sources in different years have shown varying degrees of resistance. In order that a uniform seed supply may be available to the farmers, the experimental farm and a selected group of growers in the vicinity of Nappan are producing a highly resistant strain of this variety in commercial quantities. Wilhelmsburger is a green topped variety with some roots showing bronze or light purple. In so far as shape is concerned it is classed as a globe although some variation occurs.

It has proved a somewhat better yielder than have the various strains of club-root resistant Bangholm.

The other two varieties recommended are Bangholm (Herning Strain) and Bangholm (Experimental Farm Strain). Both varieties are medium purple tops. The former is classed as a flat globe and the latter as a short tankard. The Bangholm (Experimental Farm Strain) shows considerable variation in both shape and colour.

Several strains of Bangholm were tested and a number of them proved very susceptible to club-root. When ordering this variety it should be specified that a club-root resistant strain is wanted, otherwise disappointment may result, as there are marked differences between strains of this variety in so far as resistance to club-root is concerned.

It might be well to point out that resistance and not immunity is claimed for the varieties recommended. Some roots are likely to be destroyed, but on the whole they should produce a satisfactory crop under average conditions.

Seed of Wilhelmsburger and Bangholm (Experimental Farm Strain) is being produced within the province, under careful supervision and should prove very satisfactory as stock seed is maintained from roots grown on heavily infected land.

Brown-Heart of Swedes.—Brown-heart, a deficiency disease affecting swedes, was first mentioned in Canadian agricultural literature in 1910. It was not, however, until nearly 20 years later that it began to cause general concern among growers and investigators.

During recent years a great deal of attention has been centred on this disorder and a number of interesting facts concerning its development and control have been brought to light.

The tests conducted since 1933 have been of a co-operative nature with several of the experimental farms and plant pathological laboratories as well as a large number of the illustration stations in the Maritime Provinces co-operating.

It has been found that broadcasting 15 to 20 pounds of borax per acre will effect a favourable degree of control under most conditions. When applied directly in the row, 10 pounds per acre has been effective. On soils of high lime content these quantities may be ineffective.

Boron, the active principle of borax, is known to be toxic to some crop plants and tests are now under way to determine what quantities may be used without danger of injury to the common farm crops.

This disorder became of economic importance when swedes for table purposes were rejected by buyers but it was not thought that it would in any way affect their use for feed. Recent investigations, however, have shown that affected roots have a lower feeding value than have normal roots.

Field Carrots.—There are three types of field carrots; long, intermediate and short. These types are subdivided as to colour, namely, red, yellow and white. Most of the common varieties are either yellow or white.

Comparative trials have not shown any great difference in yield between the various types. Varieties of the long type, however, are hard to pull and break very readily during pulling and handling. For this reason varieties of the intermediate and short types are preferred.

The following varieties are recommended:

Short

Mammoth Short White

Intermediate

Danish Champion
New Yellow Intermediate
Mammoth White Intermediate
Improved Intermediate White

Sugar Beets.—A rather comprehensive test of sugar beet varieties for factory purposes has been conducted during the past three years. The data obtained would indicate that beet yields, sugar content, coefficient of purity and yield of sugar per acre are satisfactory. Both high tonnage varieties containing a low percentage of sugar and varieties producing a low tonnage but being characterized by a high percentage sugar content were included in this test.

It would appear that high tonnage is the factor most responsible for high yields of sugar per acre.

A seed production test indicates that good seed yields can be obtained in this locality.

Since the production of sugar beets for factory purposes is not of general interest in the province at this time, no varietal recommendations are being made in this report. The tests are being continued and information on varieties will be gladly given to those interested.

Fleshy Annuals.—Under this heading are classed such crops as kale and rape. Four varieties of kale, namely, Green Marrow Stem, Purple Marrow Stem, Sheep and Thousand Headed and one variety of rape, Dwarf Essex, have been tested for the past three years.

The Dwarf Essex rape has given the greatest yield of both green and dry tonnage per acre. It is also the easiest to produce in that it does not require any thinning while the kale must be thinned similar to root crops.

Of the varieties of kale tested, Green and Purple Marrow Stem are more productive than Thousand Headed and Sheep kale. The latter are rather small growing and appear to lack productivity. All of these are readily eaten by live stock.

Annual Crops for Hay

During the past three years a number of annual crops have been tested to ascertain their suitability for the production of hay. Such crops are seeded and harvested in the one season. These same crops may be used also as soiling crops (green feed), or as annual pastures.

The crops included in this test and rates of seeding per acre were as follows:

Banner oats (3 bu.)
Banner oats (2 bu.); Chancellor peas (1 bu.)
Banner oats (2 bu.); Chancellor peas (¾ bu.); Common vetch (¼ bu.)
Banner oats (2 bu.); Fall rye (1 bu.)
Japanese millet (25 lb.)
Siberian millet (25 lb.)
Sudan grass (25 lb.)
Early Amber cane sorghum (25 lb.)
Wisconsin Black soybeans (90 lb.)
Mandarin soybeans (90 lb.)

In so far as yield is concerned, the oats; oats and peas; and oats, peas and vetch, have been outstanding. The oats seeded alone have slightly outyielded the mixtures in which oats have been seeded in combination with peas and vetches. Oats seeded with fall rye have not yielded nearly as well as the oats, or oats, peas and vetch combination. It was thought that the fall rye would produce some fall pasture after the crop was taken off, but it failed to do so in this test and has only been a very small factor in the yield produced by this mixture. Sudan grass and Early Amber cane sorghum gave excellent yields in 1934, but these were practically a failure in 1935 and 1936. Japanese and Siberian millets were next to the oats and oats, peas and vetch mixtures in the production of forage.

Soybeans produced a crop of hay which was only fairly satisfactory, but further tests may show these to have some value as an annual hay crop.

It is worthy of note that millets, Sudan grass, Early Amber cane sorghum and soybeans did not compete successfully with weeds. If these crops are grown, reasonably clean land should be available. In the plots in which oats or any of the mixtures containing oats were growing, weeds were never a factor in these tests.

Perennial and Biennial Legumes and Grasses for Hay

The hay crop is one of the most important crops grown in the province and the one to which probably the least thought is given when making up seed mixtures.

In 1922 tests were laid down to ascertain if possible the best mixtures to use when seeding down areas for hay. These tests were continued until 1934 and data are now available covering the 12-year period. Different grasses were seeded alone and in various combinations with red clover, alsike and other grasses. Towards the end of the test alfalfa was introduced into a few of the mixtures. Each seeding was left down until two hay crops had been harvested. This is the same number of hay crops that is usually harvested in a standard four- or five-year rotation.

These tests have proved definitely that none of the grasses when seeded alone can produce the yields of hay that may be obtained from the same grasses when seeded in combination with either red or alsike clover, or with both.

Of the grasses, when seeded alone, timothy has been much more productive than meadow fescue, orchard grass or red top. Timothy is perfectly winter hardy and appears to be better adapted and less affected by unfavourable conditions than the other grasses. It has been criticized because of low feeding value, but the fact remains there is no other grass so generally suited to conditions as they exist in this province. Early cutting would do much to improve the feeding value of timothy.

Of the different mixtures tested the following have given the highest yields:

Timothy (8); red clover (10)
Timothy (8); alsike clover (6)
Timothy (8); red clover (8); alsike clover (2)
Timothy (8); red clover (5); alsike clover (2)

Note.—Numbers in brackets refer to pounds of seed used per acre.

From the yield data obtained in this test it would seem as though red clover and alsike may be interchanged freely without seriously affecting yields. Alsike is more tolerant of wet and acid soils and might largely replace red clover on soils of this type.

In so far as alfalfa is concerned, the addition of two pounds per acre to any of the above mixtures on fields that are well drained and contain sufficient lime for its development is suggested. Observations should then be made as to how it survives the winters. The alfalfa can be used to replace two pounds of red clover.

Many of the mixtures tested contained a greater variety of species than did the four listed, but none appeared to be any better and most of them were decidedly inferior from the standpoint of yield.

In those mixtures in which meadow fescue made up a large percentage of the yield, the crop lodged very badly, thus making it difficult to harvest and the hay of poorer quality.

On low lying ground it is probably good insurance to substitute red top for part of the timothy, say six pounds of timothy and two pounds of red top per acre. No appreciable difference in yield was noted in these tests when this substitution was made.

In a test where mammoth and medium red clovers were tested in combination with timothy and meadow fescue, in so far as the meadow fescue was concerned, it did not appear to make any difference which type of clover it was seeded with, but timothy gave a somewhat higher yield when combined with the mammoth type. This probably is explained by the fact that meadow fescue and medium red clover are earlier in maturing than timothy and mammoth red clover.

Red Clover.—Frequent tests have established the fact that red clover seed imported from southern countries is entirely unsuited to conditions in this province. This is due to the fact that the plants are not hardy enough to come through the winter and early spring months. It is true they may survive a winter that is exceptionally favourable, but they are almost certain to be killed out under average winter conditions.

When the yields of all southern grown lots (French and Italian) and all northern grown lots (Swedish and Canadian) were averaged over a period of years, it was found that the northern grown lots had doubled the yield of the southern grown lots.

There are two general types of red clover:

(*a*) Mammoth or single cut type
(*b*) Medium or double cut type

Varieties or regional strains of the mammoth type are later in maturing than are those of the medium type. They also develop a somewhat coarser type of growth and do not, as a rule, produce an aftermath or second cut of any consequence.

In so far as yield of hay is concerned, there does not appear to be any marked difference between the better strains of these two types. Strains of the mammoth type will usually produce the heavier yield in the first cut, but strains of the medium type largely make up any difference when their second cut is taken into consideration.

In view of the fact that there is considerable difference in the time of maturity of these two types, it would seem to be good practice to have a part of a newly seeded area laid down to each type. This would give a longer period over which the clover crop would be in prime condition for harvesting.

Use only northern grown red clover seed of known origin.

The following strains are recommended:

Medium Type	*Mammoth Type*
Ottawa Red Clover	Altaswede
Canadian Grown Medium Red Clover	Mammoth Late

Alfalfa.—Alfalfa has not proved particularly well adapted to conditions as they exist in this locality. It has been relatively easy to obtain a crop the first year after seeding and in some cases it has survived for two years or more. On the whole, however, it has been a rather uncertain crop.

Alfalfa requires a well-drained soil that is abundantly supplied with lime. It is naturally a very deep-rooted plant and cannot thrive where the water table is near the surface.

There are sections in the province where it is being grown on a comparatively small scale with a reasonable degree of success. Alfalfa produces a very nutritious hay, high in protein, and in those localities where it can be grown, it should prove well worth while to give it particular attention. Its requirements may, in time, be better understood and the acreage gradually increased as suitable locations are found.

It has been found better to seed alfalfa without a nurse crop, or if a nurse crop is used, to sow thinly and remove early, giving the alfalfa every opportunity to become well established before winter sets in.

There is some evidence to the effect that alfalfa survives better in rows than when seeded broadcast. The resulting crop, however, is likely to be somewhat coarser, and when cultivation between the rows is practised, it is difficult to keep the hay clean.

Alfalfa should not be left too bare in the fall. It is well to make the last cutting early enough so that a fair aftermath is produced before growth is checked by frost.

Varieties or strains exhibit marked differences in yield and hardiness, as well as in other plant characters. Only northern grown seed should be used.

The following varieties or strains are likely to be most satisfactory:—

Grimm
Ontario Variegated
Ladak

In a small row test Cossack has given evidence of being winter hardy, as well as productive.

Timothy.—As has been stated previously, timothy is the most suitable grass for hay purposes. The bulk of the timothy seed used is of a commercial nature, harvested from stocks upon which no attempt at improvement has ever been undertaken.

The statement has been made that this crop is very generally adapted; at the same time there is a great variation between plants in the various stocks. Plants vary with respect to coarseness, leafiness, time of maturity, disease resistance, etc.

A number of improved strains have been developed and while it has been difficult to show that they yield more than commercial lots, they possess desirable characters which the commercial lots do not. The value of strains possessing greater leafiness, disease resistance and other desirable characters is evident.

Among others, the following improved strains have been developed: Boon, Huron, Swallow and Svalof M. C. None of these, as yet, has been grown in large enough quantities to become a factor in the seed trade.

White Clover.—White clover, as a rule, occurs naturally in most parts of the province where grass land is kept grazed or clipped closely enough to allow it to become established. It is now considered a valuable constituent of pasture areas.

Several improved strains have been tested rather extensively and of these the Danish strain, Morso, is probably the most hardy and productive. English Wild White, a true pasture type, has not proved winter hardy on this farm. Ladino, a large growing mammoth type, has also shown some lack of hardiness.

Recently considerable attention has been given to the native wild white clover. It has much the same appearance as the English Wild White, but is characterized by being somewhat more growthy. In recent trials of short duration it has been more winter hardy than other strains tested. More will probably be heard of this native type in the future.

Soybeans for Seed

Soybeans are a comparatively new crop in this province. They have been compared with other crops for annual hay purposes in another section of this report.

Soybeans require a comparatively long time in which to reach maturity, although there are great differences between varieties in this respect. They will stand more frost in both spring and fall than will ordinary field beans. Harvesting can be effected even after the plants have been entirely killed.

Only the earlier varieties can be matured with certainty under conditions as they exist in this locality. Manitoba Brown, the earliest variety tested, has

matured every year during the past four years, but it has not yielded quite so well as some of the later maturing varieties, even although the later varieties had not entirely reached maturity when killed by frost. Wisconsin Black, which is about a week later in maturing than Manitoba Brown, has been successfully ripened.

Mandarin is about as late a variety as is likely to mature and it cannot be depended upon every year. O.A.C. No. 211 is later than Mandarin and has ripened in favourable years only. Manchu has not matured in any year of the test.

Manitoba Brown and Wisconsin Black are likely to be most satisfactory when full maturity is desired, although Mandarin has given a higher yield.

Substantial increases in yield have been secured by inoculation of the seed, which indicates that the seed should always be inoculated unless the organism is known to be present in the soil.

HORTICULTURE

Horticulture at this farm is one of the minor projects and very little work of this nature is carried on, it being left entirely to the experimental stations at Kentville, N.S. and Fredericton, N.B.

The only important projects carried on under the horticultural division are the unit stock selection of disease-free Irish Cobbler potatoes and the study of ornamental trees, shrubs and flowers.

In the selection of unit stock of Irish Cobblers, particular attention is paid to the disease-free units. This work has now been going on for eight or ten years and some very promising unit selections have been made.

As a result of the study of ornamental trees, shrubs and flowers, the following are some of those recommended as being hardy and suitable for this district:—

Perennials and Biennials

Iris	Hollyhock
Peony	Thermopsis
Lupine	Perennial phlox
White rocket	Funkia
Iceland poppy	Sweet william
Larkspur	

Annuals

Ageratum	Helichrysum
Alyssum	Jacobea
Amaranthus	Kochia
Antirrhinum	Larkspur
Anchusa	Linaria
Balsam	Love-in-a-mist
Calendula	Mignonette
Castor oil bean	Nasturtium
Cockscomb	Pansy
Cosmea	Portulaca
Coreopsis	Petunia
Chrysanthemum	Phlox
Candytuft	Salvia
Carnation	Stock
Dimorphotheca	Verbena
Dianthus	Zinnia

Tulips do exceedingly well in this district when properly cared for and the necessary protection is given.

Narcissus, sweet pea and dahlia also are recommended for beautifying the home grounds.

The trees that have done well at this farm are as follows:—

Norway maple	White ash
Norway spruce	English oak
Schwedler maple	Douglas spruce
Rock maple	Katsura tree
American elm	Blue spruce
European larch	Cut-leaf birch
Weeping birch	Siberian pea
Swiss stone pine	

The shrubs that have done well at this farm and which we recommend for this district are as follows:—

Mock orange	Physocarpus opulifolius
Rocky Mountain blue spruce	Spiraea arguta
Arbor vitae	Japanese hydrangea
Chamaecyparis pisifera filifera	Missouri currant
Berberis Thunbergii	Japanese wild quince
Spiraea Vanhouttei	Rosa rugosa

Lilac (Most of the common varieties do well here)

Cydonia japonica—	Polish privet
Japanese quince	Amur privet
Bush honeysuckle	Douglas fir
Double-flowered hawthorn	Cotoneaster vulgaris
Snow-ball	Siberian pea
Alder buckthorn	Japanese cherry

In tree fruits, a small apple orchard is maintained and the following varieties of apples have proved reasonably hardy and suitable for this district:—

Duchess	Northern Spy
Wealthy	Golden Russet
Linda	Bethel
Hume	Tolman Sweet
McIntosh Red	Baxter

The latter does exceptionally well, but is a poor seller.

Linda and Hume have only been under test for a period of two years, but indications are that they may prove quite suitable for this district.

POULTRY

Poultry in Nova Scotia has received, during the past eight or ten years, more attention, on the average, than heretofore. This is as it should be, because poultry can be made a very profitable source of farm revenue. Data collected over a period of years at the experimental farm, Nappan, as well as at other branch farms, substantiate this statement.

The information obtained from carefully compiled records on production and feed costs for a period of years shows that a flock of from one to two hundred bred-to-lay pullets per farm, properly housed, fed and cared for, is a profitable means of increasing the farm income.

The object of this report is to summarize, in as clear and concise a form as possible, a few of the outstanding facts learned about poultry. These facts are obtained from a study of the accumulated data covering a period of years. In some cases it will cover ten or more years, but the major portion will be taken from the past five-year averages.

Production and Cost

There is no phase of the industry that concerns the producer more vitally than the possibility of producing a commodity profitably. The following table

sets forth the results obtained each year from a flock of Barred Rock pullets kept at the experimental farm, Nappan. The results are not abnormal, but just what may be expected from a flock of good bred-to-lay pullets under good conditions.

PRODUCTION AND COST RECORDS OF FARM POULTRY FLOCK

Year	Bird days number	Average number birds carried	Total eggs number	Market value	Feed cost	Return over feed cost	Feed cost per dozen
				$ cts.	$ cts.	$ cts.	cts.
1926-27	48,052	131·6	19,256	661 25	297 28	363 97	18·5
1927-28	94,586	259·1	45,727	1,401 95	761 87	640 08	19·9
1928-29	83,122	227·7	34,073	992 03	558 17	433 86	19·6
1929-30	55,337	151·5	26,784	703 37	431 43	271 94	19·3
1930-31	81,188	222·4	40,101	635 65	422 96	212 69	12·6
1931-32	86,817	237·8	44,191	676 19	425 27	250 92	11·5
1932-33	101,031	276·8	56,398	775 04	438 65	336 39	9·3
1933-34	59,535	163·1	30,234	512 61	271 24	241 37	10·7
1934-35	89,343	244·8	43,205	829 73	435 94	393 79	12·1
1935-36	112,041	306·1	61,302	1,309 40	626 84	682 56	12·3
Total	811,012	.....	401,271	8,497 22	4,669 65	3,827 57	.....
Ten-Year Average...	81,101·2	222·2	40,127·1	849·722	466·965	382·757	13·96

The data given in the above table show that a fair margin over feed cost was obtained each year, with perhaps better than an average production, but not an abnormally high one.

It can be noted also that there was a gradual improvement in production from year to year. The increase in production, along with lower prices of feeds, resulted in a corresponding increase in net returns over feed cost.

For the ten-year period the flock averaged 222·2 birds and their annual production was 40,127 eggs, at a feed cost of $466.96. The average market value was $849.72, leaving an annual return value over feed cost of $382.75. Reduced to the unit basis, this means that (1) the average annual production per bird was 180·5 eggs; (2) the annual return was $3.82 per bird; (3) the feed cost was $2.10 per bird, and (4) the average annual return per bird over feed cost was $1.72. During this period the average market value was 25 cents per dozen and the average feed cost was 14 cents, which left a return value of 11 cents per dozen over feed cost.

Considering the fact that these records were taken over a period of years, which included some very trying weather, varying from severe droughts to sudden changes and extremes in temperature, the results give a fair indication of what can be expected of a good flock of birds when they receive the proper care, feed and housing. It also gives some idea of the part the poultry industry can take in building up a more progressive agricultural industry.

Breeding

Pedigree breeding of Barred Rocks is a major project at this farm.

Briefly, the procedure has been to select all females on the basis of their production, conformation and type. If they have produced 200 eggs, weighing 24 ounces per dozen, within their pullet year, and are of good conformation and breed type, they would qualify for one of the breeding pens.

The males were formerly selected on a basis similar to that of the pullets, but during the past two years a study of the possibilities of selecting the males on the average production of their daughters, plus conformation and type, has been made. The procedure is to trap nest as many of the daughters of each male as possible, using the records of the daughters as the basis for evaluating each pen sire. That means that all males which are of good conformation and

type, whose daughters' average production was up to the standard set for each male's progeny, would be selected for future pen sires. This is best illustrated by taking the results of the work carried out during the season of 1935.

Ninety-four females were divided into nine pens, made up as follows: 12, 12, 13, 8, 8, 13, 14, 14 and 13 females, each headed by one male.

Out of the 94 females mated, only 51 had daughters which completed their pullet-year production. The others died, or only had one daughter left. Females with less than two daughters were not taken into account in this study.

There were 218 daughters from the 51 females and their average production was 215·5 eggs, which was taken as the flock standard.

To learn whether any of these males could be classed as superior breeders it was necessary to have their daughters carried throughout the year on the same feed and under the same environmental conditions. For this work, it has been found necessary to set a standard difference for each mating, according to the number of daughters. For example, two dams, with two daughters, must have an average production difference over the standard for the flock of 36·29 eggs; four dams, with sixteen daughters, an average production difference over the flock standard of 20·13 eggs, to permit their sire being classed as a superior breeder.

The necessary differences which have been established by the Poultry Division, Central Farm, Ottawa, have been used in the following table. This table shows the sires used, the number of dams whose daughters have completed their full pullet year's production, the number of daughters from each mating, their average production, the average egg weight, the average number of eggs above the flock standard and the necessary differences to permit their sire being classed as a superior breeder.

PRODUCTION RECORDS OF THE PROGENY OF CERTAIN SIRES

Sire	No. dams	Number daughters finished year	% Mortality	Average egg production	Average egg weight	Number of eggs	
						Above Standard	Necessary difference
					gms.		
Glenfarm 10M-16347	3	10	9·1	227·40	58·07	12·35	24·78
Parfaite 9M-16398	6	38	11·6	228·22	60·33	13·17	14·50
S4	8	38	2·6	214·73	58·69	−0·32	13·55
M2701	3	11	21·4	188·87	59·10	−26·18	24·02
Fredericton 41L-14720	6	28	12·5	229·05	56·47	14·00	16·08
S29	4	16	15·8	226·68	57·80	11·63	20·13
S30	8	33	2·9	188·86	61·14	−26·19	14·12
S28	10	35	10·2	223·32	55·81	8·27	13·37
S33	3	9	40·0	208·30	54·43	−6·75	25·55
Average				215·05			

From these data it will be seen that the daughters of four males, namely, S4, M2701, S30 and S33, dropped below the flock average, which, according to this index study, means these males should not be considered as future breeders. It also shows that the average production of the daughters of Glenfarm 10M, S29 and S28 were above the flock standard, but too far below the necessary difference to permit these males to be considered even good. They should not be used as breeders if better males are available.

In the case of Parfaite 9M —16398— and Fredericton 41L —14720—, it is true the average production of their respective daughters did not quite come up to the necessary difference, yet it is sufficiently close to justify their selection as breeding sires.

Feeds and Feeding

There are more requests for information on feeds and feeding than on any other phase of the poultry work. It can also be said that there is no more important factor affecting the success of the industry than that of feeds and feeding.

There are many combinations of feeds which can be recommended for the successful feeding of poultry, either for egg or meat production. But the majority appear to be a little too complicated for the average feeder. In fact, it is not always possible to procure many of the ingredients recommended in these combinations. Especially is this true in outlying districts.

With the idea in mind that perhaps a less complicated ration or rations might be found, a series of feeding tests were started at this farm. The main object was to use, as far as possible, those grains or feeds which could be grown on the farm or purchased locally.

In the following table the average results obtained from three different laying-mash mixtures are given. The chief purpose of these feeding tests was to compare the value for egg production of two laying-mash mixtures, one with and one without corn meal, with a standard mixture which had previously given satisfactory results. Ninety Barred Rock pullets, ranging in age from five to six months, were selected the 1st of October of each year for five successive years. They were divided into three comparable groups and placed on their respective rations for an average period of 274 days. Each group was fed a scratch grain mixture consisting of 200 pounds each of wheat, cracked corn and oats.

The following ingredients were common in the mash mixture of each group of birds: 50 pounds of beef meal, 30 pounds alfalfa leaf meal, 25 pounds each of fish meal, dried buttermilk and charcoal, 15 pounds of bone meal, 5 pounds of salt and 1 gallon of cod liver oil.

Group I was placed on the standard mixture consisting of 100 pounds each of bran, shorts, middlings, crushed oats, corn meal and including the above ingredients common to all mash mixtures.

Group II received a mixture of 150 pounds of ground barley, 175 pounds ground oat groats, 100 pounds ground wheat, 75 pounds of ground corn meal, and including the above ingredients common to all dry mash mixtures.

Group III received a mixture made up of 175 pounds of ground barley, 200 pounds ground oat groats, 125 pounds of ground wheat plus those ingredients given above, which were common to all three dry mash mixtures.

The five-year results are briefly summarized as follows:—

COMPARISON OF DRY MASH MIXTURES FOR EGG PRODUCTION, YEARS 1930-31 TO 1934-35

Results—Five-Year Average

—		Lot I	Lot II	Lot III
Number of days on experiment	No.	274·6	274·6	274·6
Average number of birds on experiment	"	29·79	28·65	29·39
Average number of bird days on experiment	"	8,179·8	7,869·6	8,071·8
Scratch grain consumed	Lb.	1,518·20	1,424·20	1,428·70
Mash consumed	"	739·40	658·80	738·00
Beef scrap consumed	"	16·40	6·20	7·20
Shell consumed	"	50·06	46·3	45·76
Grit consumed	"	24·14	15·10	20·46
Roots consumed	"	502·30	502·30	502·30
Green feed consumed	"	1·60	1·60	1·60
Total feed consumed	"	2,852·10	2,654·50	2,744·02
Total eggs laid	No.	4,416·2	4,177·40	4,285·60
Average number of eggs per bird	"	148·24	145·81	145·82
Total weight of eggs	Lb.	531·98	489·70	503·22
Pounds of feed per pound of egg	"	5·36	5·42	5·45
Total cost of feed	$	40·1010	38·6822	40·6315
Total value of eggs	"	72·3770	68·2569	71·0919
Return over feed per pen	"	32·2760	29·5747	30·4604
Return over feed per bird	"	1·0830	1·0322	1·0364
Feed cost per dozen	cts.	·1090	·1111	·1138
Feed cost per bird	$	1·3460	1·3500	1·3820

The results of these three feeding trials, as measured by the egg production per bird fed, feed consumption per pound of eggs, as well as returns over feed costs, show no significant difference between the three rations tested under the conditions of this experiment.

BARLEY VERSUS CORN FOR POULTRY

The purpose of this feeding test was to compare the value for egg production of barley and corn. The two rations contained the same ingredients except in Group II corn replaced barley in both the grain and dry mash mixtures.

Seventy-five Barred Rock pullets were selected each fall for two consecutive years, divided into two comparable groups and placed on their respective rations for an average period of 182 days.

The following ingredients were common in the dry mash mixtures of each group: 100 pounds each of bran, shorts, middlings and crushed oats; 75 pounds of beef meal; 25 pounds each of fish meal and buttermilk; 15 pounds of bone meal; 50 pounds of charcoal; 5 pounds salt and 1 gallon of cod liver oil.

Group I received a scratch grain made up of 100 pounds each of wheat, oats and barley and a dry mash made of the above dry mash ingredients, plus 100 pounds of ground barley.

Group II received a scratch grain made up of 100 pounds each of wheat, oats and cracked corn, and the dry mash mixture, given previously, as common to both groups, plus 100 pounds of corn meal. In other words, both groups received the same rations with the exception that Group II had corn substituted for barley.

The average results are summarized in the following table:—

THE AVERAGE RESULTS OF TWO SIX-MONTH FEEDING TRIALS OF BARLEY VERSUS CORN FOR POULTRY

—		Group I Barley	Group II Corn
Number of days on experiment	No.	182·5	182·5
Number of bird days	"	5,756·5	5,832·5
Average number of birds	"	31·54	31·95
Scratch grain consumed	Lb.	1,147	1,154
Dry mash consumed	"	456·5	388
Beef scrap consumed	"	82	41
Roots consumed	"	466	466
Grit consumed	"	20·75	14·75
Shell consumed	"	42	42
Total pounds of feed consumed	"	2,214·25	2,105·75
Total eggs laid	No.	3,068	2,844·50
Average number of eggs per bird	"	97·27	89·02
Total weight of eggs	"	315·89	300·27
Pounds of feed per pound of eggs	Lb.	7·10	7·01
Total cost of feed per pen	$	31·02	29·43
Total value of eggs	$	53·45	48·60
Returns over feed cost per pen	$	22·43	19·16
Returns over feed cost per bird	$	0·71	0·60
Feed cost per dozen	cts.	·12	·12

The average price of barley was $1.44 per hundredweight and for corn $1.55.

The results of this test, as measured by the egg production per bird, feed consumption per pound of eggs and returns over feed cost, show a slightly higher average production in favour of Group I (barley fed), as well as an increase in returns over feed cost. But the pounds of feed consumed per pound of eggs produced was practically the same for both groups.

There was an outbreak of avian bronchitis in the two groups during November and December of 1931. The corn group dropped from 52·8 per cent production to 28 per cent. The barley group dropped from 52 per cent to 38 per cent. One bird was lost from Group I and two from Group II.

The difference resulting from the two feeds could hardly be considered significant. To procure further data on the possibilities of substituting barley for corn in poultry rations, this work was carried one step further. Briefly, the procedure was to raise the young chicks hatched from the eggs of Group I (barley fed) and the young chicks hatched from the eggs of Group II (corn fed) up to maturity on these respective rations to compare the effect, if any, of barley versus corn on the growing chicks, as well as the subsequent effect it might have upon the egg production of these birds and their succeeding progeny. This work was continued for four successive years. The only change made in the ingredients was to increase the portion of wheat, barley and corn in the respective grain rations. The reason for this was because the birds were confined to the houses for a much longer period than those in the previous tests. Group I received a grain ration made up of 200 pounds each of barley and wheat and 100 pounds of oats, and a dry mash mixture of 100 pounds each of bran, shorts, middlings, ground barley and ground oats, 50 pounds of beef meal, 25 pounds each of fish meal, dried buttermilk and charcoal, 30 pounds of alfalfa leaf meal, 15 pounds of bone meal, 5 pounds of salt and 1 gallon of cod liver oil.

Group II received a grain ration made up of 200 pounds corn, 200 pounds wheat and 100 pounds of oats. The dry mash was the same as for Group I except 100 pounds of corn meal was substituted for the 100 pounds of ground barley.

In the table that follows the average results obtained for the four-year period are summarized:—

BARLEY VERSUS CORN FOR EGG PRODUCTION 1932-33 TO 1935-36

Four-Year Average Results

—		Barley Ration	Corn Ration
Number of days on experiment	No.	336	336
Number of birds on experiment (average)	"	27·73	28·35
Number of bird days on experiment	"	9,317·75	9,525·60
Scratch grain consumed	Lb.	1,766·75	1,838·12
Mash consumed	"	877·75	829·38
Shell consumed	"	65·25	61·55
Grit consumed	"	41·88	36·02
Roots consumed	"	588·63	588·63
Green feed consumed	"	2·00	2·00
Total feed consumed	"	3,342·26	3,355·70
Total eggs laid	No.	4,742·75	5,213·00
Average number of eggs per bird	"	171·03	183·88
Total weight of eggs	Lb.	593·24	644·14
Pounds of feed per pound of egg	"	5·63	5·21
Total cost of feed	$	46·2455	46·8450
Total value of eggs laid	$	81·7000	91·9240
Return over feed cost per pen	$	35·4545	45·0790
Return over feed cost per bird	$	1·3064	1·5901
Feed cost per dozen eggs	cts.	·1171	·1078
Feed cost per bird	$	1·7040	1·6524

The results of this experiment, as measured by (1) the egg production per bird, (2) feed consumed per pound of egg production, and (3) returns over feed cost, show a difference in favour of Group II (corn fed). Further feeding tests would seem to be necessary to permit very definite conclusions being drawn. The market price of the two feeds would be a governing factor.

Dates of Hatching

For the past 12 years data have been compiled on all eggs set during the months of March and April. The purpose was to compare the fertility, hatchability of eggs set and livability of chicks hatched during these two months.

There was an average of 1,202·8 eggs set in March and 1,326·3 in April. The average fertility for March was 77·26 per cent; of the total fertile eggs, 50·75 per cent hatched. The average fertility for April was 73·30; of the total fertile eggs 52·48 per cent hatched. The total eggs required for one chick hatched was 2·54 eggs for March, compared with 2·59 eggs for April. All other things being equal, these results do not indicate a significant difference in fertility, hatchability or in livability of chicks in the March versus April settings.

For the past 11 years records have been kept on the fertility and hatchability of eggs from hens and pullets, as well as the livability of the chicks.

Briefly, the data collected over the 11-year period show that much better results were obtained from the hens than from the pullets. The fertility averaged 77·36 per cent for the hens and 71·25 per cent for the pullets. The percentage of fertile eggs hatched was 51·98 for the hens and 29·91 for the pullets.

The percentage of chicks alive when wing banded was 87·23 for the hens and 71·36 per cent for the pullets.

The data show that it required an average of 2·32 eggs for each chick hatched from the hens and 4·68 eggs hatched from the pullets.

The average of these results indicates quite definitely that hens are preferable to pullets for breeding work. Occasionally it might be found advantageous to breed pullets for special breeding requirements, but generally speaking it is not good policy.

Cost of Raising Chicks

During the past five years data on the cost of raising chickens to five months of age have been collected. These cost figures include (1) fuel and eggs for incubation at market value; (2) fuel and chick feed for the brooding period; (3) feeds of all kinds consumed from the end of the brooding period to the age of five months.

In the following table is given the total number of pullets and cockerels on which complete records were kept for each of the five years:—

COST OF RAISING CHICKS

Year	No. Pullets	Total Cost	Cockerels	Total Cost
		$		$
1932	451	230·810	194	125·390
1933	289	130·311	167	66·206
1934	468	243·285	81	47·033
1935	383	198·963	176	127·358
1936	494	269·048	140	92·890
Total	2,085	1,072·417	758	458·877
5-year average	417	214·483	151	91·775
Average cost per chick	.....	·514	.....	·654

The average of these results shows that pullets cost 51 cents and cockerels 65 cents.

Egg-Laying Contest

The Nova Scotia Egg-Laying Contest was started at Nappan on November 1, 1919, and continued each year until the end of the 1935 contest.

The contests have done more to bring the true value of the poultry industry to the fore than has any other one project undertaken. The contest brought before the average breeder three very important facts: (1) That there was more in strain than in breed; (2) that a strain of bred-to-lay birds, no matter what breed, was profitable; (3) that in a reasonably short time, by proper breeding, selecting and feeding, a profitable flock could be developed.

The contest proved to be a good medium through which outstanding bred-to-lay strains could be procured. They were extremely helpful to each contestant, giving him an official record of the progress he was making each year on his own plant, in addition to being a wonderful advertising medium at a very low cost.

The data recorded from year to year, together with observations made of the effect the contest had in creating a greater interest in the possibilities of the poultry industry, substantiate the preceding statements. No better example could be given than a comparison of the average production of the first contest held in 1919-20 with that of the last contest conducted in 1934-35.

The average production for 1919-20 was 122 eggs, as compared with an average of 203 eggs for 1934-35.

The following table gives the results of the last five contests held at the experimental farm, Nappan, as well as the five-year average:—

CONTEST FIVE-YEAR AVERAGE 1930-31 TO 1934-35

Contest Year	Bird Days	Birds	Eggs	Value	Feed Cost	Return over Feed Cost	Eggs per Bird	Pounds of Feed
		No.		$	$	$	No.	Lb.
1934-35	77,170	216·16	44,012	842·26	445·88	396·38	203·14	33,950
1933-34	84,216	235·90	43,528	770·16	422·61	347·55	184·07	30,470
1932-33	110,730	310·17	59,867	796·77	516·31	280·46	193·01	36,364
1931-32	89,431	250·50	45,239	617·92	389·46	228·46	180·50	24,651
1930-31	104,817	293·60	57,109	912·85	563·06	349·79	194·51	39,356
Totals	466,364	.....	249,755	3,939·96	2,337·32	1,602·64	.....	164,791
5-year average	93,272·8	261·26	49,951	787·992	467·465	320·528	191·19	32,998·2

During the past five years there was an average of 93·2 birds which qualified for registration, or a total of 461 females. The above figures show that the average production for the five-year period was 191 eggs and that the average return over feed cost was $1.23 per bird. The average feed cost per dozen eggs produced was 11 cents.

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