DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

EXPERIMENTAL STATION
LACOMBE, ALBERTA

PROGRESS REPORT
For the Years 1932 to 1936

F. H. REED
Superintendent

Harvesting at the Experimental Station, Lacombe, Alberta, with Station Buildings in the background. Note the gently rolling park belt country typical of Central Alberta.

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INTRODUCTION

Until 1931 the review of each year's work at the station was presented in the form of an annual report. Since that time it has not been possible to have such reports published. However, during the years from 1932 to 1936 considerable experimental work has been conducted, and in order that farmers may benefit from the information thus secured, this progress report has been compiled.

This report is a summary of work in the major projects conducted at the station. In the limited space available it is impossible to publish all the details of the work, or to include long tables; but these are replaced to some extent by observations made during the course of the work, and conclusions drawn from the results secured.

ANIMAL HUSBANDRY

HORSES

A breeding stud of Clydesdale horses is maintained at this station headed by the imported stallion Strathore James —26996—, whose services are available to breeders under the new horse breeding policy introduced in 1935 by the Dominion Department of Agriculture. The main object of this policy is to assist in the production of a supply of high-class foundation breeding stock, particularly young sires, for the improvement of the horse industry.

During the year 1935 only 18 mares were bred to Strathore James but after the policy had been considerably altered for the 1936 breeding season, 54 sound, high-class mares were brought into the station for service. Further information in connection with this program may be obtained by writing the Superintendent of this station.

The objects in keeping Clydesdales at this station are:—

1. To produce high-class pure-bred breeding stock for distribution to breeders and farmers.
2. To demonstrate the advantages of pure-bred or high-grade mares for the production of a superior type of horse for use on farms and for market.
3. To study methods of feeding and management for stallions and brood mares, and for raising young horses.
4. To study the cost of rearing young stallions and fillies until breeding age.
5. To study the use of potassium iodide and possibly other means of prevention and cure for joint-ill in foals.

During the past five years eight young pure-bred stallions have been sold to farmers and as they have all been of good type and breeding they should be instrumental in raising the standard of the horses in the districts in which they were placed.

Several years' experience has demonstrated that brood mares wintered in the open and fed a variety of green oat sheaves, oat straw and hay under Alberta conditions, keep in good flesh and produce stronger, better foals with much less sickness than when these mares are kept in the stable, fed a grain ration and regularly worked.

After their second winter, all horses except stallions, unless working, are wintered in a bush lot and fed from a self-feeder. Water is always available in a trough with a tank heater. The mixture of cut sheaves and cut oat straw

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is available to the horses constantly from the self-feeder and on two days a week coarse mixed hay spread on the ground is fed. Work horses and brood mares handled in this manner come through the winter in good condition for spring work or foaling.

The regular feeding of potassium iodide to both mares and stallions has given good results. In the nine years since this practice was started, out of 53 foals born only six have been lost from joint-ill while previous to the feeding of potassium iodide, heavy losses of foals frequently occurred from this cause. Several methods have been tried but the safest is to feed one-quarter teaspoonful of potassium iodide crystals in chopped oats to each stallion or breeding mare once every week. This is not expensive and has a beneficial effect on the reproductive organs.

Group of Clydesdale mares owned by the Experimental Station, Lacombe, with first foals by the imported stallion Strathore James—26996.

SHORTHORN CATTLE

A change in the cattle-breeding work was effected in the year 1932. The Aberdeen-Angus herd was sold and the Holstein herd was transferred to the experimental station at Lethbridge, Alta. A foundation herd of pure-bred Shorthorns was started from cattle received from the experimental farm at Indian Head, Sask., and the experimental station at Swift Current, Sask. This change was made necessary by the adoption of the policy of keeping not more than one breed of cattle on any one western farm or station. As the Lacombe station is situated in the heart of a prominent Shorthorn district, it seemed the logical place for Shorthorns.

In February, 1934, an additional five head of pure-bred Shorthorn females were purchased from Wm. Hudson, Kathyrn, Alta. The total number of foundation females transferred and purchased to establish the pure-bred Shorthorn herd at Lacombe was 45 head.

The object of the breeding operations is to endeavour to establish by constructive breeding and selection a Shorthorn herd combining true Shorthorn type and character with good production of milk and butterfat.

Normal cows and heifers that have not previously been tested or that give promise of bettering previous records are entered in the Canadian Record of Performance for pure-bred dairy cattle as soon as they freshen, in order that

as many bulls as possible sold from the herd may have the necessary credentials in the way of official milk records. The 305-day record is the objective as there is a calving limit of 400 days, but where they do not hold to a service early enough to have them drop a calf within the time limit for the 305-day division, they are carried on for the 365-day record. The average production of 34 cows and heifers finishing a lactation period within the calendar years 1932 to 1936 inclusive was 7,777 pounds of milk and 326 pounds of fat in 360 days.

Twenty-four cows and heifers completed R.O.P. tests within this five-year period with an average production of 8,433 pounds of milk and 339 pounds of fat in 336 days.

The Shorthorn herd is free from tuberculosis, having successfully passed its fifth accreditation test in October, 1936.

SALES OF BREEDING STOCK

During the past five years the rigid selection of females in an endeavour to improve the type and production of the herd has meant few females available for sale as breeders. As a consequence, the bulk of the sales were made up of bulls, which were sold at very reasonable prices considering their type and breeding. Then too, as a result of the blood test, the herd has been so badly depleted that in addition to the fact that it has been impossible to carry on much cattle-feeding experimental work, sales of breeding stock have been greatly curtailed.

MILK PRODUCTION OF PURE-BRED COWS

The milk given by each cow is weighed morning and evening during her entire lactation period and recorded on a stable milk sheet.

The total feed cost for each month of the calendar years 1932 to 1936 inclusive was recorded, and from this the cost per 100 pounds of milk was computed. The monthly feed charges not only took into account the cost of the feed consumed by all hand-milked producers in the herd during the actual lactation period, but also during the dry period preceding the lactation. The feed for the cows and heifers in the herd that are inclined toward beef lines and were suckling calves was not included in the feed cost. In the case of heifers with their first calves, charges for feed include the consumption from a date approximately two months prior to parturition to the time of being dried off preparatory to their second calving. In the case of cows with their second calves, charges for feed include the period from the time of drying up at the end of the previous lactation period to the end of the next.

The labour cost of caring for the cattle, the interest on the investment, depreciation, etc., was not taken into consideration nor was the value of the calf.

Feed prices were based on the actual cost of purchased feeds, and the cost of producing home-grown feeds.

The meal ration was made up of four parts oat chop, one part bran and one part oilmeal. The meal ration was fed at the rate of one pound to each four pounds of milk produced.

The average feed cost to produce 100 pounds milk at this station during the last five years was 51 cents in 1932, 55 cents in 1933, 79 cents in 1934, 86 cents in 1935, and 84 cents in 1936.

The average percentage of fat in the milk in 1932 was 3·70; in 1933, 3·52; in 1934, 4·17; in 1935, 4·39; and in 1936, 4·16.

Farmers watching parade during live stock field day.

ALFALFA MEAL VS. BRAN

To obtain information as to the relative feeding value of alfalfa meal and bran, two experiments have been conducted involving 17 milch cows during the winters of 1932 and 1933. The alfalfa meal was made by putting good quality alfalfa hay through a Letz grinder.

Prior to the test, the alfalfa meal and the bran with which it was to be compared were analysed by the Dominion Chemist. From an analytical standpoint, the alfalfa meal excelled the bran in one point only; that is in the amount of ash or mineral matter that it contained.

The milch cows that were set aside for these experiments were fed the following rations:—

Period 1—Standard roughage and meal ration.
Period 2—Standard roughage ration with alfalfa meal replacing bran in the grain ration.
Period 3—Standard roughage and meal ration.

To obtain the percentage of butterfat, a test was taken during the final week of each period.

The standard ration consisted of mixed hay, oat greenfeed, corn silage, and a meal mixture made up of oat chop, 400 pounds; bran, 200 pounds; and oilmeal, 150 pounds. The experiment was divided into three periods of three weeks each. By averaging the results of periods one and three and comparing with period two, a fair basis of comparison was obtained. Bran was valued at $14 per ton and alfalfa meal at $17 per ton. This brought the meal mixtures to $17.20 and $18 per ton respectively.

In the first test the alfalfa meal ration produced 112·3 pounds or 4·34 per cent more milk than the ration containing bran. The cost of milk production did not differ materially with the two feeds, any advantage lying with the alfalfa meal ration.

In the second experiment, the milk and fat production on alfalfa meal and bran was practically the same. An analysis of the results showed a very unusual occurrence in that the feed cost to produce 100 pounds of milk was exactly the same for both feeds.

The results of the two tests show that alfalfa meal of the quality used in these experiments is as valuable a supplement to the meal ration of cows in milk as is bran and could be used to replace bran provided it can be bought at approximately the same price.

SWINE

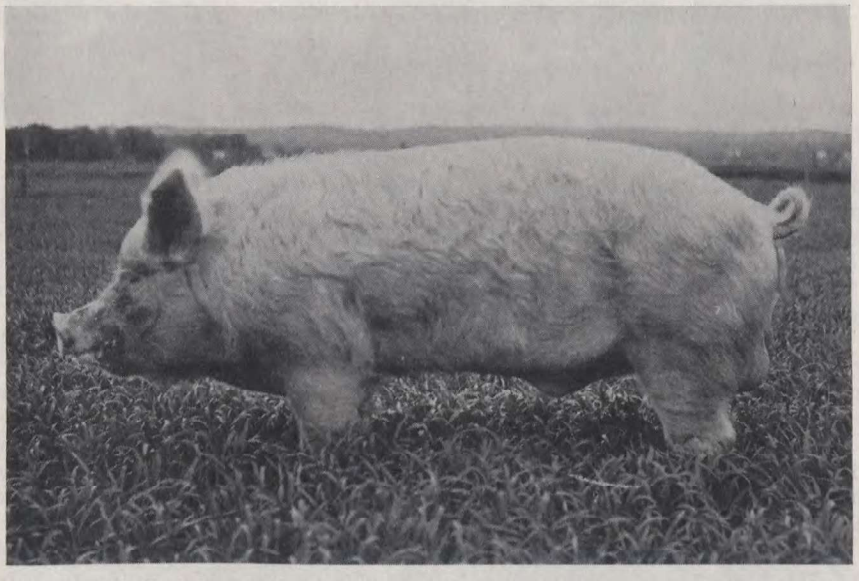
The breeding of swine continues to form one of the major divisions of the live stock work conducted at this station. This is as it should be, since swine raising is one of the foremost branches of agriculture and is gradually increasing in importance from year to year.

The high quality of the swine herd of pure-bred Yorkshires at this station has been well maintained during the past five years through continued selection of the sow herd, and by the introduction of valuable new blood as represented by two imported boars.

The boar Weston Bob 18 (imp.) —164676—, bred by H. W. White, Spalding, Lincolnshire, England, was imported in November, 1933, by the Dominion Live Stock Commissioner and transferred to this station in the spring of 1934. He possesses fleshing of back and loin superior to Canadian-bred Yorkshire boars. Crossed on the Yorkshire sows at this station, this boar has brought about an advancement in the way of increased substance and strength in the offspring as well as an improvement in fleshing qualities of back, loin, and ham.

The boar "Malte of Svalof" (imp.) —179619—, born June 17, 1933, is a Swedish Large White (Yorkshire) boar of tested ancestry. He was imported from Sweden in the spring of 1934 by the Dominion Live Stock Branch and during the past two years has been mated with a number of Canadian-bred Yorkshire sows to determine the suitability of Swedish Large White boars for mating with Canadian Yorkshire sows. Results so far indicate that Swedish Yorkshires are more economical feeders than pigs from the Canadian-bred boar. The Swedish boar is well filled in the ham and has a heavy coat of good quality hair. His progeny, for the most part, are outstanding in these characteristics.

The entire herd of Berkshire swine which had been bred at this station for 19 years was disposed of in the fall of 1932 owing to its lack of bacon type and the limited demand for breeding stock of this breed.



The Swedish Yorkshire boar Malte of Svalof (imp)—179619—senior herd sire at the Dominion Experimental Station, Lacombe, Alberta. This boar was imported from Sweden in 1934 by the Dominion Live Stock Commissioner.

Tamworth swine which had been bred at this station for ten years were discarded in 1935 at which time it had been well established that the Yorkshires were more prolific and made the best mothers, and further that the demand for Tamworth breeding stock had decreased to a point where it would not justify the maintenance of the herd for this purpose alone. Young sows especially are inclined to give rather small litters. Improvement in prolificacy is a requirement of the breed at the present time.

LANDRACE SWINE

A shipment of Swedish Landrace hogs from the Central Experimental Farm, Ottawa, Ontario, consisting of three two-year-old sows, three Canadian born gilts and one young unrelated Canadian born boar, arrived at this station in October, 1935.

The Landrace is the breed used in producing the famous Danish bacon for the British market. These pigs were purchased in Sweden by the Live Stock Branch of the Dominion Department of Agriculture. They are, however, essentially the same breed and type as the Danish Landrace.

These pigs are being tested to determine the number and size of litters produced, the feed consumption per 100 pounds of gain, and slaughter data. These tests are being conducted under the Advanced Registry Policy, the same as is now in operation for pure-bred swine. No distribution of Landrace breeding stock will be made until such time as their merits as a pure breed or for cross breeding have been demonstrated under Canadian conditions.

SALE OF BREEDING STOCK TO FARMERS

Supplying choice pure-bred breeding stock to farmers at reasonable prices is one of the policies of the Dominion Experimental Farms. This has been carried on very effectively with hogs as well as with other classes of stock at this station.

During each of the last five years there has been a greater demand for swine breeding stock from this station than could be filled. During the five-year period 568 hogs were sold for breeding purposes of which 253 were boars, and 315 were sows. The sales were made not only to farmers but to Government institutions as well, and at the present time the foundation stock in practically every prominent herd in the Prairie Provinces and British Columbia was received from this station.

In addition to the sales of breeding stock, a considerable amount of pork was marketed during the years 1932 to 1936 inclusive. Of the 1,158 head marketed as pork, 66·6 per cent graded select bacon, 26·1 per cent graded bacon and 7·3 per cent butchers. Had the hogs sold for breeding been sold commercially, the percentage of selects would have been greatly increased.

PROLIFICACY OF DIFFERENT BREEDS OF SWINE

The prolificacy of a breed of pigs is a very important point, directly affecting the profits of the breeding and feeding operations. The figures presented in the following table are compiled from farrowing records at this station for the years 1925 to 1936 inclusive:—

AVERAGE SIZE OF LITTERS OF DIFFERENT BREEDS

——	Yorkshire 12 year average	Berkshire 8 year average	Tamworth 10 year average
Total number of litters	388	77	139
Total number of pigs farrowed	4,647	722	1,191
Average number of pigs per litter	11·98	9·38	8·57
Total number of pigs raised to weaning	3,012	529	844
Average number of pigs weaned per sow	7·76	6·88	6·07

A COMPARISON OF SPRING AND FALL FARROWING RECORDS

Farrowing data secured at this station indicate that there is little difference between the size of spring and fall litters. Records for the 14 years 1923 to 1936 inclusive show that 529 sows of all ages and breeds farrowing in the spring during those years gave birth to 5,598 pigs or an average of 10·6 pigs, while the 194 sows farrowing in the fall produced 1,954 pigs or an average of 10·1 pigs to the litter. There is a much greater difference, however, in the percentage of live pigs farrowed that were raised. Of these 5,598 spring farrowed pigs only 4,078, or 72·8 per cent were raised to weaning at eight weeks of age. Of the 1954 fall farrowed pigs, 1,515 or 78 per cent were raised to weaning age. The sows farrowing in the fall brought 5·2 per cent more pigs through to weaning age than did those farrowing in the spring. It is interesting to note, too, that only 8·5 per

cent of fall farrowed pigs as compared with 10·6 per cent of spring farrowed pigs were dead at birth.

For good results, fall litters should be farrowed not later than September 15. Pigs farrowed before this date usually are well enough developed to stand the cold weather when it comes. In order to have the pigs born in the first half of September, the sow must be bred between May 10 and May 25. If she is to wean her spring litter before being bred she must farrow during the latter part of March or early in April. Almost invariably, the best pigs and the largest profits come from the early spring and the early fall litters.

The raising of two litters a year would allow a more constant flow of hogs to the market with a resultant general benefit to the industry as a whole. The average sow will not successfully raise two litters every year, but the policy of raising three litters from each sow every two years would help to close up the gap in production.

RATE AND ECONOMY OF GAINS BY PIGS

The marketing of hogs only when they have reached the correct weight of from 200 to 230 pounds at the farm, and have acquired the proper finish, is one of the greatest problems of the bacon industry. The marketing of light weight unfinished, and overweight hogs causes large annual losses to farmers. Equally important is the fact that the poor grade bacon produced from these hogs is a constant menace to the standing of Canadian bacon.

Experiments at Lacombe have shown that it pays to feed hogs well from the time they are weaned, and to market as soon as they are up to the proper weight and finish. Growth and feeding data on 109 hogs show that as the hogs grew older they required more and more feed for 100 pounds of gain, with a resultant increase in the cost of gain.

The pigs weighed an average of 31·7 pounds at the weaning age of 60 days. The growth and feeding data were taken at 30-day intervals throughout the life of the hogs and the results point out several facts of great important to the pork producer.

It required 319 pounds of grain to produce 100 pounds of gain for the first 30 days, 375 pounds for the second 30 days, 378 pounds for the third 30 days, and 442 pounds for the final 38-day period, the average requirements for the total period being 392 pounds of grain per 100 pounds of gain.

The average daily gain per hog started at 0·87 pound for the first 30 days, 1·14 pounds for the second 30 days, 1·51 pounds for the third 30 days, and 1·62 pounds for the final 38 days, the average daily gain for the full period being 1·31 pounds.

Feeders are frequently misled by the gains made by their hogs when about 220 pounds in weight. Because they are making more rapid gains than when they are younger and smaller, they believe they are making cheaper gains. It is true that they are making greater gains but each pound is put on at greater cost than when the pigs are younger.

With a steadily increasing cost per pound of gain for pigs over 220 pounds in weight and a heavy cut for "heavy" hogs, it does not pay to feed hogs after they are up to proper weight and finish. Similarly with a heavy cut in the price of light weight, unfinished hogs, which produce a low quality bacon, it pays to feed pigs until the proper weights and finish are reached.

ADVANCED REGISTRY POLICY FOR SWINE

The Advanced Registry Policy for pure-bred swine which is being promoted by the Dominion Department of Agriculture was placed on an official basis in 1929. In general the plan provides for testing the ability of individual sows to farrow and wean large litters of pigs capable of making rapid growth with economy of feed and of yielding carcasses of high commercial worth. The

breeder owning sows and boars qualifying under this scheme is in a position to supply superior breeding stock to commercial producers and incidentally is entitled to a premium for stock from proved ancestry.

Breeders voluntarily enter their sows with the Dominion Live Stock Branch at Ottawa, giving notice when the sows are bred. Before the litter is weaned an inspector tattoos and weighs the pigs. At this time the owner designates five pigs for slaughter, four of which will eventually go through a packing plant in the quality test. In order to qualify, a sow must wean at least eight pigs. The four pigs nominated for the slaughter test must show an average gain of 200 pounds in 200 days or the equivalent thereof before the sow can qualify for maturity. The qualifications for the slaughter test are more complicated, but the four pigs selected from the litter, for this purpose, when dressed must show a certain weight, length, thickness, evenness, finish, balance and quality. By this system of testing it is possible to obtain accurate information as to the breeding qualities and productive ability of the sows in the herd, the rapidity of growth made by their pigs, and on the quality of bacon produced.

If the sow qualifies she is given an Advanced Registry (A.R.) number which is recorded along with the pedigree.

A qualified Advanced Registry boar is one that has sired at least three litters, the dams of which have qualified as a result of scores secured through such litters.

TESTING SWINE UNDER THE ADVANCED REGISTRY POLICY

During the years 1929 to 1936 inclusive, growth and feeding data have been carefully compiled at this station on 82 litter groups entered in Advanced Registry. During the years 1929 to 1932 inclusive the complete litters with the exception of a few pigs kept from some of the litters for breeding purposes were included in the experimental project, although the scheme called for five pigs from each litter only, four of which were to be used for slaughter. The five pigs nominated from each litter were fed with the other pigs in the litter, up to market weight. During the past four years however only the five nominated pigs were used for test purposes. When each of the four pigs nominated from each litter reached its proper development, it was shipped by express to a packing plant at Edmonton for the slaughter test.

The individual hogs in each litter group were weighed when the pigs were weaned and put on test, at the end of each 30-day period and at the termination of the experiment. A record was kept of the amount of feed consumed by each group of pigs during the feeding period from weaning to slaughter. Changes in rations were made at the end of 60- and 30-day periods, and the amount of feed consumed during each period was recorded.

The grain ration fed for the first 60 days following weaning consisted of equal parts of shorts, finely ground oats and barley. At the end of the 60-day period the ration was changed to include two parts of barley to one part of oats and one part of shorts. During the period, 90 days to finish, the shorts were eliminated from the ration and the percentage of barley chop increased to four parts of barley to one part of oats. Buttermilk was supplied to each litter group twice daily throughout the duration of the test.

The growth and feeding data of 82 litter groups entered in Advanced Registry during the years 1929 to 1936 inclusive, are summarized as follows:—

Number of pigs		530
Average initial weight at weaning	pounds	32·2
Average finished weight at farm	pounds	204·0
Average daily gain	pounds	1·29
Feed required for 100 pounds gain:		
Grain	pounds	342·06
Buttermilk	pounds	764·66

A point not indicated above is that in the 82 litter groups tested there was a wide variation in the amount of feed and the time required to produce 100

pounds of pork. The litter groups were raised under the same conditions and received the same feeds. The best group fed during the eight years required 252 pounds of grain and the poorest, 471 pounds of grain to produce 100 pounds of pork. The time taken to bring the pigs to market weight varied from 170 to 220·4 days. The average daily gain per hog from weaning to slaughter varied from 1·05 to 1·49 pounds. Thus it would seem that there are certain strains of swine which will produce hogs of market weights much more economically and at an earlier age than the pigs of other strains. The purpose of the Advanced Registry work is to ascertain and record the profitable strains and discard the unprofitable strains.

The minimum score required for a sow to qualify is as follows: production, 40; maturity index, 100; slaughter test, 75.

The score for production is obtained by allotting five points for each pig which the sow brings to weaning age so that a sow to qualify for production cannot do so with less than eight pigs weaned, thereby scoring 40 points.

The minimum score for the early maturing factor is 100, which means that the sow has produced with the four pigs nominated at weaning time, an average gain of 200 pounds in 200 days or the equivalent of this rate of gain. A sow having progeny making better gains than these would score more than 100 while a sow producing slow maturing pigs would score less than 100 and would fail to pass the standard for early maturity.

The slaughter test takes into consideration the weight of carcass, length of side, shoulder fat, loin fat, minimum back fat, percentage of middle, the belly thickness, finish, balance of side, and evenness.

The dam is, therefore, rated according to her prolificacy, ability to feed her pigs, their thriftiness and how they score on the rail.

ANALYSIS OF ADVANCED REGISTRY SCORES OF 75 EXPERIMENTAL LITTERS

	Average Scores											
	Yorkshires			Tamworths			Berkshires			All Breeds		
	Production	Maturity Index	Slaughter Test	Production	Maturity Index	Slaughter Test	Production	Maturity Index	Slaughter Test	Production	Maturity Index	Slaughter Test
Sows tested..... No.	54			14			7			75		
Sows tested..... Score	46·95	108·28	75·42	40·00	106·64	77·21	46·43	103·51	61·30	45·60	107·53	74·44
Sows qualified..... No.	34			9			1			44		
Sows qualified..... Score	47·06	108·68	78·65	42·22	107·55	77·44	40·00	106·00	73*	45·91	108·39	78·27
Per cent failing in each test..	.....	1·85	37·08	21·43	7·14	7·14	.....	14·29	85·71	4·00	4·00	36·00

*Qualified when slaughter test requirement was 70.

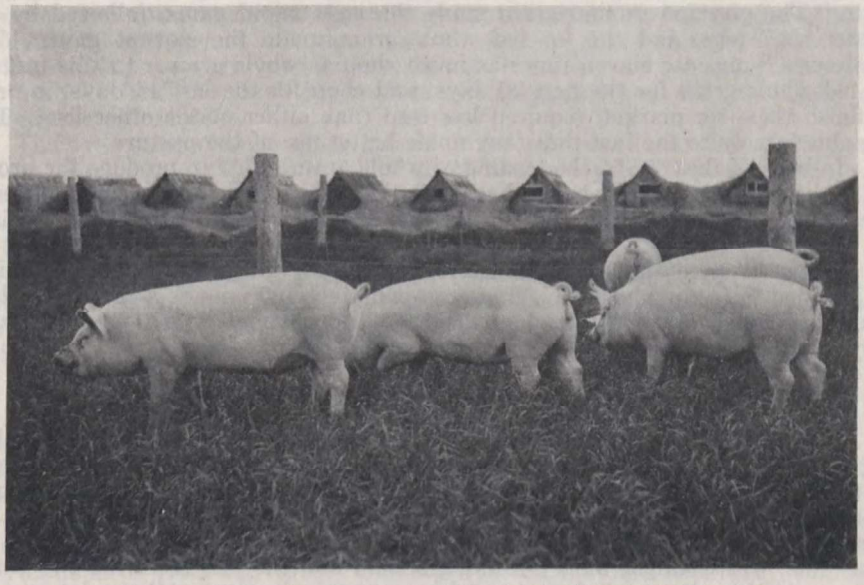
One of the most remarkable features of this table is that it shows that, for Yorkshires and Tamworths, the averages for all sows tested were above the pass mark. This is because of the fact that very few sows of these breeds failed under both maturity index and slaughter test, and most of the sows that failed to qualify lacked only a few points in one test, securing good scores in the other tests.

Another significant point is that Berkshires gave the poorest results under maturity index, with Tamworths next, and Yorkshires best; only one Yorkshire sow failed to secure the necessary maturity index.

In the slaughter test the Berkshires failed badly, and over a third of the Yorkshires went down, but the Tamworths graded quite satisfactorily. However, the Tamworths' difficulty, besides being low in maturity index, was to secure sufficient production.

In all fairness it should be stated that a large percentage of the Yorkshires tested were gilts with their first litters, which was a severe handicap, as older sows score higher in all tests.

The common causes of failure in the slaughter test have been light hams, heavy shoulders and thin bellies.



Advanced Registry Test Group sired by the Swedish Yorkshire Boar, Malte of Svalof (imp)—179619.

EXPERIMENTAL WORK WITH HOGS

During the past five years, the persistent demand for breeding stock has made considerable inroads into the number of young pigs available for experimental test work. Considerable investigational test work, however, has been completed during the five-year period.

PALATABILITY OF GRAINS IN HOG FEEDING

In a palatability test conducted during the winters of 1932-33 and 1933-34, pigs allowed free choice of ground wheat, oats and barley showed a preference for wheat.

Buttermilk was supplied to a total of 34 pigs in these tests, and a mineral mixture of 76 pounds slack coal, 20 pounds salt, 3 pounds ground limestone and 1 pound sulphur was kept before the pigs.

The pigs ate 7,952 pounds wheat, 6,125 pounds barley and 4,253 pounds oats, and made quick and economical gains, averaging 1·18 pounds per day, and consumed only 4·43 pounds meal for each pound of gain, which is decidedly above the average for fall pigs. These good results were due largely to the fact that the pigs had a variety of cereals in their ration.

GROUND VS. UNGROUND GRAIN FOR HOGS

Two experiments comparing whole and ground grain have been conducted, using pigs with an average initial weight of 85 pounds. In the first test during the winter of 1932-33, the pigs fed on chop made 25 per cent higher gains than the

lot fed whole grain, and the whole grain lot had to be put on ground grain for 14 days after the first lot went to market, and required 813 pounds of meal before they had attained the proper finish. The cost of grinding was offset by more complete utilization of the feed, and there was little difference in cost of gains.

In the second experiment, with pigs on pasture, one lot was self-fed unground grain; a second, ground grain and a third had free choice of ground and unground grain. The pigs fed ground grain made the most rapid gains, followed by the "cafeteria" pigs, and the lot fed whole grain made the slowest gains. The "cafeteria" pigs ate eleven times as much chop as whole grain. In this test the lot fed whole grain for the first 90 days, and chop for the last 14 days, in order to finish them for market, required less feed than either of the other lots. This was due largely to the fact that they made better use of the pasture.

In both of these tests, the feeding of whole grain failed to produce the proper finish demanded for select bacon hogs, but the results indicate the possibilities in this method of feeding for the growth and development of gilts to be retained for breeding purposes.

It would seem that in times of low prices for grain and hogs, one might be justified in feeding hogs weighing approximately 100 pounds a ration of whole grain until they have attained a weight of approximately 170 pounds, when they should be finished for market on ground grain.

PROPORTION OF BARLEY FOR HOG FEEDING

In a series of tests to determine the value of barley for feeding and finishing select bacon hogs, 136 spring and fall pigs, averaging 63 pounds in weight, in four lots were fed four different proportions of barley and oat chop ranging from one-half barley to straight barley. The lot fed three parts barley and one part oats made higher daily gains with lower feed consumption than any of the other lots, with straight barley ranking second and the lots receiving two-thirds and one-half barley made lower and less economical gains. All the lots graded 61 per cent select, with the exception of the two-thirds barley fed lot, which graded only 58 per cent select.

The results of these tests would seem to indicate that pigs averaging 63 pounds in weight when put on test and fed heavily on barley, supplemented with buttermilk, through to market weight, develop as satisfactorily from the standpoint of type as pigs fed a proportion of oat chop.

The outstanding point, however, is that barley alone or a mixture of three parts of barley and one part of oats, supplemented with buttermilk, is capable of producing considerably greater gains and also more economical gains with a lower feed consumption than are rations containing a greater amount of oat chop.

The hog market value of barley, computed from the result of this test, varies as follows:—

When hogs are worth:	Barley may be marketed through hogs at:
8 cents per pound	89 cents per bushel
7 " "	77 " "
6 " "	67 " "
5 " "	55 " "
4 " "	44 " "
3 " "	33 " "
2 " "	22 " "

VARIETIES OF BARLEY FOR HOG FEEDING

Trebi barley is gaining in popularity, especially in Central Alberta, where it outyields most other varieties. Some feeders maintain that Trebi barley is less palatable to hogs and inferior in feeding value to O.A.C. 21. O.A.C. 21 has been accepted as the standard by which other varieties of barley have been measured for a number of years. An experiment to compare these varieties was carried out with fall pigs during the fall and winter of 1932-33 and 1933-34 and with spring pigs during the summer of 1933.

In a palatability test in which the pigs were allowed to help themselves to ground Trebi and O.A.C. 21 barley from two self-feeders placed in a feed yard, the pigs showed a greater appetite for O.A.C. 21 barley, eating 0·52 pound more daily per pig. This test covered a period of two years and involved 34 fall pigs. In order to compare the relative feeding value as well as the palatability of Trebi barley with O.A.C. 21 barley for growing and fattening pigs, two experiments feeding barley as the only grain, supplemented with buttermilk and involving 36 spring and fall pigs, were conducted. Both samples used in the feeding trials were very good barley, bright in colour and weighing 52 pounds per bushel. The chemical analysis of the two varieties did not show any appreciable difference.

The two-year average daily gain for the pigs on Trebi was 1·22 pound and on O.A.C. 21, 1·13 pound. The meal required per 100 pounds gain was, for Trebi, 454 pounds, and for O.A.C. 21, 474 pounds. In actual feeding value, 100 pounds of Trebi barley appeared to be equal to 104 pounds of O.A.C. 21 barley.

The results of these tests show that while the hogs preferred O.A.C. 21 to Trebi, when given free access to both, they made slightly higher and more economical gains on Trebi barley than they did on O.A.C. 21 barley. Given no choice, the pigs seemed to take readily enough to Trebi.

FEEDING VALUE OF TANKAGE FOR HOGS ON PASTURE

To obtain information as to the economy of feeding tankage in the ration for growing and finishing hogs when pasture is supplied and the supplements are discontinued at different stages of development, two experiments have been conducted involving 90 pigs of an average initial weight of 42 pounds during the summers of 1933 and 1935. One lot was fed tankage until they averaged 80 pounds in weight; a second lot was fed tankage until they averaged 130 pounds in weight; a third lot was fed tankage until they averaged 150 pounds in weight; a fourth lot was fed tankage until finished; and a fifth lot was fed without tankage. The meal ration for all five lots was identical.

The results showed tankage to exert no influence on the rate and economy of gains after the pigs attained an average weight of 150 pounds. The feeding of tankage to pigs on pasture until they attained an average weight of 80 pounds proved highly beneficial and its special value would seem to be in its ability to get the young pigs away to a good start. Grain fed without tankage to pigs on pasture gave rise to comparatively slow and expensive gains.

DIGESTER TANKAGE VS. BOSS MEAT MEAL

During the summer of 1934 a test was made to compare the value of digester tankage and boss meat meal as protein supplements for growing and fattening swine.

The tankage was 50 per cent protein and the meat meal was 60 per cent protein.

Boss meat meal is a dry rendered product. The materials from which this is made are not processed under live steam, but in jacketed tanks, this resulting in a less odorous and higher protein product than when live steam is used.

Digester tankage is made entirely from the residue of the tanks and the materials are processed under live steam. Some of the proteins are lost when handled in this manner, which would explain the lower protein content than in boss meat meal.

Three lots with nine pigs in each were used for this test. All lots were self-fed the same grain ration throughout the experiment. In addition, lot 1 received

8 per cent digester tankage; lot 2, 8 per cent boss meat meal; and lot 3, which was the check lot, received only the meal ration. Each group of hogs had access to oat-and-rye pasture and a colony house for shade and shelter.

The pigs which received boss meat meal in addition to the meal ration made the highest average daily gains, the most economical gains, and returned the highest net profit. On the basis of grain saved, boss meat meal costing $2 per 100 pounds had an actual value of $4.97 per 100 pounds and digester tankage costing $1.40 per 100 pounds had an actual value of $3.21 per 100 pounds.

THE INFLUENCE OF EXERCISE ON THE DEVELOPMENT OF SHOULDER IN BACON HOGS

An investigation to study the effect of exercise and particularly "rooting" on the development of shoulder and on general carcass quality in the bacon hog; also to compare inside and outside feeding in connection with this problem, was conducted in co-operation with Swift Canadian Company, Edmonton, during the summer of 1934.

One group of pigs was confined to the piggery in a 10-foot by 12-foot pen and was not allowed outside from the time the experiment commenced until the pigs were marketed. These pigs were full hand fed their grain. The second group of pigs was placed on cereal mixture pasture at the start of the experiment and full grain hand fed like the first group. The third group was likewise placed on pasture but their grain ration was limited. For the first 75 days on experiment, the pigs in the third lot were fed at the rate of 3 pounds of grain daily per 100 pounds live weight. At two-week periods the lot was weighed and the ration for the following two weeks was based on these weights. After 75 days of limited feeding the pigs had to be put on a full grain feed in order to get them finished for market. A ration equal to 3 per cent of the body weight did not satisfy the appetites of the rapidly growing pigs, which seemed to be always hungry and had a gaunt, unthrifty appearance.

The lot fed inside required 66 pounds less meal for each 100 pounds gain than the average of the two lots fed on pasture. This means that it cost 59 cents more per 100 pounds gain to feed on pasture. The results of this test indicate that pigs confined to sanitary feeding pens and fed inside under what might be called the Danish plan on a grain ration properly supplemented with feeds high in proteins, minerals and vitamins, make faster and more economical gains than pigs fed similar feeds under outside conditions in a pasture lot.

All of the six pigs which were fed inside graded select, while there were five selects and one bacon in the outside full grain fed lot, and four selects and two bacons in the outside limited grain fed lot.

There was no significant difference in the length of the carcasses in the various lots. The extra exercise taken by the outside limited grain fed pigs and the additional age did not result in extra length in the carcass.

The shoulder represented practically the same percentage of the carcass in all lots. Shoulders represented 27·21 per cent of the carcass in the inside lot, 26·25 per cent in the outside full-fed lot, and 26·96 per cent in the outside limited-fed lot. Under the conditions of this experiment the "rooting" indulged in by the outside pasture pigs and the extra age resulting from the short grain ration did not lead to the development of heavier shoulders.

COMPARISON OF MINERAL SUPPLEMENTS FOR BACON HOGS

During the winters of 1934-35 and 1935-36 an experiment was conducted to determine the value of mineral supplements for growing and fattening fall pigs fed outdoors. Forty-five pure-bred Yorkshire pigs of an average initial weight of 74 pounds were used in these tests. All lots were self-fed the same grain and protein supplement ration throughout the test. A mixture made up

of 75 per cent meat meal (Gainers Super 70) and 25 per cent linseed oilmeal was used as a source of protein in all the lots. This mixed protein supplement was fed at the rate of 8 per cent of the meal ration and was used in preference to the dairy by-products or tankage, as these two supplements not only supply protein but are rich in mineral. In addition to the protein supplement, lot 1 received mineral in the form of "Min-O-Vite" and lot 2 monocalcium phosphate. Lot 3 received the meal and protein supplement ration without additions. In each case, the mineral was thoroughly mixed in the meal at the rate of 2 per cent of the meal ration. All lots were fed outside and had well-banked portable cabins with openings to the south for sleeping quarters. The feeding lots, 16 feet by 28 feet, adjoined each cabin, which provided space for limited exercise and the self-feeder. Water from which the chill had been removed was provided twice daily. The ground was frozen throughout the entire period of the experiment and the pigs were dependent for their mineral supply upon the grain mixture fed.

The feeding of monocalcium phosphate at the rate of 2 pounds in every 100 pounds of meal mixture resulted on the average in a 9-per-cent increase in daily gains and a 7-per-cent decrease in cost of gains.

The feeding of "Min-O-Vite" at the rate of 2 pounds in every 100 pounds of meal mixture resulted on the average in a 10-per-cent increase in daily gains but increased the cost of gains by 7 per cent.

On the basis of grain saved, monocalcium phosphate costing $4.25 per 100 pounds had on the average an actual value of $8.22 per 100 pounds and "Min-O-Vite," costing $9 per 100 pounds, had on the average an actual value of $4.81 per 100 pounds or was fed at a loss of $4.19 per 100 pounds. The addition of 2 per cent of "Min-O-Vite to the ration increased the gains but such gains were not sufficiently large to compensate for the increased cost of the ration at the price charged for this mineral supplement.

FIELD HUSBANDRY

SOIL AND CLIMATE

The portion of Central Alberta served by the station can be divided into four major soil zones: the timber zone, the park belt, the marginal prairie and the short grass prairie.

The timber belt or zone is characterized by a rather infertile gray soil covered with considerable timber and brush. In this zone, rainfall is abundant, cereals are very subject to frost injury, and fertility is an important problem. The limitations of this zone make it necessary for the farmers to practise diversified farming in order to secure a livelihood.

The park belt constitutes the zone where the timber belt merges into the open prairie. It has a very fertile black loam soil, a moderate rainfall, and produces an abundance of natural vegetation. High yields of cereal and forage crops, combined with other natural advantages, make this zone particularly well adapted to diversified farming.

The marginal prairie zone is situated between the park belt and the short grass plains. It has a dark brown loam soil and constitutes the finest wheat growing portion of the province. This zone experiences some very dry years which lend a certain amount of hazard to crop production.

The short grass plains or prairie is the true prairie characterized by a low rainfall and loam soil containing less organic matter than the park belt or the marginal prairie. It is essentially a ranching and wheat growing country which does not lend itself to diversified farming.

Climate is one factor in crop production over which the farmer has no control. For that reason, farm operations should be arranged so that they will

not conflict with climatic limitations. Knowledge of the climate of the district is important, for upon the general weather conditions prevailing throughout the year, and particularly throughout the growing season, depends the kind and, in a large measure, the quantity and quality of the crop produced.

The average annual precipitation at Lacombe for the past 29 years is 17·55 inches. April has 1·26 inches; May, 1·96 inches; June, 3·42 inches; July, 2·71 inches; August, 2·37 inches; and September, 1·60 inches. In other words 75·8 per cent of the precipitation received during the year occurs during the growing season. Over 46 per cent is received during May, June and July when it will do most good. If the precipitation were distributed evenly throughout the year, yields would be considerably less.

Temperature plays a very important part in crop production. Extremely low or high temperatures may cause serious crop damage by burning or freezing the standing crop. It is significant that the average mean temperature at Lacombe for the five months, May, June, July, August and September, during the six-year period 1931-36 was 3·1 degrees above the average of the past 29 years. Undoubtedly there is some correlation between these unusually high temperatures and the more or less droughty conditions which have prevailed during that period.

CULTURAL EXPERIMENTS

A series of cultural experiments was started in 1911 and completed in 1920. The land was uniformly cropped in 1921 and put down to new projects in 1922. The experiments continued until 1931 when the work was again reorganized. It is of particular interest that experiments conducted in 1911 are still of value when interpreted in the light of present day cultural practices.

SUMMER FALLOW TREATMENT

An experiment in which the summer-fallow was ploughed at depths varying from three to twelve inches showed that the depth of ploughing does not materially influence the yield of grain. It would seem as though the best depth to plough is the depth at which the implement used will work to best advantage. The additional cost of deep ploughing is not justified by a corresponding increase in yield per acre. Continued deep ploughing—eight to twelve inches—resulted in a loss of soil fibre and tilth, and thus did considerable damage. Ploughing should be considered as an operation included in the preparation of a seedbed. The cheaper and easier it can be done, the better.

Experiments in which the summer-fallow was ploughed at different depths, at different seasons, and a different number of ploughings, indicated that no one treatment is outstandingly superior to others. This experiment showed that it is possible to produce as large yields of as clean a crop on land that has not been ploughed for ten years—other implements being used to control weeds and prepare the seed bed—as on land ploughed and prepared in the usual way. Annual weeds can be controlled easily with shallow tillage implements, but deep rooted perennials may require deeper tillage implements such as the plough to facilitate their control. In general, any method of tillage that will keep weeds under control will give good results from the standpoint of yield. Certain conditions may arise, however, when ploughing may be essential, and a cheaper way of eradicating weeds and preparing a seed bed than would be the case were only shallow implements used.

Different summer-fallow substitute crops were compared. In general, the substitutes are not so effective in weed control as the bare fallow. This is particularly true when the land is infested with perennial weeds. Corn is one of the most satisfactory intertilled substitutes. Sunflowers are harder on the land than corn, but they are more effective as a smother crop and give a higher

tonnage of green fodder per acre. Roots and potatoes leave the land in good tilth but require too much hand labour to make it possible to grow them in a large way as a substitute crop. Oats for greenfeed or silage are not so good as the intertilled crops when the yield of the succeeding crop is considered; on the other hand, they are less likely to increase the weed content of the soil than a neglected intertilled crop. Growing grain in two, three, four and five row groups cannot be recommended as this provides an excellent opportunity for weeds to increase between the rows.

TREATMENT OF STUBBLE LAND

The treatment of stubble land merits consideration for the reason that over half of the grain grown in the district served by the station is produced on stubble land. Fall ploughing gives a higher yield per acre than spring ploughing and is effective in helping to control perennial weeds, but materially increases annual weeds. Burning the stubble in the fall or spring slightly increases the yield per acre but has been condemned because it intensifies soil drifting and dissipates potential organic matter. It is justified only where the stubble is so heavy that it interferes with tillage and seeding operations, or where it carries an infestation of harmful insects or plant diseases. Disking behind the binder or in the fall is recommended as it germinates a large number of weed seeds which are killed during the winter.

Spring ploughing is preferable to fall ploughing when there is a decided lack of moisture in the fall, but fall ploughing will give higher yields than spring ploughing when the land goes into the winter full of moisture. If the fall is wet and the land is ploughed early in September, worked down at once and goes into the winter full of moisture it will produce nearly as well as a summer-fallow. On the other hand, if fall ploughing is done when the land is dry and the ploughing is left rough, it will not produce nearly so well as spring ploughing. In general, fall ploughing cannot be recommended except when the land is particularly free from weeds and contains plenty of moisture. Any fall tillage given should be shallow such as that given with a disk or cultivator.

Soil drifting, due to depleted organic matter and dry weather coupled with high winds, constitutes another serious objection to fall ploughing.

The results produced by the different treatments of wheat stubble in preparation for wheat or oats indicate that the method of preparing the land had little effect on the yield per acre. Any treatment which keeps weeds in check, thus conserving moisture, is effective as a preparation for grain. It would seem that a tillage method intermediate between disking and ploughing such as tillage with the one-way disk may eventually prove most satisfactory from the standpoint of production and economy.

TREATMENT OF SOD

Experiments designed to show the effect of breaking and handling sod in different ways were conducted. Sod of non-creeping grasses was ploughed at varying depths. Ploughing at depths greater than four to five inches showed little advantage. Ploughing should always be done deep enough to thoroughly cover the trash. Deeper ploughing than this is unnecessary and unprofitable.

Sod will produce highest yields if broken in May or early June and fallowed for the remainder of the season. On the other hand, reasonably good yields are produced if the hay crop is harvested and the land ploughed immediately after hay harvest. The latter method seems to be the most profitable and is the one followed at the station. Dry years and dry districts favour the early ploughing.

Breaking shallow and early and backsetting deeper and later in the fall helps to eradicate grasses with creeping root stalks such as brome, but does not materially increase the yield per acre. The method of eradicating brome most

generally practised in Central Alberta includes ploughing shallow in October and thoroughly double disking both ways with a sharp disk before freezeup. When treated in this way, brome is usually killed almost 100 per cent.

Timothy is difficult to eradicate in wet seasons when it persists and volunteers in the succeeding grain crop. Backsetting timothy sod in the fall tends to increase the amount of volunteer timothy. Backsetting exposes the crowns before they have had time to rot with the result that the plant is able to re-establish itself before winter sets in.

Alfalfa, if ploughed when the soil is full of moisture will send up new shoots from the crown through the furrow slice and thus re-establish itself. The best way to handle alfalfa sod in wet seasons is to shallow plough, keep the land well worked, and backset deeply before seeding the next crop.

Sweet clover sod gives best returns if ploughed as soon as possible after the hay crop is removed and treated as a fallow for the rest of the season. Ploughing at this time requires more power than is necessary if the sweet clover roots are permitted to die before ploughing, but increased yields produced by the early ploughing warrant the expense involved.

A study of experimental data shows that sod of all kinds may be ploughed late in the season in a wet year, and if worked down at once will produce a fair crop. When everything is considered, it is recommended that sod be ploughed fairly early in the season—not later than June on the open prairie and not later than August 1 in the park belt. The late ploughing may be expected to give fair results in the moister areas of the foothills.

SOIL DRIFTING

Any serious soil drifting which has taken place in the park belt has occurred at irregular intervals. The amount of damage done has been relatively small and the years during which this occurs so far apart that it has been difficult to outline experiments to study the problems under local conditions.

Most of the soil drifting which occurs is that which takes place after spring tillage and seeding operations have started, hence is a very difficult problem to handle. Drifting on summer-fallows, such as occurs in the drier areas of the province, responds to recognized control measures. Strip farming, as practised in districts where soil drifting is general, so far has not proved necessary for the park and timber belt of the province.

BARNYARD MANURE AND COMMERCIAL FERTILIZERS

Barnyard manure is not produced in sufficient quantities in Central Alberta to return to the soil the plant food which is removed by the grain crops produced. Nor is barnyard manure an ideal fertilizer for cereals since it tends to produce a rank, leafy, late maturing growth. Since cereals undoubtedly will continue to be the principal cash crops, and since fertilizers for cereals should promote early maturity and seed production, barnyard manure cannot wholly fill the fertilizer requirements for Alberta.

Barnyard manure has given better returns when used on roots and other forage crops than when used on cereal crops. None of the experiments has proved the use of barnyard manure to be profitable financially. On the other hand, the benefits resulting from the use of barnyard manure would seem to justify the expense of putting it on the land, particularly when some disposal has to be made of it. Provided it is not full of viable weed seeds, the practice of applying the unrotted manure direct from the stable to the land is recommended as being most economical and advisable from a practical standpoint. While manure in any form and applied in any way is beneficial, best results are obtained when well rotted manure is either ploughed under or worked into the

soil as soon as possible after it is applied. The application of barnyard manure or straw in any form is recommended where it can be done without additional outlay, such as when men and teams would otherwise be idle.

Ploughing down green manure crops such as field peas, sweet clover, etc., tended to reduce instead of increase the yield per acre of succeeding grain crops. In all probability the reduced yield resulted from loss of moisture utilized by growing the green manure crop which, when ploughed under, left the soil loose and open with a subsequent further loss of moisture by evaporation.

COMMERCIAL FERTILIZER EXPERIMENTS

Experiments conducted warrant some general conclusions being drawn from data tabulated and observations recorded. In general, the judicious use of commercial fertilizers (ammonium phosphate and superphosphate) resulted in increased yields per acre. In a few cases, however, the increased yield per acre was not sufficient to pay for the expense involved.

Rates-of-application experiments indicate that lighter applications are best. A heavy application may develop more plant growth than there is moisture to support during periods of drought, and the fertilizer thus works to the detriment instead of to the advantage of the crop. Since the use of fertilizers is to replace plant food deficiences in the soil, it is wise to err toward light rather than toward too heavy applications. Applications for cereals grown on summer-fallowed land should not exceed 50 pounds per acre. In many cases a lighter application will give more economical returns and a good increase in yield per acre.

Fertilizers should be drilled, not broadcast. Broadcast fertilizer might give no response whatever if no rains occurred to wash it down in the soil. When drilled in direct contact with the seed in the moist soil, it goes into solution and thus is available to the young seedling as soon as the seed germinates.

Fertilized grain develops a sturdy growth in young cereal seedlings which is not manifest in the volunteer plants and weeds between the rows. For this reason, fertilized grain can compete better with both annual and perennial weeds. This does not imply that the use of commercial fertilizer will eradicate weeds, but merely means that the increased vigour of the fertilized cereal plants makes them better able to hold their own in competition with the unfertilized weeds which grow in the spaces between the drill rows and therefore receive less benefit from the fertilizer.

Beneficial results accruing from the use of fertilizer in insect and disease control have been observed. Fertilization hastens early growth and maturity and promotes root development, thus shortening the period during which damage may be done by wireworms and cutworms. Remarkable results in this connection have been observed. The more vigorous fertilized grain is more resistant to disease than the less vigorous unfertilized plants. In one case, an unfertilized crop carried 30 per cent smut infection while the fertilized crop carried less than half as much. Similar examples with other crops and other diseases have been observed.

The advance in maturity and the increase in the strength of the straw resulting from the use of a suitable phosphate fertilizer means a lot to those farming in areas with a short growing season, where early fall frosts are a constant menace and where lodging adds to both the cost and difficulty of harvesting. Under such conditions fertilizers may increase the yield per acre, lower the cost of production, improve by one or more grades the quality of the threshed grain, and thus result in a decided increase in the profit per acre.

While fertilizers have materially increased yields of grain, grasses, legumes, roots, and corn at the experimental station, Lacombe, there are certain instances where their application has not been beneficial. For that reason it is recom-

mended that those contemplating the use of commercial fertilizers should begin fertilizing those areas of the farm which will give the best response, such as a well-cared-for summer-fallow. The experience gained under favourable conditions will enable the operator to more intelligently extend their use to less favoured areas. The use of fertilizers for forage crops in very dry areas is a questionable practice.

The use of fertilizer cannot replace good farming methods. The benefits arising from its use can be fully realized only when used in conjunction with the most approved farming practices, and can never replace proper cultural practices, suitable crop rotation, and the use of approved varieties.

Sheaves of wheat harvested from the same area of unfertilized and fertilized land. Suitable fertilizers increase yields on land which has grown grain continuously without any return of fertility.

ESTABLISHING STANDS OF GRASSES AND LEGUMES

Different soil treatments and different methods of seeding, with and without a nurse crop, have been tried. Stands seeded without a nurse crop yielded nearly twice as much as those seeded with a nurse crop and they continued to produce more, even to the third hay crop.

Seeding with a nurse crop produces good results in a year with abundant rainfall, but is doomed to failure in dry seasons.

The method of establishing stands which has given most general satisfaction is as follows: A stubble field is given shallow fall and spring cultivation

in order to promote germination of weed seeds. The spring growth of weeds is ploughed under in late May or early June and the land immediately worked down into a fine, firm seed bed. The land should be thoroughly packed both before and after seeding. If the ploughing is done early enough, two or three lots of weed seeds can be germinated and destroyed before the seed is drilled about one inch deep during the second or third week in June. Seeding down in this way results in a quick and uniform germination of the seed and the development of a thick vigorous stand before winter sets in.

This method of seeding down permits the partial summer-fallow of the land which involves weed eradication, moisture conservation, and the preparation of an ideal seed bed; and at the same time eliminates risk of damage by soil drifting and cutworms. Seeding too late in the season may result in damage to the young seedlings by high surface soil temperatures resulting from the sun's rays coming in direct contact with the bare soil.

THE PRODUCTION OF WINTER ANNUALS

Considerable experimental work has been done with winter rye. The diverse methods of producing this crop make it one of the best to use in eradicating both annual and perennial weeds.

Winter rye seeded on summer-fallowed land will outyield that grown by any other method. Furthermore, the summer-fallow appears to be the only preparation which can be depended on in dry seasons. On the other hand, other treatments give satisfactory results in years with more abundant precipitation.

Winter rye acts as a weed when sown in the spring with another cereal. Furthermore it may develop sufficient mature kernels to seriously lower the commercial grade of the cereal used as a nurse crop. The most practical preparation for winter rye, other than summer-fallow, is that of stubbling it in following an early maturing crop of wheat, oats, barley or oat greenfeed. If the fields can be cleared, and the rye seeded by September 15, good results are usually secured. Fall ploughing either stubble or sod for rye dries out the soil and produces very unsatisfactory results.

Winter rye does best if seeded between August 1 and September 15. Earlier seedings develop too much top and tend to smother out during the winter, while later seedings tend to winter-kill badly. If the seeding is done late enough for the rye to be in the single leaf stage when winter sets in, it frequently comes through with little injury and produces enormous crops. There is a critical stage in the development of this crop which appears to be when the plant is developing its crown root system. If the land freezes up during this period, the percentage of winter-killing may be very high.

DATES OF SEEDING AND DIFFERENT SPACING FOR CORN AND SUNFLOWERS

Corn and sunflowers were seeded at weekly intervals from May 1 to the second week in June.

Early seedings of corn are not recommended for the reason that late spring frosts may destroy stands from early seedings. The third and fourth week of May is considered the best time to seed this crop in Central Alberta.

Sunflowers are more resistant to frost damage than corn and for that reason may be seeded as early as desired without danger of injury by late spring frosts. The earlier sunflowers are seeded, the better they will yield.

Sunflowers were thinned to different spacings of plants. It was observed that a six-inch spacing in 36-inch rows gave a crop that was best as regards height and size of stalks. Greater spacing tended to produce large, coarse stalks that were difficult to harvest and handle at the cutting box. Thicker stands produced short, fine stalks that tended to lodge badly.

Corn gives better results if grown in a thicker stand than is usual in the eastern corn growing areas.

RATES OF SEEDING EXPERIMENTS

Rates-of-seeding experiments have been conducted with Reward wheat, Victory and Legacy oats, and Trebi barley.

It is of interest that in all cases the thinner seeding resulted in greater length and strength of straw, an increase in the number of days required to mature the crop, and less reduction in the yield of threshed grain than one might anticipate.

In the case of Reward wheat, the highest yield per acre was produced by a seeding of 1½ bushels per acre, while the yields produced by ½ and 3 bushels per acre were almost identical.

In the case of both Victory and Legacy oats, the ½ bushel rate of seeding produced only slightly less than the 1, 2, 3, 4 and 5 bushel rates of seeding, all of which gave very similar yields.

Trebi barley seeded at ½ bushel per acre yielded only slightly less than the 1 bushel rate and more than 1½, 2, 2½ and 3 bushel rates of seeding. Although all the barley was badly lodged, the lighter seedings stood up much longer than the heavier rates.

HARVESTING WHEAT, OATS AND BARLEY AT DIFFERENT STAGES OF MATURITY

The period during the formation and maturing of the kernel is the most critical in the production of cereal crops in districts with a relatively short growing season such as prevails in Central Alberta. Under such conditions, harvesting part of the cereal crop before full maturity has been attained has been practised since cereals were first grown. A very important question which presents itself under such conditions is, " How immature can cereals be harvested without serious financial loss?"

In order to study the effect of harvesting wheat, oats and barley at different stages of maturity, cuttings were made at two-day intervals, commencing at the milk stage of maturity. Some of the kernels were removed from the head at cutting time, and others were left to ripen with full length of straw attached.

The data obtained showed that there was no increase in weight of the kernel after cutting, as a result of the transfer of material to the kernel after the crop was harvested.

There was an increase in the weight of one thousand kernels of from 14·9 to 32·2 grams in the case of wheat, 18·5 to 27·1 grams in the case of oats, and 25·2 to 35·0 grams in the case of barley as the grain advanced from the milk to the firm dough stage of maturity. No yields per acre were taken, but the weight per thousand kernels indicates the corresponding increases in yield per acre which could be expected while the grain advanced through the different stages of maturity. No increases were recorded after the firm dough stage of maturity was attained by the three crops studied.

Moisture determinations showed that the moisture content of the grain was relatively high, even when apparently fully matured, carrying approximately 40 per cent moisture when considered ripe enough to harvest with the binder. The completion of the ripening process after this stage of maturity (the firm dough) is reached, involves loss of moisture, changes of colour, and other changes of a chemical and physiological nature not apparent to the naked eye.

Germination tests showed that the three classes of grain germinated 100 per cent, even when harvested in the milk stage, thus indicating that when low germination of these crops occurs, it is due to some cause other than harvesting at an immature stage.

Tests for percentage of barley and oat hulls on samples harvested at different stages of maturity were made. The percentage of hull on oats varied from 37·1

in the milk stage to 28·6 in the medium to firm dough stage, after which there was no appreciable change. The barley showed a similar trend, but the difference was not quite so marked. Like the oats, there was no appreciable change after the medium to firm dough stage of maturity was attained.

The commercial grading of all the samples was obtained. The wheat varied from No. 6 when harvested in the milk stage to No. 1 Northern when harvested during or after the firm dough stage. In the case of oats, harvesting in the milk stage gave feed grade and later harvestings improved in quality until the firm dough stage gave 2 C.W. Barley harvested in the milk stage gave No. 6, while that harvested in the firm dough stage graded Extra C.W. In all cases there was no further improvement in the commercial grade after the grain attained the firm dough stage of maturity.

Chemical analysis of the grain samples showed that there was very little, if any, change in the protein and ash content of the kernel after the firm dough stage of maturity was attained.

Samples of wheat from different cuttings were milled and the flour produced was both baked and analysed chemically. This analysis showed a higher protein and ash content for the immature cutting and these gradually decreased as the crop advanced towards maturity until the firm dough stage, after which there was no change. Bread baked from the different cuttings showed gradual improvement from the first cutting until the grain attained the firm dough stage, after which there was no improvement in the baking quality of the flour produced.

A review of all the data collected in this study indicates that where grain is harvested with the binder and allowed to go through the remainder of its maturing processes in the stook, little, if anything, is to be gained by leaving it uncut after it attains the firm dough stage of maturity. On the other hand, there frequently is a wide variation in the maturity of a crop and, if it is harvested when the most mature heads are in the firm dough stage, other heads may be less mature and thus result in a lower yielding and lower grading crop. For that reason, the least mature heads should be used as a guide for determining when the crop is ready to harvest. If the late maturing heads are in the firm dough stage of maturity, the crop may be harvested with every assurance that there will be no sacrifice in yield or quality.

CROP ROTATION

Crop rotation involves growing crops in a definite, planned sequence. A properly planned crop rotation should:—

Suit local soil and climatic conditions.
Produce crops in advantageous sequence.
Provide sufficient cash crops to meet fall payments.
Produce crops for available markets.
Distribute labour uniformly throughout the season.
Control weeds.
Supply sufficient feed for live stock.
Curtail fencing as much as possible.

THINGS TO KEEP IN MIND WHEN PLANNING A ROTATION

1. A permanent pasture field should be provided for work horses and milch cows at night. This should be located near the buildings.

2. Permanent pasture and alfalfa fields should not be included in the rotation.

3. Stubble should receive shallow surface cultivation in the fall and spring and be ploughed immediately preceding the seeding of coarse grains.

4. Early maturing varieties are safer and usually make more money than later maturing varieties of cereals.

5. A late-seeded crop of oats for greenfeed or silage is a better cleaning crop than a poorly cared for intertilled crop or summer-fallow.

6. Late-seeded crops of early maturing varieties of oats or barley, for grain, greenfeed or silage, are effective in controlling wild oats and other annual weeds.

7. A heavy hay crop is an excellent smother crop for all weeds.

8. Legumes improve fertility and grasses improve the root fibre of the soil.

9. A mixture of grasses and legumes will give a higher yield of more palatable and nutritious hay, and at the same time improve the soil to a greater extent than either seeded alone.

10. In most cases it pays to seed down without a nurse crop.

11. Meadows should not be left down for more than two years in a diversified farming rotation.

12. Long rotations are safer and more profitable than shorter ones.

13. Straight grain-growing rotations are not as safe as diversified farming rotations.

14. Two acres of hay seeded with a nurse crop, or one acre of hay seeded without a nurse crop, or one and one-half acres of oat greenfeed will supply sufficient feed for the equivalent of one mature horse or cow.

ROTATIONS FOR FARMS IN CENTRAL ALBERTA

The rotations given are based on the results of cultural and rotation experiments and observations made at this station. They are designed to meet the particular soil and climatic conditions which prevail in the different zones of the province of Alberta served by the station. Diversified farming rotations are recommended for districts where the average rainfall makes it economically advisable to attempt to grow these crops.

Two-year Rotations:

First year—Summer-fallow.
Second year—Cereal (wheat, oats or barley).

This rotation is suitable for the very dry areas where it is advisable to grow grain on summer-fallowed land only. In most cases it would be advisable to strip farm such land to control soil drifting.

Such a rotation will also be found useful to the farmer and seed grower who needs to keep his land free from weeds though farming in districts of the province favoured by a more liberal rainfall.

Three-year Rotations:

First year—Summer-fallow.
Second year—Wheat.
Third year—Wheat, oats or barley.

This rotation would find its greatest use on the straight grain farms of the marginal prairie between the park belt and the true short grass prairie.

First year—Sweet clover.
Second year—Wheat.
Third year—Wheat, oats or barley.

This rotation is suited to districts where the summer-fallow is not necessary to ensure a good crop of grain. It is recommended for the farmer who wants to grow a large proportion of grain and secure the benefits which result from growing a legume in a crop rotation. Experiments have shown that wheat following sweet clover will outyield that grown on summer-fallowed land, pro-

vided sufficient moisture is available to develop the crop. Where moisture is lacking, wheat following sweet clover may be a complete failure.

Six Year Rotation:

First year—Summer-fallow or intertilled crop.
Second year—Wheat, seeded down.
Third year—Hay.
Fourth year—Hay or pasture and break before grain harvest.
Fifth year—Wheat.
Sixth year—Wheat, coarse grain or greenfeed.

This rotation would be suitable for the grey bush soils and the more moist portions of the park belt which are situated west of the Calgary-Edmonton highway and north of the Canadian National Railway running east from Edmonton. Fencing may be reduced in this rotation by combining years 1 and 4, 2 and 5, and 3 and 6 in the same fields.

Eight Year Rotation:

First year—Summer-fallow or intertilled crop.
Second year—Wheat—seed down with 10 pounds sweet clover and 4 pounds timothy.
Third year—Hay or pasture.
Fourth year—Hay or pasture—break late in July and fallow for balance of season, top dress with manure during winter.
Fifth year—Greenfeed or intertilled crop.
Sixth year—Wheat—stubble fall cultivated.
Seventh year—Wheat, oats or barley on spring ploughing—stubble fall cultivated.
Eighth year—Barley or oats for grain, greenfeed or annual pasture.

This rotation is suitable for the same area as outlined for the six-year rotation. It may be conducted on four fields by dividing the fields and combining years 1 and 5, 2 and 6, 3 and 7 and 4 and 8, in the same fields and thus reducing the cost of fencing.

Eight Year Rotation:

First year—Summer-fallow or intertilled crop.
Second year—Wheat.
Third year—Seed down without nurse crop.
Fourth year—Hay.
Fifth year—Hay or pasture—Break before grain harvest.
Sixth year—Wheat.
Seventh year—Wheat or coarse grain.
Eighth year—Coarse grain or oats for silage or greenfeed or annual pasture.

This rotation is recommended for the park belt and marginal prairie land east of the Calgary-Edmonton highway and south of the C.N.R. line running east from Edmonton. Like the other eight-year rotation, fencing may be reduced by combining two years in one field thus utilizing four fields only. It differs from the other eight-year rotation in that the seeding down is done without a nurse crop, thus ensuring a catch of grass and legumes for hay in areas where limited precipitation makes seeding down with a nurse crop of cereals a risky farm practice.

This is considered a safer rotation for the park belt and the grey bush soils than the six-year and the other eight-year rotation, where the seeding down is done with a nurse crop. Years of observation have led to the belief that failure to secure stands of hay crops has been the greatest stumbling block to the

adoption of diversified farming rotations in the areas outlined. It is believed the rotation suggested will do much to alleviate the difficulties usually encountered in adopting and putting into effect a diversified farming program.

The six- and eight-year rotations will prove useful in controlling both annual and perennial weeds, in maintaining soil fertility and in providing cash crops as well as an abundance of coarse grain and fodder as feed for live stock.

SUGGESTED SEEDINGS FOR HAY CROPS

The following seed mixtures are suggested for hay crops on grey bush soils, in the park belt and the moister areas in the marginal prairie.

Meadows for one year:

1. Sweet clover 15 pounds.
2. Sweet clover 10 pounds, timothy 4 pounds.
3. Sweet clover 10 pounds, rye grass 8 pounds.

Meadows for two years:

1. Sweet clover 10 pounds, timothy 2 pounds, rye grass 5 pounds.
2. Sweet clover 10 pounds, crested wheat grass 8 pounds.

Meadows for three years or longer:

1. Alfalfa 12 pounds.
2. Alfalfa 8 pounds, timothy 2 pounds, crested wheat 4 pounds.
3. Alfalfa 8 pounds, timothy 3 pounds.
4. Alfalfa 8 pounds, crested wheat 6 pounds.
5. Alfalfa 8 pounds, brome grass 8 pounds.

For the short grass prairie and drier areas of the marginal prairie the following are recommended:—

Meadows for High Land:

1. Crested Wheat Grass.
2. Brome Grass.

Meadows for Depressions where Moisture tends to Concentrate:

1. Crested Wheat Grass.
2. Brome Grass.
3. Alfalfa.
4. Sweet Clover.

For hay crops on low wet places or in wet districts the recommendations are as follows:—

Areas which do not flood for more than a week to ten days:

1. Four pounds each of timothy, alsike clover and mammoth red clover.

Areas which may remain flooded for a considerable length of time in the spring:

1. Timothy 2 pounds, Red Top 2 pounds, and Alsike Clover 4 pounds.

METHODS OF ESTABLISHING STANDS OF GRASSES AND LEGUMES

For the drier areas of the short grass prairie, it is suggested that the seed be drilled directly into the stubble, about one inch deep, either in the late fall, winter, or very early spring so that the moisture from the winter snow will be available to germinate the seed and establish the root system of the young seedlings.

This method is also recommended for the drier portions of the marginal prairie. In most of this area, however, it is believed that early spring seeding

on lightly disked stubble, or early June seeding on well worked stubble land will give best results. The use of a nurse crop under such conditions is not recommended.

Best stands are assured by seeding without a nurse crop on a finely tilled seed bed that has been packed until it is firm enough to carry the horses and machinery without them sinking more than one inch deep. It is suggested that in the grey bush soil belt, the park belt, and the marginal prairie belt, the land should be disked or cultivated in the late fall or early spring, ploughed late in May, worked down into a fine seed bed at once, and kept harrowed at weekly intervals until the second or third week in June, when the grass or legume seed is drilled from one-half to one inch deep. The crop should be allowed to go into the winter with the first year's growth intact. If very weedy, it may be clipped as high as possible with the mower, but the clipping should not be done later than the first week in August.

It will pay to have a grass seeder attachment for the seed drill to sow the small seeds of grasses and legumes such as timothy, alfalfa, sweet clover, red clover and alsike. Seed of brome, rye, crested wheat and similar grasses, and even the small seeds referred to above can be seeded through the grain box of the grain drill by mixing the grass seed with some kind of material that will carry it through the seed runs without clogging.

Wheat that has been heated in an oven or run through a grinder set so that it merely breaks it up, so that it will not germinate, is very useful for this purpose. The grass or legume seed is mixed with the wheat treated as described, in the proportion of one-half bushel of treated wheat to the amount of grass seed to be sown per acre. The wheat and grass seed should be thoroughly mixed before being placed in the drill. The drill, if set to seed approximately three pecks of wheat per acre, will sow the grass and legume seed at the proper rate.

If the land is packed until it is firm and all the pressure is taken off the drill, the seed will be placed at the proper depth, not over one inch deep. If the seed is buried deeper than this, seeding should be stopped and the land packed again before completing the seeding. Small grass and legume seeds buried too deep in the soil are wasted, as the seedlings are smothered and killed before they can reach the surface.

Seeding with a nurse crop of cereals gives good results in the grey bush soil areas where the annual precipitation exceeds 20 inches.

CEREALS

The cereal work at the station consists of variety tests with spring and winter wheat, winter rye, oats, barley, peas and flax, the production of pure seed stocks of recommended varieties, the production of new varieties and strains by crossbreeding and selection, the testing of farmers' samples for purity of variety, and numerous co-operative projects with other institutions and departments. All this work involves keeping records on approximately 4,000 plots each year. Only those varieties of importance to the district served by this station will be discussed in this summary.

SPRING WHEAT

Canus wheat, introduced by the University of Alberta, is too late maturing to justify growing it in a commercial way in Central Alberta. It is as late as Marquis if not later, and since Marquis is too late maturing to justify its production in the park belt, farmers would be unwise to attempt to grow Canus. Canus is reported to have a certain amount of drought and disease resistance, and for that reason it may have a place in the open plains section of the drier portions of the province.

Garnet continues to be the most popular wheat among the growers of Central Alberta. In yield it compares favourably with other varieties. This, when added to its early maturity and ability to grade well, will undoubtedly result in this variety being favourably considered by growers so long as favourable prices continue for commercial grain of this variety.

Marquis undoubtedly is the best variety to grow as the main crop in those districts where it is not subject to damage by frost and rust.

Red Bobs 222, a selection from Red Bobs developed at the University of Alberta, is one of the best of the different selections made from that variety. It is a high yielding strain with fair strength of straw. It is about midway between Garnet and Marquis in maturity. The greatest criticism of this variety is its tendency to produce a high percentage of starchy kernels when grown in districts with an abundant rainfall.

A strain of Reward, namely Reward 22-42, is a decided improvement over the original strain distributed. Average yields per acre show that the yields produced by this strain compare favourably with those produced by Red Bobs, Garnet, and Marquis. Since this variety has exceptionally strong straw, high quality grain, good yield and early maturity, it should be one of the best wheats to grow in the park belt and on the grey wooded soil of Alberta.

In view of the publicity given to newly produced and introduced varieties of rust resistant and macaroni wheats, it would be well for the grower to keep in mind that rust has never been a serious problem in Alberta, and that these newer wheats may not give as good returns as the wheats referred to, while their production will only complicate a situation which already is aggravated by the production of varieties unsuited to the prevailing soil and climatic conditions and marketing facilities.

WINTER WHEATS

Winter wheat tests indicate that as yet no variety or strain of winter wheat has been developed which can be depended on to produce crops which would warrant their recommendation for production in Central Alberta. New varieties are being developed which show considerable promise.

OATS

Banner, Victory, Legacy and Alaska are the varieties recommended for that portion of Alberta served by this station.

Banner and Victory are similar in maturity, length and strength of straw, and yield per acre. The kernel of Victory is slightly shorter and plumper than Banner. For that reason, there appears to be a tendency for Victory to gradually replace the Banner. These varieties are recommended as the standard or main crop varieties for Alberta where danger of damage by early fall frosts is not a factor to be considered.

Legacy is considered the best of the early-maturing varieties. It matures a week to ten days earlier than Banner or Victory, has straw of similar strength, and will outyield them if for any reason they do not come to full maturity. It is one of the best varieties to grow on the grey bush soil of the timber belt, or for late seeding in the park belt.

Alaska is one of the earliest varieties included in the test plots. It matures as much earlier than Legacy as Legacy is earlier than Banner and Victory. It has short, fine straw of fair strength, but the kernels are rather lean as compared with Victory. The lean kernels have had much to do in preventing this variety attaining the popularity its merits would justify. This variety is recommended wherever an extremely early variety is needed.

A number of new productions are showing much promise and it would seem to be only a matter of time until newer varieties are introduced which are distinct improvements over those at present in the grain trade.

BARLEY

Many new varieties of barley have been introduced since the last annual report from this station was issued. Only those of importance will be discussed here.

Trebi is unquestionably the highest yielding variety tested over a long period of years and is strongly recommended where the grower wishes to secure high yields of feed barley. It is a six rowed variety that has straw of fair length and strength, and has rough awns. It is not favoured by the malting trade.

O.A.C. No. 21 is grown extensively both for feed and as a malting barley. It is the best variety to grow for the malting trade. It is a six rowed variety that gives a fair yield and has straw of good length and fair strength. It is generally accepted as the standard by which other varieties are measured for both feed and malting purposes.

Olli is a particularly promising variety which has recently been introduced. It is one of the earliest maturing varieties under test, and gives a surprisingly large yield per acre. The straw is short and very strong. The awns break off the kernels easily, giving a cleanly threshed sample of grain. It has stood up well in malting tests but must be grown in a commercial way before its malting qualities can be definitely determined.

Peatland is a new variety introduced by the University of Alberta for growing on the peaty soils of Central and Northern Alberta. It is a late-maturing, strong strawed, low yielding, six rowed, rough awned variety. This variety has not met with the unqualified approval of the malting trade. Its production should be limited to the area for which it was developed.

There is a considerable number of smooth awned varieties which have been introduced. Among the best are Newal, Regal, Velvet and Wisconsin No. 38. These varieties are all similar to O.A.C. No. 21 in maturity, length of straw, yield, etc.; but since they are not favoured by the malting trade, their production is of necessity limited. For that reason it is possible that their production will not attain the anticipations of their originators.

Two rowed barleys are not grown extensively. Canadian Thorpe has practically passed out of the grain trade, while Hannchen is not grown on the rich soils of the park belt for the reason that is weak straw results in it lodging badly. None of the two rowed varieties are favoured by the malting trade but recent introductions show considerable promise as feed barleys.

FLAX

Redwing is undoubtedly the best variety for use in Central Alberta. It is early maturing, wilt resistant, has strong straw, and yields well. It is a small, brown seeded variety.

Bison is a large, brown seeded variety that is grown extensively throughout the prairie. It is a little later maturing, and is not as strong in the straw nor as productive as Redwing.

PEAS

Early Blue is an early maturing, high yielding variety that does particularly well when grown in Central Alberta. Other early maturing, small seeded, white varieties that do well are Chancellor and Golden Vine.

SEED WORK AND PLANT BREEDING

Elite and certified seed of approved varieties are increased for distribution. These include Marquis, Garnet and Reward wheat; Victory, Legacy and Alaska oats; Trebi barley and Early Blue peas.

Farmers listening to the Dominion Cerealist during cereal crop field day.

Farmers inspecting plots grown from their own samples.

Approximately 1,000 samples of farmers' grain are grown in a crop testing plan where they are carefully checked for purity of variety. The results of these tests are made available to the farmer through his local elevator agent.

Verification test plots have been grown for the Canadian Seed Growers Association and other organizations.

Plant breeding work has been increased until promising new varieties of wheat, oats, barley and flax are now under test. It is believed that such varieties developed under local conditions of soil and climate may prove superior to varieties developed under conditions quite different from those which prevail in Central Alberta.

FORAGE CROPS

LEGUMES AND GRASSES

Experiments with forage crops have been conducted since the station was first organized. The results are applicable to the grey bush soils of the timber belt and the rich black loam soils of the park belt and marginal prairie zone, and to the more northern moist areas of the short grass prairie. Records are kept on approximately 2,000 plots of forage crops each year.

ALFALFA

Variety tests with alfalfa show that Alberta grown Grimm seed can be depended on to produce a crop that is both vigorous and hardy. Other hardy and productive varieties and strains are Hardistan, Ladak, Saskatchewan No. 451 and No. 666, and Alberta grown Cossack. There is not much difference in the yield produced by the different varieties and all of them produce forage of good quality.

The area devoted to the production of this crop is rapidly increasing as its merits become known. The hardy varieties referred to are more hardy than sweet clover, and since alfalfa is a long lived perennial, it would seem as though this crop will become the most extensively grown legume forage crop in Alberta.

SWEET CLOVER

A large number of varieties and types of sweet clover have been developed by plant breeders. These include white and yellow blossomed varieties of both tall and dwarf types. Of the different varieties tested, Alpha No. 1 has proved to be one of the best. This variety is a white-blossomed variety with fine, short stems and a high proportion of leaves. It is reasonably hardy and resistant to root rots, and produces high quality forage. Arctic sweet clover, a large, white-blossomed type, is the most resistant to root rot and winter-killing of the different varieties tested.

Sweet clover is most useful in short rotations where it is used also as a soil improvement crop. In this respect, it gives excellent results on the grey bush soils. It also gives wonderful results in low, moist areas in the open prairie, particularly on the low-lying land where moisture tends to concentrate. At the station, crops following sweet clover in a wet year have exceeded those grown on summer-fallowed land. There is room for considerable expansion in the production of this crop.

RED CLOVER

Variety tests with red clover have shown that the mammoth or single cut clovers are hardier than the common or double cut red clovers. The Altaswede variety, a selection from Late Swedish Mammoth Red, developed by the University of Alberta, has been one of the hardiest tested.

Red clover requires more moisture than is usually available in the district immediately adjacent to the station and on the marginal and short grass prairie. It does particularly well on the grey wooded soils of the timber belt, provided suitable fertilizers are used. This crop should be grown much more extensively in the foothill country than is the case at present.

ALSIKE CLOVER

Plant breeders have done little or no work with alsike in the way of selecting for improved strains. The commercial stocks of seed are as good as it is possible to secure from any source. This clover is hardier than red clover. It is particularly valuable for seeding around slough margins and creek bottoms where more than the usual amount of moisture is available. Like red clover, it does particularly well on the grey wooded soils if suitable fertilizers are applied.

WHITE DUTCH CLOVER

White clover is essentially a pasture plant and has little value for hay production. It is hardier than either red or alsike. White clover finds its greatest usefulness in pasture mixtures for moist locations or on the grey bush soils of the foothills. One to two pounds per acre is sufficient for this purpose.

The seed of commerce is known as white Dutch clover because Holland used to be the chief source of seed. It is now imported from many countries. Morso is an improved Danish variety and one of the best with respect to winter hardiness and pasture type. English wild white and New Zealand wild white are regional strains that are highly regarded for close grazed pastures, but they are somewhat less winter-hardy than Morso. Ladino is a tall-growing, large-leaved type more productive than common white clover but less suited to close grazing.

TIMOTHY

No marked difference in the yield produced by different varieties of timothy has been recorded. It would seem that the selection of a suitable variety should be based upon the quality of the hay produced rather than on yielding ability.

Gloria, a variety introduced from Sweden, has given a good account of itself as regards both yield and quality. It is followed closely by Swallow, a mass selection of Swedish origin by the University of Alberta. Huron has yielded well but is only a fair leaf producer as compared with Gloria and Swallow. Boon has produced good yields but has a lower percentage of leaf growth as compared with the better varieties. Commercial is decidedly the poorest variety under test, giving the lowest yield and forage of inferior quality.

Timothy requires more moisture than is available on the short grass plains. It does well in low, moist locations in the park and timber belt. It also is a very useful grass for mixing with legumes for both hay and pasture. When sufficient moisture is available to supply its needs, it is one of the highest yielding grasses when used for either hay or pasture.

BROME GRASS

There are two varieties of brome available in the seed trade, commercial or awnless brome, and Parkland. The Parkland variety appears to be a distinct improvement over commercial brome in that it has been selected for non-creeping root stalks. This characteristic has not been wholly eliminated, nevertheless the root development of Parkland tends much more towards that of a bunch grass than does commercial.

No significant difference has been noted in the yield produced by commercial and Parkland brome the first year after seeding. It is believed, however, that the non-creeping habit will result in the old stands of Parkland remaining productive for a longer period than commercial.

The Parkland variety appears to be a decided improvement over commercial for growing in mixtures with alfalfa and other crops for hay.

CRESTED WHEAT GRASS

Four strains of crested wheat grass have been compared. The Fairway strain is proving superior to others. It is fine-stemmed and leafy while others are coarser-stemmed and have a smaller percentage of leaves. There is no significant difference in the yield produced by the different varieties and strains.

Crested wheat is undoubtedly the best grass to grow for forage in the drier areas of the province where drought resistance is important. It is also important that this grass yields well when grown on the higher land of the park belt and grey wooded soil areas.

For pasture purposes crested wheat grass gives good results in the drier areas where less drought resistant grasses are failures. Its chief place as a hay and pasture grass in more moist areas is for use in mixtures with other grasses and legumes.

SLENDER WHEAT OR WESTERN RYE GRASS

The newer varieties of rye grass such as Fyra, Grazier and Mecca are distinct improvements over commercial seed. There is not a marked difference in the yields produced by different varieties and strains, but the newer strains have plants with a much leafier growth that produces forage that is more palatable and attractive to live stock.

Rye grass is not being grown as extensively as it was at one time for the reason that it is a short-lived perennial grass, the plants of which lose their vigour and are unable to compete with weeds when two or three years old and thus become unproductive. This grass is being gradually replaced by crested wheat grass.

BLUE GRASSES

Kentucky blue grass at Lacombe is superior to Canada blue grass for both hay and pasture.

Blue grass does best if an abundance of moisture is available. It withstands dry weather fairly well but its yield is greatly reduced if there is a shortage of moisture. Kentucky blue grass finds its greatest usefulness when included in mixtures of grasses and legumes where rainfall is fairly heavy. It is particularly valuable as a bottom grass in pastures. It is also one of the best lawn grasses tested at the station.

FESCUES

Creeping red fescue is more productive than the other fescues tested at the station. It is also more productive than Kentucky blue grass and undoubtedly will compete with blue grass for hay and pasture purposes.

Creeping red fescue also makes a good lawn grass. It is a darker green colour than blue grass, but is a harder grass and more difficult to cut than blue grass. It appears to be only slightly more drought resistant than blue grass and, like it, can compete with weeds better than the bunch grasses.

REED CANARY GRASS

There is a wide variation in the type and habit of growth of the different strains of reed canary grass. This grass has creeping root stalks and grows naturally in low, wet places. It does not yield well on high, dry land, and the forage produced is rather coarse unless it is cut early. It is very doubtful if it is ever grown extensively for forage except around slough margins or similar low, wet places.

RED TOP

This grass can be found growing in its native state around the margins of sloughs which are not alkaline. It yields well under such conditions but is rather unproductive when grown on high land.

The forage produced is quite leafy but is below the average in quality, particularly if permitted to get too mature before cutting for hay.

Harvesting a 3½ ton crop of a mixture of sweet clover and timothy.

MIXTURES OF GRASSES AND LEGUMES

Mixtures of grasses and legumes have numerous advantages over growing pure crops of either. As a rule a mixture will yield more per acre, gives a more palatable and nutritious hay that is easier handled and more easily cured, is a better weed control crop, and leaves the land more fertile and with a higher fibre and organic matter content.

Different mixtures of grasses and legumes are given in the section dealing with crop rotations. The reader is also referred to a section on methods of seeding grasses and legumes in the section under soil tillage.

OTHER FORAGE CROPS

CORN

The frost-free period is so short in Central Alberta that only the early maturing varieties develop sufficiently to make good ensilage. Only the very early maturing varieties such as Howes Alberta Flint ripen seed. North-

western Dent and Gehu Flint are the two varieties used by the station for the production of ensilage.

Corn is grown only in a limited way in Central Alberta. The acreage, however, is gradually but slowly increasing, and the boundary of the production area is slowly moving northward with the introduction of newer, cold resistant and early maturing varieties.

SUNFLOWERS

Sunflowers are grown for three purposes in Central Alberta: for forage, windbreaks, and for seed. That grown for forage is used for the production of ensilage, of which the Giant Russian or Mammoth Russian type is best. Such a variety seldom advances beyond the flowering stage of maturity before it is cut for silage. Nevertheless it gives the highest yield of dry matter per acre. Where seed production is the objective, early maturing sorts such as Mennonite should be used.

ROOT CROPS

It is doubtful if roots will enter into the general forage crop scheme on many farms for some years yet for the reason that the crop is not particularly safe from a production standpoint, and in addition the average western farmer and farm hand does not take kindly to work he cannot do with machinery.

Mangels and sugar beets are apt to meet with unforeseen hazards such as damage by late spring frosts, soil drifting and cutworms or other biting insects. Roots belonging to the turnip family are less subject to injury from such sources, but frequently the yields are seriously reduced by maggots which feed on the growing roots.

Mangels of the tankard and globe types are recommended. The Bangholm type of swede turnip or rutabaga is most satisfactory.

SOYBEANS

Numerous experiments with soybeans have been conducted. The frost-free period of Central Alberta is too short to make it advisable to grow this crop on a commercial scale. Late spring frosts necessitate this crop being seeded after June 1, which makes it so late maturing that it is always damaged by early fall frosts before it is harvested.

MILLETS, SORGHUMS, ETC.

Experiments with millets, sorghums, broom corn, etc., indicate that these crops require more heat and a longer frost-free period than prevails in Central Alberta.

The millets are the most suitable of the crops mentioned. Even the millets are usually damaged by early fall frosts before they are harvested.

PERENNIAL PASTURE CROPS

An experiment designed to give information on the suitability of different grasses and legumes seeded alone and in mixtures was seeded in 1932 and again in 1933. Plots seeded with the different crops were harvested by hand as often as the plants growing in the plots made sufficient growth to permit grazing.

Brome.—Brome is one of the most productive grasses included in the project. It will continue to produce new growth as long as moisture and plant food are available, but is not as productive as the drought-resistant grasses in dry years. It is recommended for districts other than the short grass prairie. Brome is a

soft grass and is damaged by low temperatures, hence does not make as good late fall and winter pasture as harder grasses such as crested wheat and blue grass.

Western Rye.—Western rye grass is not a good pasture grass. It is a drought-resistant grass and yields well in dry years, but produces a type of growth that is not as attractive to live stock as some of the softer grasses such as brome and timothy. A further objection to this grass as a pasture crop is that it is a short lived perennial. Stands seeded in 1932 were badly infested with weeds in 1934, while practically 100 per cent of the plants were dead by 1935.

Crested Wheat.—The principal objection to crested wheat as a pasture grass is that it is somewhat unattractive to live stock as compared with other grasses, if it gets too far advanced in maturity. It yields well in dry seasons but is not the equal of brome and timothy during years of abundant rainfall. It continues to produce a vigorous growth after being pastured for four years. The chief place for this grass for pasture purposes would be in the dry areas of the province. This grass makes an early spring growth, hence a few pounds included in a pasture mixture would help provide early spring grazing.

Timothy.—Timothy has proved one of the best and highest yielding pasture grasses tested except under very dry conditions. It is long lived and continues to give new growth as long as moisture is available. It holds its own surprisingly well in competition with creeping-rooted grasses such as brome and blue grass. The principal objection to this grass is that its succulent growth is injured by severe fall frosts. Any pasture mixture for the park and timber belt should include a few pounds of timothy seed.

Kentucky Blue Grass.—This grass is an ideal pasture grass in many ways. The herbage produced is both palatable and nutritious and is not injured by low temperatures. The chief objection to this grass is that it lacks somewhat in productivity as compared with other grasses and when grown under dry conditions. Its creeping habit makes it an excellent turf grass for permanent pastures and most mixtures would be improved by the inclusion of a few pounds of seed of this grass per acre.

Creeping Red Fescue.—This grass is similar to blue grass in habit of growth in that it spreads by underground stems but it gives higher yields per acre. The statements concerning blue grass also apply to creeping red fescue.

Reed Canary Grass.—This grass appears to have nothing to commend it for pasture purposes on high land where it gives low yields of coarse herbage that is not particularly attractive to live stock, and which is subject to damage by severe fall frosts. Since it grows naturally around the margins of many of the sloughs throughout the park and timber belt, it makes a much better showing if grown in its natural habitat.

Meadow Foxtail.—This grass produces a very early growth that is leafy and succulent. It is not a high yielding grass but its earliness and attractive foliage would commend it for use in pasture mixtures to produce early grazing. Unfortunately the seed of this grass is light and fluffy, which makes it difficult to seed with machinery.

Alfalfa.—Alfalfa has proved the most productive of the different annual, biennial and perennial pasture crops tested. It stands grazing well if the plants are permitted to become well established before being grazed, and it is able to compete with different creeping-rooted grasses when seeded in a mixture with them.

Sweet Clover.—Sweet clover is like alfalfa in that it also produces high yields of high quality forage. The principal objection to this crop is that it is a biennial, hence can be used to advantage only in temporary or two-year pasture mixtures.

Red Clover.—Red clover is not a good pasture crop for Alberta. It requires more moisture than is available in the short grass prairie and the park belt. Its chief use would be in the timber belt where moisture is more abundant. Under such conditions, a few pounds per acre might be used to advantage in pasture mixtures.

Alsike Clover.—The statements made concerning red clover also apply to alsike clover.

White Dutch Clover.—This clover thrives best under moist conditions. It is hardier than red and alsike clover and seems to have a slightly wider range of adaptation. For that reason, pasture mixtures for the park and timber belts of the province would be improved by the addition of two or three pounds of this clover seed. White Dutch clover gives enormous yields in wet seasons and comes on and makes a lot of late summer and fall pasture after summer rains occur.

ANNUAL PASTURE CROPS

Four years' results with annual pasture crops indicate that neither barley nor wheat is equal to oats as an annual pasture. It is of interest that the mixture of two bushels of oats and one bushel of winter rye per acre, that has been used extensively as an annual pasture at the station, outyields by a considerable margin all other pasture crops tested. It is believed that this mixture constitutes one of the best for cattle, horses and hogs.

Late maturing varieties of oats such as Banner will outyield the early maturing sorts. On the other hand, Gopher, one of the early varieties, appears to be a particularly good variety for pasture purposes.

A mixture of two bushels of oats and one bushel of peas gave a good yield per acre, but it is doubtful if it would stand pasturing as well as some of the other mixtures, such as oats and rye or oats and rape. The mixture of two bushels of oats and ten pounds of rape has one commendable feature in that it provides good, late fall pasture.

The mixture of one bushel each of barley, wheat and oats, does not appear to have anything in particular to recommend it. It is outyielded by oats alone and the forage produced is not superior to straight oats.

It is possible that winter rye has never been appreciated as a pasture crop. It produces a high yield per acre when seeded alone, and an increased yield when mixed with oats. If left all winter, it will provide good early pasture the following spring.

Spring rye appears to be about the same as barley and wheat in productivity. While it may have a place in the drier portions of the province, there appears to be no reason for growing it in preference to other cereals under conditions of soil and climate similar to those which prevail at this station.

Rape gives a high yield of green herbage but because of its high moisture content, does not yield as much dry matter as some of the other annual pastures. It provides pasture that is palatable, succulent, high in protein and nutritious. It is not injured by early fall frosts and like winter rye, makes one of the best annual late fall pastures.

The millets, including Teff grass, are not satisfactory annual pasture crops. They make a slow growth in the seedling stage and are thus unable to compete with weeds. In addition, they are very subject to frost damage and thus are unsuitable crops for fall pasture for Central Alberta.

Rape makes an excellent fall pasture for hogs. Part of the breeding herd of fifty brood sows kept at the Dominion Experimental Station, Lacombe.

FORAGE CROP NURSERY

A forage crop nursery was established in 1931. Approximately 240 varieties and strains of grasses and legumes were seeded. Field notes were taken to show the agronomic value of the many species under test. These data were compiled for three years, and since the nursery was completely reseeded in 1934, it is deemed advisable to include in this report a short discussion of the various species not mentioned in the preceding paragraphs.

PERENNIAL GRASSES

Bent Grass.—Eighteen strains of bent grass were included in the test. These have proved to be of no value to the agriculture of this district. They may prove useful, however, for fairways and lawns where moisture can be applied artificially.

Blue-Joint.—This grass is a vigorous grower and resembles couch grass in that it has running root stalks which causes it to spread rapidly, making it very difficult to eradicate once a stand is established. For this reason it is not recommended for use as a hay or pasture crop for high land, but it is an excellent grass for permanent pasture on low land.

Fescue.—Twenty varieties and strains of fescue were tested, including hard fescue, sheep's fescue, creeping red fescue, meadow fescue, tall fescue, and Chewings fescue. Of these, perhaps the most promising is creeping red fescue in that it gives a good yield of hay similar in quality to Kentucky blue grass. It withstands dry conditions very satisfactorily and remains green and palatable late into the fall.

Lyme Grasses.—These grasses appeared to be of little agricultural value the first two seasons they were under test. In 1934, however, a good yield with

heavy leaf growth was recorded. This grass may have some value as a hay or pasture crop.

Meadow Foxtail.—A fair yield of early maturing, fair quality hay is usually obtained from meadow foxtail, but because it would be difficult to seed with ordinary farm machinery, on account of its light, fluffy seed, it is not recommended for agricultural purposes.

Orchard Grass.—This grass lacks the winter hardiness that is essential for a suitable crop in this district. Further selection is necessary before suitable strains will be available.

Red Top.—Three strains of red top were included in the test. These would appear to have no value for high land, but would be of value to include in a mixture of grasses and legumes for lowland areas.

Reed Canary Grass.—Five strains were included in the test. This grass, while it is a somewhat coarse, unpalatable feed, gives very high yields per acre. It is essentially a moisture loving grass but fair results have been obtained on fairly high land.

Tall Oat Grass.—The first two seasons this grass was under test it appeared very promising as a hay crop in mixtures with alfalfa. It has a very light seed with awns attached which would prevent the use of ordinary farm machinery in seeding. In 1934 all plants were dead, possibly because it is a short lived perennial. For these reasons it is not considered to be of sufficient value to warrant it replacing any of the common grasses now used for hay or pasture.

Tufted Hair Grass.—This grass is a native of Central Alberta and is very winter hardy. Yields are only fair but the quality of the forage produced is good.

Other Grasses.—Those grasses which failed to grow or were completely winter-killed are as follows: Bermuda grass, crested dogstail, Dallas grass, English rye grass, Italian rye grass, marram or mat grass, perennial rye grass, reed grass, sweet vernal grass, and velvet grass.

BIENNIAL AND PERENNIAL LEGUMES

Kidney Vetch.—This legume matures early, sets seed freely and shows some promise of being useful as a forage crop for this district.

Lupins.—Although an excellent growth was recorded with lupins, the stem is coarse, and when compared with alfalfa or sweet clover, this legume is very inferior as a fodder plant.

Sainfoin.—Certain strains are hardier than others, but those that do survive do not compare favourably in value to alfalfa or sweet clover.

White Dutch Clover.—Eight varieties and strains of white Dutch clover were under test. The highest yielding variety is Mammoth White Dutch but, unfortunately, all the varieties lack winter hardiness when grown under dry conditions. White Dutch clover has proved to be an excellent bee pasture where stands can be maintained. It is also of value when included in pasture mixtures for moist locations.

Other legume crops which failed to grow or were not sufficiently winter hardy to withstand the first winter are burnet, sickle milk vetch, strawberry clover, and sulla or Spanish sainfoin.

ANNUAL GRASSES

About 80 varieties and strains of grasses, legumes and fleshy plants are seeded annually in the forage crop nursery.

Annual Meadow Grass.—Annual meadow grass is a common grass on all classes of soil. It possesses little agricultural value, since its yield is very low, although it is relished by stock when in the early growth stage.

Italian Rye.—A grass similar in quality and growth habit to western rye grass. The herbage is not damaged by fall frosts but it is not winter hardy. Italian rye grass may prove to be of value as a late fall pasture crop.

Paspalum.—Very susceptible to early fall frost. Is late maturing and thus is of no agricultural value to this district.

Soft Brome Grass.—Rather late maturing and is only a fair yielder. It has not proved to be sufficiently productive for a profitable crop.

Schrader's Brome Grass or Prairie Grass.—Only a fair yielder and has no merit to warrant its production for commercial purposes.

Sudan Grass.—A late maturing grass and highly susceptible to frost damage, which detracts from its value. It is not as suitable for this district as the millets.

Teosinte.—Very late maturing, gives a poor yield and thus is of little value.

Teff Grass.—Is highly resistant to frost but the yield is poor. It has no merit to warrant its production in this district.

ANNUAL LEGUMES

Berseem.—An annual white flowered clover which has been much cultivated in Egypt. It withstands frost damage, but only fair yields are secured when this crop is produced under conditions such as exist in Central Alberta, thus it is of little value.

Black Medick.—A legume which yields only fairly well, producing a crop similar in quality to sweet trefoil. It is of no value for agricultural purposes.

Hubam Sweet Clover.—Gave a good yield but is not of sufficient value to warrant its production in preference to biennial sweet clover.

Lespedeza.—This legume is a poor yielder, is damaged easily by frost and is not considered to be of any agricultural value for Central Alberta.

Lupins.—Blue and white flowered varieties, both of which gave yields about equal to sweet clover. As a feed they would not be so attractive as sweet clover and alfalfa.

Serradella.—This is a legume having a decumbent growth habit. It is fairly early maturing and appears to be highly resistant to frost. It may prove to be of value as an annual hay crop.

Shabdar.—It has never been possible to mature seed of this legume at Lacombe. Since it is very late maturing and would yield only about half as much as red clover, it is not recommended as being of any value for this district.

Subterranean Clover.—Withstood the frost well, gave a good yield of densely matted forage and may be of value as a fall pasture.

Suckling Clovers.—These clovers have not given promising results and do not appear to advantage when compared with the common clovers and alfalfa.

Sweet Trefoil.—Another leguminous plant which may be useful for an annual hay or pasture crop. Yields are only fair but it is very early maturing and is relished especially by horses.

Vetch.—Fifteen varieties of vetch were included in the test. This legume usually gives a good yield of both forage and seed. There is a marked difference in the varieties and under local conditions common vetch has produced the most satisfactory results.

Sorghum, Feterita and White Kaffir Corn.—Suffered frost damage and of little value as they require more heat and a longer growing season than Central Alberta provides.

Winter Horse Bean.—An upright, coarse-stemmed crop which gives a good yield but is very late maturing. It is of little value when compared with the common fodder crops.

FLESHY ANNUALS

Giant Drumhead Cabbage.—This crop is similar in type to rape and kale but is a lower yielder, thus is of little agricultural value to this district.

Kale.—Five varieties of kale have been under test. As a crop they have little value since rape outyields them by 15 per cent to 20 per cent on an average.

Rape.—This crop has given very satisfactory results as an annual hog pasture, is early maturing and yields are relatively high.

HORTICULTURE

A large number of trees, shrubs, vines, tree and bush fruits, flowers and vegetables have been tested since the station was first started. The following summary presents briefly the results recorded.

The horticultural plants and varieties recommended for the district served by this station are given in the accompanying list.

Shelter belts and wind breaks are essential for the successful production of fruit of all kinds.

TREES RECOMMENDED FOR WINDBREAK, SHADE OR ORNAMENT

The following trees have all been grown successfully at this station, but each is listed under the type of soil which seems to suit it best:—

Heavy Clay	Moist, Sandy Loam	Dry, Sandy Loam	Sand or Gravel
Manitoba maple	Manitoba maple	Manitoba maple	Russian poplar
Bur oak	Green ash	Russian poplar	White spruce
Green ash	Elm	Scotch pine	Scotch pine
Elm	Cottonwood	Jack pine	Jack pine
Cottonwood	Russian poplar	White spruce	Caragana.
Russian poplar	Willow	Caragana	
Willow	Birch		
Larch	Larch		
Scotch pine	Scotch pine		
White spruce	Jack pine		
Caragana	White spruce		
	Caragana		

Low, Wet Land	Trees Which Do Well as Individual		Lawn Specimens
Ash	Manitoba maple	Northwest poplar	Mountain ash
Elm	Cut-leaf weeping birch	White spruce	Japanese tree lilac
Cottonwood	Scotch pine	Blue spruce	Bird cherry
Black poplar	Swiss stone pine	Larch	
Larch			
Black spruce			
Willow			

RECOMMENDED ORNAMENTAL SHRUBS

Botanical Name	Remarks
Acer tataricum ginnala	Graceful shrub with yellowish, fragrant flowers. Handsome foliage which turns bright red in autumn.
Amelanchier (shad-bush or Juneberry)	Very attractive when in bloom. Fruits edible.
Berberis Thunbergii (Japanese barberry)	Dense dwarf habit, rich colour in autumn.
Caragana pygmaea	Compact habit, suitable for low hedge. Flowers golden yellow.
Caragana arborescens	Tree caragana.
Caragana arborescens, var. pendula	Weeping caragana, a very handsome form, suitable for a lawn specimen.
Caragana Lorbergii	Has long, narrow leaves about one inch long, peculiar and striking form.
Caragana tragacanthoides	Resembles pygmaea, but has a looser growing habit.
Cotoneaster acutifolia	Neat, bushy shrub, glossy green oval leaves turn crimson in fall, large black fruits.
Eleagnus argentea	Silvery-white leaves, fragrant tubular flowers, bright orange fruit.
Lonicera chrysantha (honeysuckle)	Yellow flowers, red berries.
Lonicera tatarica (honeysuckle)	Pink, crimson and white flowers.
Philadelphus lemoinei (mock orange)	Flowers white and sweetly scented. This shrub kills back here and does not attain its normal height, but its lower branches produce heavy bloom.
Malus baccata (flowering crab apple)	Shrubby trees, showing a heavy bloom early in summer. Crab apples are being selected for decorative purposes. Those have purple leaves, red or crimson flowers promise to become very popular in Western Canada.
Potentilla fruticosa (shrubby cinquefoil)	A native shrub, with small yellow flowers, which are produced all through the summer.
Prinsepia sinensis	A recent introduction from China. Branches spiny, leaves bright green, narrow and from two to three inches long. Fruit, an edible cherry.
Rhamnus cathartica (buckthorn)	Stout upright shrub. Makes a fair hedge. Has small green flowers. followed by black cherries.
Syringa amurensis (Amur lilac)	Handsome shrub with large panicles of yellowish-white flowers.
Syringa villosa (Chinese lilac)	Flowers white to pink.
Syringa Josikaea (Hungarian lilac)	Flowers violet. Makes fair hedge.
Syringa vulgaris (Common lilac)	Flowers white to deep purple.
Spiraea Vanhoutei (spiraea)	Tender, but well worth planting. A box placed over the plant in the fall will usually prevent winter killing. Considered the most beautiful of the early blooming spiraeas.
Spiraea Billiardii	Perfectly hardy, pink flowers.
Spiraea media	Another hardy kind.
Viburnum americanum (Cranberry bush)	Handsome flowers in early July, followed by scarlet fruits.
Prunus tomentosa (Nanking cherry)	Hardy and ornamental. Has edible fruit.

PERENNIAL CLIMBING PLANTS

Humulus lupulus (common hop).—Although this plant is not as attractive a climber as some of the others it is used a great deal in the Prairie Provinces, on account of its hardiness. The common hop grows rapidly from the ground each year, and makes an excellent screen during the hot weather.

Clematus ligusticifolia (Western Virgin's Bower).—Another valuable climbing plant for the prairies where, along with the hop, it is a native. It is an excellent climber where a trellis is provided, the leaves are glossy and attractive, and the numerous small white flowers make this a very desirable subject for decorative purposes.

Parthenocissus quinquefolia (Virgina creeper).—One of the most popular ornamental vines. Its deeply cut, glossy leaves become very brilliant in the fall, when they assume many shades of red.

Hardy Roses (for use in shrubberies, etc,)

F. J. Grootendorst, Pink Grootendorst, Rosa rugosa, Harrison Yellow, Agnes, Rosa spinosissima, Belle Poitevine, Hansa and Rosa rubrifolia. All of these are perfectly hardy, and need no winter protection here.

TREE FRUITS

Nearly 200 varieties of apples, crab apples, plums and cherries have been tested at the station. Many of these varieties have proved wholly unsuitable, but others have been sufficiently promising to warrant further trials. As a result of observations made at this and other stations the following varieties are recommended for trial on the farms of Central Alberta:—

APPLES AND CRAB APPLES: Osman, Hibernal.
PLUMS: Assiniboine, Cheney, seedlings of Manitoba Native Plum.
SANDBERRY-PLUM HYBRIDS: Tom Thumb, selected seedlings.
SANDCHERRY: Selected seedlings.
CHERRIES: Selected seedlings.

BUSH FRUITS

Bush fruits have given very good results and can be recommended for growing either in gardens or on a small commercial scale.

RASPBERRIES: Sunbeam, Chegwin, Marlboro, Herbert, Viking.

CURRANTS:

Black—Eclipse, Kerry, Beauty, Saunders, Native.

Red—Red Grape, Holland, Pommona, Red Cross.

White—White Grape, White Cherry.

Miscellaneous—Flowering or Missouri Currant (Selected seedlings).

GOOSEBERRIES: Houghton, Pixwell (No variety very satisfactory).

STRAWBERRIES: Senator Dunlap, Dakota, Premier, Everbearing, Champion, Mastodon, Progressive.

WILD FRUITS

Native and imported wild fruits which can be grown successfully include Saskatoon, high-bush cranberry, pin-cherry, choke-cherry, sandcherry, currants, blueberries (on acid soil), raspberries, gooseberries, strawberries, Manitoba wild plums and grapes, hazelnuts.

HARDY ANNUAL FLOWERING PLANTS

These plants mature, bloom and in most seasons ripen seed when sown in the open ground early in the spring.

Botanical Name	*Common Name*	*Colour of Blossoms*	*Height*
Abronia umbellata	sand verbena	Rose	10"
Adonis aestivalis	pheasant's eye	Deep crimson	10"
Alyssum maritimum	sweet alyssum	White	4"
Anthemis arabica		Yellow	12"
Asperula azurea setosa	woodruff	Pale blue	12"
Brachycome iberidifolia	swan river daisy	White to purple	9"
Bartonia aurea		Yellow	18"
Calendula	pot marigold	Orange and yellow	12"

Botanical Name	*Common Name*	*Colour of Blossoms*	
Coreopsis	tickseed	Yellow, brown crimson	1–3′
Clarkia elegans		White to purple	24″
Clarkia pulchella		White to pink	18″
Collinsia		White to pink	9″
Chrysanthemum (annual)		White to crimson	1½–3′
Centaurea cyanus	bachelor's button	Blue	24″
Delphinium ajacis	larkspur	White to blue	2–3′
Eschscholtzia	California poppy	White to crimson	12″
Godetia		White to crimson	12–18″
Gypsophila elegans	baby's breath	White to pink	18″
Lavatera trimestris	mallow	White to pink	24″
Iberis	candytuft	White to purple	12″
Kochia tricophylla	summer cypress	Foliage plant	30″
Lathyrus odoratus	sweet pea		
Linaria		White, crimson, gold	12″
Lupinus		Blue and white	24″
Layia elegans		Yellow	12″
Linum	flax	Scarlet and blue	12″
Malcomia maritima	Virginian stock	White and mauve	18″
Mathiola bicornis	night-scented stock	Lilac	12″
Nigella	love-in-a-mist	Blue and white	18″
Phacelia		Blue	12–18″
Papaver	poppy	Wide range of colour	24″
Portulaca		White to scarlet	6″
Reseda odorata	mignonette	Brownish green	12–18″
Scabious	pin-cushion plant	White to purple	3′
Tropaeolum	nasturtium	Yellow to scarlet	12″

HALF-HARDY ANNUALS

These plants are sown indoors in early spring and planted out when danger of frost is past.

Antirrhinum	snapdragon	Wide range of colour	6″–3′
Ageratum		White and blue	9″
Carnation (annual varieties)		White and crimson	18″
Callistephus	aster	Wide range of colour	18″
Cosmea	cosmos	White to crimson	24″
Dahlia (Coltness hybrids)		Mixed	24″
Datura cornucopia	angel's trumpet	White	24″
Dianthus	pink	Mixed	9″
Dimorphotheca	star of the veldt	Orange	12″
Helichrysum	straw flower	White to dark red	3′
Lobelia		White, blue, purple	6″
Marigold (African)		Orange and lemon	30″
Marigold (Dwarf French)		Brown and yellow	9″
Nemesia		Mixed	12″
Nicotiana affinis	flowering tobacco	White	3′
Pansy (Hardy biennial, but best treated as half-hardy annual)			
Phlox Drummondii	annual phlox	White to deep crimson	12″
Petunia (Bedding)		White to crimson	18″
Salpiglossis		Mixed	3′
Schizanthus	butterfly flower	Mixed	15″
Stocks (ten weeks)		White to purple	18″
Statice sinuata	sea lavender	Mixed	18″
Verbena		Mixed	12″
Zinnia		White to scarlet	24″

HERBACEOUS PERENNIALS

These plants are left in the ground and live and thrive for a number of years.

Botanical Name	*Common Name*
Achillea ptarmica, The Pearl	sneezewort.
Aconitum napellus bicolor	monkshood.
Alyssum saxatile	goldentuft.

Botanical Name	*Common Name*
Arabis alpina	rock cress.
Aquilegia	columbine.
Anchusa italica	bugloss.
Anthemis kelwayii	chamomile.
Agrostemma coronaria	rose campion.
Boltonia asteroides	
Cerastium tomentosum	snow-in-summer.
Campanula persicifolia	bellflower.
Campanula glomerata	
Chrysanthemum maximum	shasta daisy.
Clematis fremontii	
Convallaria majalis	lily-of-the-valley.
Delphinium	larkspur.
Dianthus deltoides	maiden pink.
Dianthus plumaris, Mrs. Sinkins	grass pink.
Dianthus barbatus	sweet william.
Dicentra spectabilis	bleeding heart.
Gypsophila paniculata	baby's breath.
Gaillardia	
Hesperis matronalis	sweet rocket.
Hemerocallis	day-lily.
Helianthus multiflorus	sunflower.
Helianthus, La Pearl	
Heliopsis scabra gratissima	orange sunflower.
Helenium hoopesii	
Iris germanica	German iris (Flag).
Iris japonica	Japanese iris (Flag).
Iberis sempervirens	candytuft.
Iberis gibraltarica	candytuft.
Leontopodium	edelweiss.
Lychnis chalcedonica	scarlet lychnis.
Linum perenne	flax.
Lilium tigrinum	tiger lily.
Lilium elegans	
Lilium tenuifolium	coral lily.
Nepeta mussini	catmint.
Papaver nudicaule	Iceland poppy.
Papaver orientale	Oriental poppy.
Polygonatum	Solomon's seal.
Polemonium	Jacob's ladder.
Paeonia	peony.
Rudbeckia laciniata	golden glow.
Sedum acre	common stonecrop.
Sedum spectabile	showy stonecrop.
Saponaria ocymoides	soapwort.
Statice latifolia	great sea lavender.
Sempervivum globiferum	hen-and-chickens.
Sempervivum tectorum	common house-leek.
Sempervivum pyrenaicum	
Thalictrum adiantifolium	meadow rue.
Thalictrum aquilegifolium	
Thymus serpyllum	creeping thyme.
Veronica spicata	speedwell.
Verbascum phoeniceum	mullein.

VARIETIES OF VEGETABLES RECOMMENDED

Asparagus	Mary Washington.
Beans	Large plantings of either pole or lima beans are not advised in this district, both being very late. The most dependable varieties of the dwarf green and wax podded varieties are: Stringless Green Pod, Bountiful, Princess of Artois, Round Pod Kidney Wax, Davis White Wax, Pencil Black Wax, Improved Golden Wax, Great Northern. The Broad Windsor bean can be grown with fair success.
Beets	Early Flat Egyptian, Crosby Egyptian, Detroit Dark Red, Crimson Globe, Half-Long Blood.
Broccoli	Italian Purple Sprouting.
Brussels Sprouts	Dalkeith, Improved Dwarf.

Cabbage	(Early) Jersey Wakefield, Golden Acre, Copenhagen Market. (Late) Danish Ballhead, Flat Swedish. (Red) Danish Stonehead.
Carrot	Chantenay, Danvers Half-Long, Half-Long Scarlet Nantes, Oxheart.
Cauliflower	Snowball, Dwarf Erfurt.
Celery	Golden Self-Blanching, White Plume, Golden Plume, Paris Rose Ribbed.
Celeriac	Long Smooth Prague.
Citron	Red Seeded, Colorado.
Corn	Assiniboine, Squaw, Pickaninny, Banting, Golden Gem, Dorinny.
Cucumber	Arlington White Spine, Davis Perfect, Early Green Cluster, Early Russian, Improved Long Green.
Kale	Dwarf Scotch.
Kohl Rabi	White Vienna, Purple Vienna.
Lettuce	(Leaf) Grand Rapids, Black Seeded Simpson, Early Curled Simpson. (Head) Big Boston, Iceberg, Wonderful, Trianon Cos.
Leek	Giant Carentan.
Mustard	English White.
Onions	Ailsa Craig, Yellow Globe Danvers, Large Red Wethersfield. (Pickling) White Barletta.
Parsley	Champion Moss Curled.
Pot Herbs	Sweet Basil, Dill, Sweet Marjoram, Sage, Summer Savory.
Parsnip	Hollow Crown, Guernsey, Student.
Peas	(Dwarf) American Wonder, English Wonder, Laxton's Progress. (Medium) Stratagem, Lincoln, Reliance. (Tall) Thos. Laxton, Gradus.
Pumpkin	Connecticut Field, Small Sugar.
Rhubarb	Ruby, MacDonald, Sutton's Seedless, Victoria.
Radish	Scarlet Turnip White Tip, Saxa, Scarlet Globe, Icicle.
Salsify	Mammoth Sandwich Island, Scorzonera.
Squash	Green Hubbard, Golden Hubbard, Buttercup, Green or White Bush Marrow.
Spinach	King of Denmark, Juliana, Bloomsdale, New Zealand (Late).
Spinach Beet	(Swiss Chard) Giant Lucullus.
Tomato	Abel, Bestal, Bison, Alacrity, Open Air, Herald, Essex Wonder, Best of All.
Turnip	Snowball, Golden Ball.

Pavilion erected in 1935-36 for sales of live stock and agricultural meetings at the Dominion Experimental Station, Lacombe.

POULTRY

The work with poultry during the past five years has been mainly a continuation of experiments and the keeping of pedigree records with a view to establishing a strain of White Wyandottes of high production qualities combined with good breed type, fertility, hatchability and large eggs. Every bird is trap-nested throughout the year and only the heaviest producing birds of good type and laying eggs weighing at least 24 ounces to the dozen are retained for breeding purposes.

SALES OF BREEDING STOCK

Each year a considerable number of birds for breeding purposes are sold to farmers who have in view the improvement of their flocks for egg production. The total sales during the five-year period 1932 to 1936 inclusive were 202 pullets, 269 cockerels and 11,833 hatching eggs.

INCUBATION

Artificial incubation is employed for all hatching. The table following shows hatching results at this station for the years 1932 to 1936 inclusive, and the average for this period:—

HATCHING SUMMARY FOR THE YEARS 1932 TO 1936 INCLUSIVE

Year	Total eggs set	Per cent fertile	Per cent total eggs hatched	Per cent fertile eggs hatched	Per cent of chicks hatched alive when wing-banded	Total eggs required for one chick when wing-banded
1932	2,466	75·00	54·10	72·10	92·90	1·99
1933	1,743	72·63	50·37	69·35	87·81	2·26
1934	1,774	83·37	45·60	54·70	96·04	2·28
1935	1,815	73·83	36·86	49·93	96·86	2·80
1936	2,791	73·19	38·77	52·96	94·55	2·73
Total	10,589	.....	.....	.....	.....	.....
Average 5 years	.....	75·33	45·06	59·81	93·42	2·38

BLOOD TEST FOR PULLORUM

Beginning December, 1928, the flock of White Wyandottes at this station have each year been subjected to the test for Bacillus pullorum. This disease, which is also known as bacillary white diarrhoea, is responsible for much of the high death rate among chicks. The eggs from diseased birds have the organism and the chicks when hatched are infected. Where a flock is free from this menace, every care should be taken to see that any stock or hatching eggs introduced are from a clean, blood tested flock.

The following summary shows the results of the blood test for each year from 1928 to 1936 inclusive:—

In 1928 there were 228 birds tested, showing 41 reactors.
In 1929 there were 234 birds tested, showing 9 reactors.
In 1930 there were 600 birds tested, showing 7 reactors.
In 1931 there were 456 birds tested, showing 2 reactors.
In 1932 there were 600 birds tested, showing no reactors.
In 1933 there were 433 birds tested, showing no reactors.
In 1934 there were 529 birds tested, showing no reactors.
In 1935 there were 190 birds tested, showing no reactors.
In 1936 there were 130 birds tested, showing no reactors.

In each of the years 1928 to 1931 inclusive the positive or questionable reactors were promptly disposed of following the blood test. It is extremely encouraging that not a single bird has reacted positively or questionably in the last five tests. However, every possible precaution is being taken to prevent the recurrence of pullorum in the flock.

REGISTRATION

Of the birds entered from this station during the past five years in the egg laying contests held at Brandon, Manitoba; Indian Head, Saskatchewan; and Lethbridge, Alberta, 36 qualified for registration. The qualifications for a bird to register are that she must have laid 200 or more eggs in a contest, these eggs to average 24 ounces or more to the dozen, and she must be free from standard disqualifications. One of the pullets entered from this station in the 1934 contest at Brandon laid 286 eggs in 365 days. This was the largest number of eggs laid by any bird in the contest.

Co-operating with the Dominion Live Stock Branch, this station entered for the first time in the fall of 1936, 270 pullets in the Record of Performance test.

CORN VS. BARLEY IN THE LAYING RATION

An experiment has been conducted during the three years 1932-33, 1933-34 and 1934-35 for the purpose of determining if barley is a satisfactory substitute for corn in the grain ration of laying pullets for winter egg production. Two groups of pullets of the same age, strain and general development were fed the same way for a period of 168 days each year, from November to May, except that in one pen both the scratch and the mash contained considerable corn, while in the other pen the corn was left out of the scratch and mash, barley and barley meal being substituted. The scratch feed was fed in the litter and the mash was fed dry in a hopper and was always available.

The figures from this experiment show that, for the same amount of feed consumed, the birds receiving the corn in the rations produced 14·05 per cent more eggs by weight but on account of the high cost of the corn as compared with barley, the profit over cost of feed per bird was 8·11 per cent in favour of the barley-fed pen. It is also interesting to note that for the 168 days of the experiment the birds in the barley-fed pen consumed an average of 2·4 pounds more feed per bird but the average total egg weight production was 0·95 pound less per bird than in the corn-fed pen.

The results of this experiment would indicate that if the farmer or poultryman has a supply of good quality barley, it will not be necessary to purchase high-priced corn for egg production.

In feeding barley it should be remembered that it is lacking in vitamin A, while yellow corn is a good source of this vitamin. In so far as poultry are concerned, a severe lack of this vitamin has a tendency to slow up growth in the young and to cause a deficiency disease known as opthalmia (an eye disease) not uncommon to poultry. Fortunately, this vitamin deficiency can be overcome by the use of cod liver oil, or alfalfa leaves, or surplus vegetables.

BEES

With a wide variation in weather conditions, the period 1931 to 1936 produced an equally great fluctuation in honey flow. During this period the average yearly production per colony was 125 pounds. In 1933 the average production was 21·3 pounds, while in 1934 it was 217 pounds, or ten times as great —the highest yearly average ever produced at Lacombe. The peak production of 348 pounds for a single colony in 1934 also marks a new record.

METHODS OF WINTERING

Since 1927 experiments have been conducted to compare the advantages of outside and inside wintering. Inside-wintered colonies have been kept in the office basement, at a temperature maintained as closely as possible between 45° and 50°.

In outside wintering, three methods were used—four-colony cases, two-colony cases and singe Kootenay cases. Although in some seasons inside wintering or multiple case accommodation proved more successful, over the full period of the experiment a greater proportion of the colonies wintered in Kootenay cases survived, and these colonies achieved the highest production.

The less satisfactory results secured from wintering in the multiple cases may be partly explained by the fact that if one colony dies the other colony or colonies in the case are exposed to the severe cold which can enter through the dead colony.

Although in many instances the surviving cellar-wintered bees were in better condition when put out in the spring, the colonies in the Kootenay cases almost without exception built up more quickly and produced a greater yield of honey. This was probably due to the protection afforded by the Kootenay cases during unfavourable weather.

Unfortunately, the purchase of Kootenay cases necessitates the greatest initial expenditure per colony, while four-colony or inside wintering are cheapest. To offset this, the Kootenay case method requires the least labour, as the colony may be advantageously left in the case all year round without repacking, while colonies in multiple cases must be removed in the spring and replaced and repacked each fall, and cellar-wintered bees must be taken inside each fall and again placed outside the next spring.

PROTECTED VS. UNPROTECTED HIVES IN SUMMER

In a project laid down in 1923 a number of colonies each year were left in Kootenay cases all summer. To some of these a lift was added with each additional super, so that the supers, also, were accorded the protection of the extra case; with others, only the brood chamber was protected. These were checked against colonies which were given no protection except that of windbreaks and buildings.

On the average, the colonies in Kootenay cases with lifts added as required, produced the best results. This may be partly attributed to the fact that the cases protected the colonies from storms in unfavourable weather and from the direct rays of the sun on hot days, and allowed better ventilation, as they maintained a more uniform temperature. The additional protection helped materially in producing a higher yield of honey, and apparently eliminated unnecessary expenditure of energy in repeated preparations for swarming, such as were evident in the unprotected colonies, which clustered on the outside of the hives on hot days.

COMPARISON OF DIFFERENT SIZES OF HIVES

In this experiment, started in 1923, Jumbo hives were compared with ten-frame Langstroths. In every year but 1926 greater returns were secured from the Langstroth hives.

The chief disadvantage of the Jumbo hives is the weight of the supers. When full, one of these supers weighs around 100 pounds, which is far too much for the average person to handle with ease.

The Jumbo brood chamber, with its greater roominess, provides more scope for a prolific queen; but the Langstroth brood chamber, with one shallow super

below the queen excluder, not only provides ample room for most queens, but also frequently facilitates the detection of preparations for swarming.

DETECTING PREPARATIONS FOR SWARMING

The object of this experiment, which has been under way for 12 years is to discover whether it is possible to detect swarm preparations through the medium of a double brood chamber, thus reducing the time required for examination.

Early in June a shallow super is placed over the brood chamber of each strong colony, and a queen excluder placed between this super and the honey supers added. By tipping the shallow super and noting whether queen cells are present along the bottom bars of the shallow frames, preparations for swarming are easily detected. In some cases where queen cells discovered in the lower brood chamber were left undisturbed they later proved to be supersedure cells.

It was also noted that a shallow super added to the regular Langstroth brood chamber helped to control swarming, as the super provided additional room for the queen to lay, and prevented the usual congestion of bees in the brood chamber.

SWARM CONTROL BY SEPARATION OF QUEEN AND BROOD

All colonies are carefully inspected for swarm preparations. In colonies with larvae in queen cells, all combs containing brood are removed from the brood chambers, and replaced with drawn combs. The queens are placed on these combs, and the bees from the brood combs shaken down with the queens. The brood combs are then placed in supers and these supers, with queen excluders beneath, are placed above the brood chamber. Queen cells in the upper supers are not destroyed, but the covers are left on tight, so that no virgin queen can fly. No queen from these upper supers has mated, and no further preparations for swarming have been discovered.

SWARM CONTROL BY DEQUEENING AND REQUEENING

In this experiment the queens are removed from colonies which are preparing to swarm; ten days later the colonies are examined, all queen cells destroyed, and the colonies given new queens. Another method is to leave one queen cell in each colony, so that the bees can requeen themselves.

As no further preparations for swarming have been discovered in colonies treated in this way, this method is apparently very effective.

TOP ENTRANCE HIVES

In 1931 two strong colonies, each with brood chamber above and three deep supers below, were equipped with different types of top entrance vestibules. These colonies were examined every ten days, and the amount and location of brood were noted.

When the entrances were removed in order to examine lower supers, considerable trouble was experienced with incoming bees searching for the entrance. This system did not facilitate handling the supers and did not provide even normal conditions, one colony having twice attempted to swarm.

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