DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

EXPERIMENTAL FARM

AGASSIZ, B.C.

RESULTS OF EXPERIMENTS

1931-1935 INCLUSIVE

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SUPERINTENDENT

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REPORT OF THE DOMINION EXPERIMENTAL FARM, AGASSIZ, B.C.

SEASONAL NOTES

After a three-year period of very low rainfall, 1931 attempted a gallant come back with 51·19 inches. The winter was very mild and the autumn dry; crops were saved in excellent condition. During 1932, total precipitation records were all broken when 90·63 inches were registered. In February, when over 14 inches fell, such a down-pour occurred at one time that the water tank was washed from the mountain-side. Clover heaved badly and with the wet autumn much hay and oats were badly weather damaged. In 1933, recorded precipitation, 81·93 inches, was again high. Early crops were saved in good condition, but late crops were damaged. Raspberries were severely winter-killed this year. The mean temperature and the total sunshine in 1934 were the highest on record. As a whole, the weather for the year was wetter, brighter and warmer than usual.

The year 1935 opened with one of the worst storms ever recorded in the district. Heavy snowfalls with wind and low temperatures followed by a severe ice-storm blocked the roads, stopped train service for a week, broke off telephone communication for several days and cut off electric power from January 21 to March 13. Torn branches from trees were thrown in every direction, fences were broken, many beyond repair, while basements and cellars were flooded with water. Crop production was generally satisfactory but somewhat late. Crops of good quality were safely stored, the unusually dry autumn providing excellent conditions for harvesting a heavy corn crop.

METEOROLOGICAL RECORDS, AGASSIZ, B.C., 1931-1935

Month	Temperature				Precipitation					Sunshine	
	1935 Maximum	1935 Minimum	1935 Mean	Mean 5-year average 1931-1935	1935 Rain	1935 Snow	1935 Total	5-year average 1931-1935	43-year average 1892-1935	1935 Hours	5-year average 1931-1935
	°F	°F	°F	°F	inches	inches	inches	inches	inches	hours	hours
January	54	0	29·8	36·87	14·03	54·6	19·49	11·78	6·99	40·4	40·0
February	55	29	43·2	39·57	3·37	.....	3·37	6·49	5·89	105·7	81·8
March	52	29	39·7	43·97	5·04	3·5	5·39	7·54	5·51	54·0	81·8
April	74	32	48·6	51·54	2·32	.....	2·32	3·20	4·54	165·7	160·5
May	77	34	55·3	55·91	0·80	.....	0·80	3·48	4·54	209·0	165·9
June	84	40	59·1	59·92	4·96	.....	4·96	3·46	3·93	139·9	173·8
July	93	41	63·7	62·66	2·29	.....	2·29	2·44	1·93	199·2	221·1
August	92	45	63·9	64·80	1·42	.....	1·42	0·97	2·19	204·8	134·9
September	86	38	62·1	58·60	3·87	.....	3·87	5·30	4·63	196·1	104·4
October	81	23	49·4	52·28	7·46	.....	7·46	7·24	6·63	96·7	60·4
November	53	21	39·8	43·34	4·66	.....	4·66	8·34	8·52	60·5	73·3
December	63	27	43·3	37·48	4·12	.....	4·12	10·07	7·92	42·3	37·4
Totals	.....	.....	49·8	50·58	54·34	58·1	60·15	70·31	63·22	1,514·3	1,335·3

ANIMAL HUSBANDRY

Dairy Cattle

A very fine herd of approximately sixty Holstein-Friesians is kept on this farm. About half of them are of milking age, the remainder being herd bulls, heifers and a few bull calves. A policy of very severe culling has been followed by which older cows, off-type heifers and all but the better bull calves each year are sold for slaughter. Some are disposed of for breeding purposes, including bull and heifer calves and a few cows. Two bred heifers were exported to the Orient and one to South Africa.

Since March, 1931, Colony Koba McKinley 19th, 61397—A.R. No. 65 XX, Score 91 points, R.O.P. No. 834, has been the senior herd sire. He now has fourteen milking daughters and ten younger ones in the herd. They are very hardy, good feeders, close to the ground, and have fair udders. The dam of the senior sire has a record of 30,155 pounds of milk and 933 pounds of fat. He was fourth prize aged bull at the Canadian Royal in 1928.

Daughters of Sir Bess Ormsby Fobes 40th 64569. These sisters averaged 14,737 pounds of milk and 561 pounds of fat as two-year-olds which was 647 and 56 pounds respectively more than their dams.

In December, 1933, Hay's Aristocracy, 99738, was secured as a junior herd sire. He was fresh off the show circuit, where as a senior calf he was reserve grand champion at Calgary, first at Edmonton, Saskatoon, Regina, and the Canadian Royal, second at the Canadian National, Springfield and Trenton, and third at the Dairy Cattle Congress, Waterloo. Eleven daughters of this bull are in the herd but none is of milking age.

The senior herd sire has been mostly mated with cows which are daughters of the " Class Extra " bull, Sir Bess Ormsby Fobes 40th, 64569. Twenty-two of this bull's daughters averaged 14,737 pounds of milk and 561 pounds of fat, all except two of them being two-year-olds. Only one tested below 3·5 per cent, and seven tested over 4 per cent. Nine of these daughters are gold medal cows.

RECORD OF PERFORMANCE

During the period covered by this report, 36 R.O.P. records were completed. Up to 1933, test cows were milked four times a day, but this policy has been discontinued and these cows are now handled in the stanchions, milked three times a day and given very ordinary feed. The production under these conditions is a suitable measure of the cow's ability to produce, but does not bring the publicity that forced feeding and extra milking did in the past. The highest production recorded was from a twin heifer, Agassiz DeKol Faforit Fobes, 21,370 pounds of milk and 749 pounds of fat, which freshened at 2 years and 66 days.

EXHIBITION WORK

No cattle were shown at fairs during the years 1931-35. This was due to lessened appropriations rather than to shortage of exhibition material. Many animals of show calibre are in the herd.

ACCREDITED HERD

During the regular annual test in June, 1931, one cow re-acted to the T.B. test and the herd lost the Accredited standing it had held since 1928. The same thing was repeated in May, 1933, but since that time the herd has regained the status of Fully Accredited.

BLOOD TESTING FOR ABORTION

Up to 1933, all animals in the herd were tested four times a year; since then, twice. Only one suspicious reaction occurred during the period. In spite of negative results with the blood test, nine abortions took place in the herd in the five-year period. These results would indicate that the abortions were caused by factors other than the germ *Brucella abortus*. Monthly treatments for breeding troubles by a qualified veterinarian to those cows requiring them and pregnancy examinations were continued. The result is that the herd is in a very fine breeding shape with a minimum of reproductive problems. The fact that in 1921, 42·9 per cent of the cows freshening in this herd aborted and that now practically none do, speaks well for the efficacy of the blood test and elimination of reactors as a control measure in handling infectious abortion.

FEED COMPARISONS

In one trial in which a home grain mixture was compared with a commercial mixture, the former yielded higher production of milk and fat at considerably lower cost. The home mixture was 300 bran, 300 oats, 100 barley and 100 oilmeal, the cost being $23 per ton.

In a feeding test to dairy cows, 100 pounds of edible fish meal replaced 200 pounds of linseed meal in a mixture which included 400 bran, 300 oats and 200 barley. The protein content of the linseed meal was 35 per cent and of the fish meal 65 per cent, the cost being $40 and $55 per ton respectively. Practically the same results were obtained when these two mixtures were fed in a comparison test to young heifers.

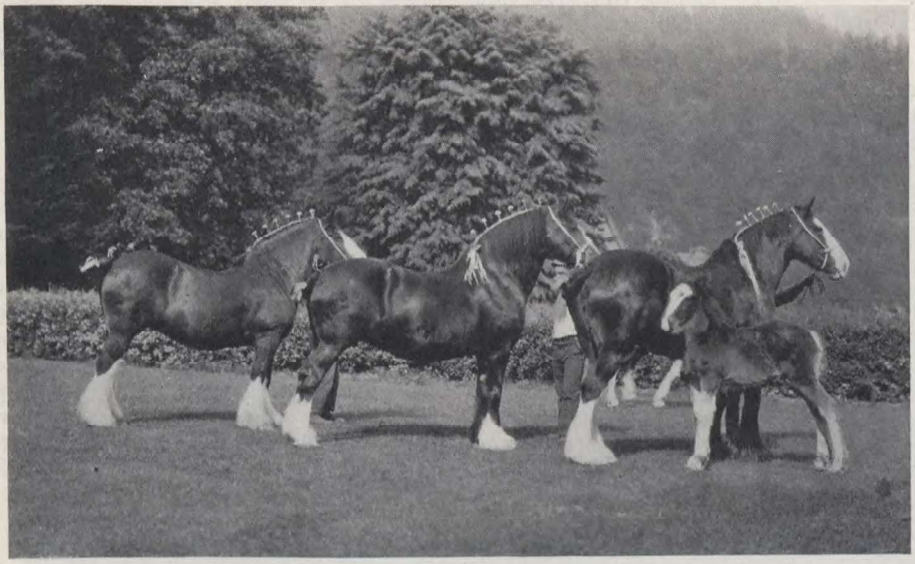
In 1935, for the six winter months, November to April, the average feed cost to produce 100 pounds of milk was $1.21. For the six pasture months, May to October, it was 74 cents. These costs are based on pasture at $2 per month per cow, hay at $12, roots and silage at $5 per ton, and concentrates at market value. The figures are based on all cows in the herd, whether milking or dry, but not on the young stock. These results agree with those of the two preceding years, except that the ratio of difference is hardly so great.

Horses

Approximately twenty pure-bred Clydesdales are kept on this farm; all were bred here, except the foundation mares and the stallion, Radiance 25908, which was bred by the Indian Head Experimental Farm and transferred here at the end of 1934. He has an enviable show and breeding record, his get winning second at the Canadian Royal in 1935 and first at Vancouver in 1936.

During the five-year period, ten horses raised here were either sold or transferred to other experimental farms. One young gelding suffering from leg trouble and the oldest foundation mare were destroyed. Thirteen foals were born, all but one of which were reared.

The average cost of horse labour, including feed, shelter, depreciation, harness, shoeing and labour figured on the horses working regular hours is just over eleven cents per hour. These workers are attractive, high-class draft horses, well harnessed, shod, and in good condition.

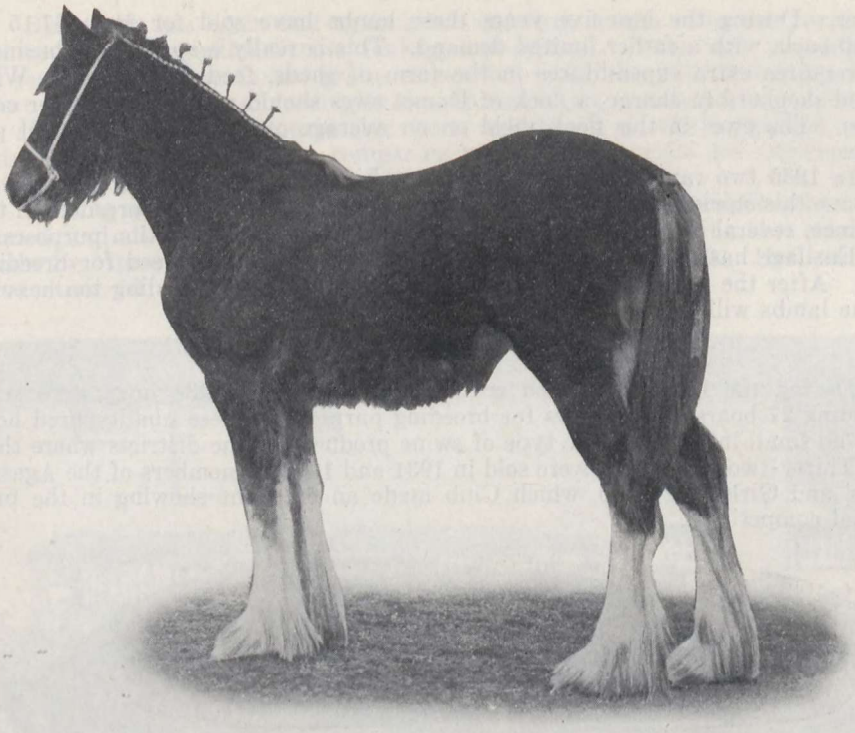


Four generations of Clydesdale breeding. Rear, Hartland's Madge 36027, sire Scotland's Pride 8940; next, Topline Bute 51062 by Bute Crown 23733; next, Lady Velma 54795 by Music Hall 23735; next, Queen O' the May 56448 by Craigie Maxwell 25499.

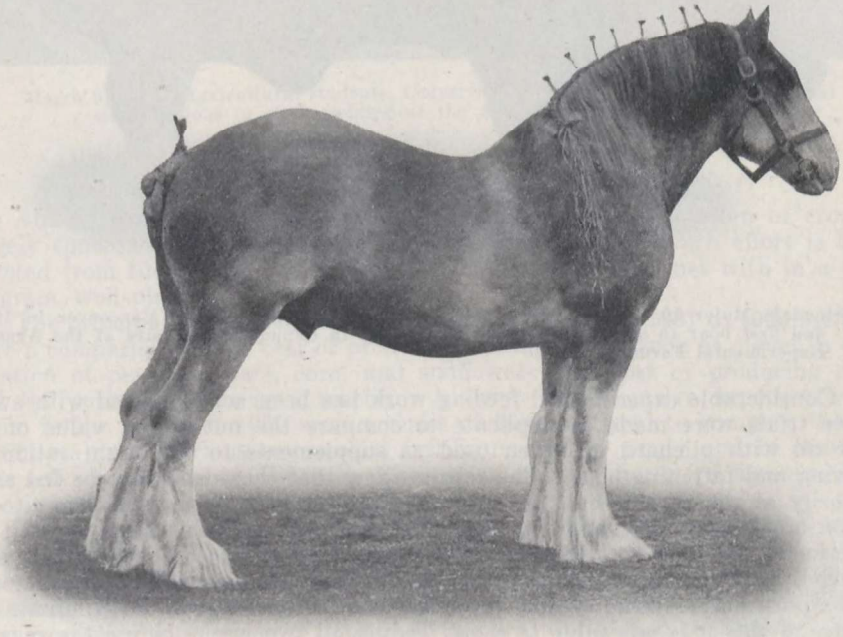
Horses were exhibited at the Vancouver Winter Fair in 1931, where the most important winnings were a grand championship on Doune Lodge Bell Heather and firsts in the get-of-sire, progeny and the best five pure-bred mares owned by exhibitor. At the 1934 Vancouver Exhibition, the foal Queen O' the May won first, and the following year won the championship. Heather Blossom won first in the foal class. At the 1935 Vancouver Winter Fair, Pat, a four-year-old gelding, won the heavy draft class, and Radiance, the stallion championship.

Sheep

Dorset Horn sheep are known as a prolific breed, the ewes being good milkers and good mothers, often giving birth to triplets and occasionally to quadruplets. As ewes breed at almost any time of the year, they are well adapted for rearing out-of-season lambs. The practice here has been to have part of the flock lamb in December and January, the plan being to market these lambs at



Queen O' the May 56448, grand champion Clydesdale female at Vancouver in 1935.



Radiance 25908, grand champion Clydesdale Stallion at Vancouver Winter Fair, 1935.

Easter. During the last five years these lambs have sold for from $7.15 to $10.40 each, with a rather limited demand. This is really a specialized business and requires extra expenditures in the form of sheds, feed, labour, etc. With a good shepherd in charge, a flock of Dorset ewes should raise over 150 per cent lambs. The ewes in this flock yield on an average of 7·3 pounds of wool per fleece.

In 1935 two rams were imported direct from Dorset, England, not only to improve this stock but also to have new blood available for other breeders in the province, several of whom have used stock from here for foundation purposes.

Ensilage has proved a very satisfactory winter succulent feed for breeding ewes. After the lambs arrive, care must be exercised in not feeding too heavily or the lambs will scour.

Swine

During the five-year period covered by this report, 484 hogs were sold, including 27 boars and 17 sows for breeding purposes. These quality bred hogs have no small influence in the type of swine produced in the districts where they go. Thirty-two young pigs were sold in 1931 and 1932 to members of the Agassiz Boys' and Girls' Pig Club, which Club made an excellent showing in the provincial competition.

Springdale Major 10, 125056. First prize mature Yorkshire boar at Vancouver in 1931 and first boar to qualify for advanced registry in Canada. Herd sire at the Agassiz Experimental Farm.

Considerable experimental feeding work has been accomplished with swine. Three trials were made in duplicate to compare the nutritional value of cod liver oil with pilchard oil when used as supplements to the grain ration for growing and fattening hogs. The results show that these oils may be fed satisfactorily at the rate of half an ounce per pig per day as a supplement to the ration of growing and fattening hogs, and that pilchard is at least equal if not superior to cod liver oil. Pilchard oil is cheaper to produce because it is a body rather than a liver product. It is not safe to feed more than the above amounts or the pork may become creamy in colour and fishy in taste. To eliminate any chance of this it is advisable to cease feeding oil two weeks before the pigs are to be marketed.

Skim-milk has again and again given excellent results when compared with fishmeal with and without roots, tankage and oilmeal. If the milk is charged at 20 cents per 100 pounds and grains at market value, the milk invariably shows most profit. The rate of feeding is approximately six pounds per pig per day.

In 1935 some rather extensive work was begun at the suggestion of the Advanced Registry Board in comparing protein supplements for addition to a ration of the common grains, wheat, oats, and barley.

Testing of sows under the Advanced Registry policy for swine has been continued, and all sows in the herd old enough have qualified. The best score was made by Agassiz Note, 169004, Advanced Registry No. 529. Her score is: production, 50; maturity, 113; and slaughter test, 86.

March 9, 1935. Agricultural students, University of British Columbia, having final examinations in stock judging at the Agassiz Experimental Farm.

FIELD HUSBANDRY

Although the work on the main farm in a four-year rotation of crops is largely concerned with the growing of feed for live stock, much effort is being devoted from time to time to a study of factors which are met with in a farm program, well-planned or otherwise.

The principal experiments carried on during the period 1931 to 1935 inclusive were a comparison of the cost of producing ensilage crops such as clover, a combination of peas and oats, corn, and sunflowers; the cost of producing roots, and the cost of operating a tractor. A very comprehensive experiment was begun in the spring of 1930 with a series of tests designed to compare the fertilizing value of various commercial fertilizers applied singly and in combination, and also in combination with different amounts of barnyard manure. This experiment ended in 1935.

The four-year rotation referred to consists of: first year, hoed crop; second year, grain seeded down to a clover and grass mixture; third year, hay; fourth year, pasture. The hoed crop used is corn for ensilage, the most favoured varieties being North Western Dent and Minnesota 13 mixed half and half. For the hoed crop liberal dressings of barnyard manure, well-rotted preferably, and of a complete fertilizer are applied. Thorough cultivation is practised during the

hoed crop year to control weeds as well as possible. The grain crop of the year following the hoed crop consists of Victory oats. The oat crop is the most important grain crop for purposes of local requirements. Victory has been the favoured variety on the Agassiz Farm for many years. The grass and clover mixture seeded down with the grain is composed of 9 pounds of red clover, 3 pounds of alsike, 1½ pounds of white Dutch, 2 pounds of Italian rye grass and 2 pounds of orchard grass per acre. This mixture has been successful also from an ensilage point of view. Much of the first crop is usually put into the silo as weather conditions at time of harvesting make haymaking impossible. In the event of possible suitable weather conditions for haymaking, a portion of the field can be seeded down with a mixture in which the orchard grass is substituted by say 6 pounds of timothy. During the fourth year of the rotation, instead of pasturing the area concerned throughout the entire season, one crop of second-year hay is frequently harvested, the field being devoted to pasturing for the remainder of the season. It is also well to mention that in the fall of seeding down the grass and clover mixture pasturing is frequently carried on to take advantage of the tremendous growth available. Even in the fall of first-year hay, after two crops have been harvested during the season, the area is frequently pastured to take advantage of excessive growth and to control it. By this system of rotation of crops, where manure is applied at least once in four years, soil fertility is maintained and weeds are controlled fairly satisfactorily.

Cost of Producing Root and Silage Crops

A very comprehensive study of the relative cost of producing root and silage crops was carried on for several years, the experiment ending in 1935. The root crop involved was mangels, which is a crop of considerable importance in the Fraser Valley. It was thought fit to place mangels on a comparable basis with ensilage crops because of the fact that, as many farms in the district are too small to warrant the use of a silo, the root crop substitutes in large measure for ensilage. Furthermore, many other farmers are also partial to the use of both roots and ensilage.

The silage crops compared in the experiment were: clover, corn, and a combination of peas and oats; sunflowers were also tested for a brief period. The variety of mangels grown was the Yellow Intermediate. Early in the test sunflowers were discarded because in wet weather, which frequently prevails at harvest time, they form a very undesirable crop to handle. Corn has great advantages over sunflowers for ensilage under existing climatic conditions. The following table shows the yields and costs of the different crops. Clover silage is the most profitable.

SUMMARY OF RESULTS, FROM AN AVERAGE OF 5 YEARS

Crop	Yield per acre	Value per acre	Cost per acre	Profit or loss per acre	Cost per ton
	tons	$ cts.	$ cts.	$ cts.	$ cts.
Mangels	26	56·04	82·46	−26·42	3·23
Corn silage	15	67·91	69·40	− 1·49	4·47
Peas and oats silage	7	34·34	52·70	−18·36	7·51
Clover silage	19	62·79	42·38	20·41	2·31

From the standpoint of cost of production, results are in favour of the clover silage.

Cost of Operating Tractor

A project, begun five years ago, has been carried on to secure information on the cost of operating a farm tractor. The tractor now in operation on this farm is a 12-20 horsepower tractor purchased in 1931. Items recorded comprise depreciation, interest, repairs and repair work, including that of an expert and otherwise. Servicing, gasolene, oil costs and tractor operator costs were also carefully recorded. A summary of results to date indicates the average daily operating costs of the tractor to be approximately $10.

Fertilizers

A series of experiments was begun in the spring of 1930 to compare the fertilizing value of various combinations of commercial fertilizers with and without additions of barnyard manure when applied for the mangel crop. This comprehensive test, comprising eleven different treatments, ended at the close of the 1935 season and yielded some very valuable information.

Results with mangels showed that well-rotted barnyard manure had an advantage over fresh manure. The use of well-rotted manure is also recommended as a further means towards offsetting to some extent the weed problem, so frequently a menace with the use of fresh manure. A combination of a heavy application of well-rotted manure and a liberal dressing of a complete fertilizer gave more beneficial results than were received from a heavy dressing of either alone. As to rate of applying barnyard manure without the addition of commercial fertilizer, results were all in favour of applications at not less than 20 tons per acre; and in applications of commercial fertilizers without the addition of barnyard manure, a complete fertilizer consisting of 200 pounds nitrate of soda, 500 pounds superphosphate and 100 pounds muriate of potash is desirable at the rate of 800 pounds per acre. Some soils would require even heavier applications than these. Drilling in the commercial fertilizer gave less satisfaction than did broadcasting. Results were slightly in favour of applying manure in the spring rather than in the fall, but it is extremely important that the manure applied in the spring be thoroughly rotted. If the manure is too strawy and not well-rotted it will cause the soil to be left far too open, in consequence of which it will dry out too much. All this will be detrimental to the success of the root crop. Attempts to grow mangels without applications of either barnyard manure or commercial fertilizers were futile under conditions of soil as those in question.

Two tons of ground limestone per acre applied on the oat crop of the year following the mangels indicated only a slight advantage in favour of lime application. Where nitrate of soda at the rate of 100 pounds per acre had been applied to the oat crop, there was a distinct advantage in point of yield. Where a generous dressing of barnyard manure or a combination of liberal quantities of barnyard manure and commercial fertilizer had been applied for the mangel crop, the yield of oats was higher as a general rule than where no manure had been applied or, if applied, only in light dressings. Furthermore, where neither manure nor fertilizer was applied for the mangel crop, the yield of oats of the following year was considerably lower than from any of the treated plots.

The application of 2 tons of ground limestone per acre apparently did not tend towards an increase in yield of oat straw, but where 100 pounds nitrate of soda had been applied to the oat crop a considerable increase in yield of oat straw was shown. Yields of straw were generally higher where liberal amounts of barnyard manure had been applied for the mangel crop than where none had been applied.

No advantage was shown in the yield of clover where lime had been applied on the oat crop of the previous year, and no benefit was evident in the yield of clover where nitrate of soda had been applied to the clover crop. Applications

of 10 tons of well-rotted manure for mangels and 10 tons for clover showed no advantage over applying the entire 20 tons for the mangels; in fact, the advantage was rather in favour of the latter. Considerably heavier yields of clover were obtained where liberal amounts of manure had been applied for the mangel crop than were obtained where light applications or none had been made. The influence of barnyard manure applied for the mangels is noticeable in the succeeding crops of clover: barnyard manure evidently tends to maintain soil fertility to a degree not apparent where no manure or only commercial fertilizer had been applied. Where neither manure nor fertilizer had been applied for the mangels or otherwise the yield of clover was correspondingly low.

No apparent benefit resulted in yields of timothy following the clover where lime had been applied on the oat crop two years previously, but an application of 100 pounds of nitrate of soda to the timothy showed beneficial results. In other words, nitrate of soda benefited the timothy, but apparently the same does not apply to clover. Where manure at the rate of 10 tons per acre was applied to the clover no immediate benefits were evident, but in the succeeding year beneficial results showed up in the yields of timothy.

If the type of soil involved and the effect of tremendous leaching due to excessive rainfall during the winter season are taken into consideration, it would scarcely be justifiable to assume that residual effect from fertilizers other than barnyard manure would bear much significance. Under existing soil conditions heavy applications of barnyard manure are obviously necessary to maintain soil fertility and to replenish the supply of humus. On the other hand, however, there appears to be no difficulty in maintaining a satisfactory state of soil fertility if reasonable amounts of barnyard manure and commercial fertilizers are applied for the hoed crop, roots or otherwise, in a well-planned system of rotation of crops.

HORTICULTURE

The findings in horticulture for the years 1931-1935 are summarized briefly in a way to be of most practical value. Appended is a list of bulletins and publications for distribution to those desiring them, which give further information in detail.

Vegetables

CHINESE CABBAGE.—Chinese cabbage is a cool season crop and as such will not produce satisfactorily when planted in the spring at a time which favours heading out during the heat of summer. In this respect it is comparable to spinach. When it is seeded between June 15 and July 15 very satisfactory fall crops have been obtained, the heads firming up in late October and November. The plants will stand up to eight degrees of frost without injury. The cabbage is of good quality for use as a salad or cooked vegetable. The varieties New Joy and Wong Bok have proved the most satisfactory. The most troublesome pests are flea beetles and root maggots.

CORN.—Golden Bantam represents the standard of quality in sweet corn. It can on the other hand be classed no better than a medium-early maturing variety. The following kinds mature from ten to fourteen days earlier: Pickaninny, Banting, and Dorinny, which all produce small ears—the Banting is preferred; Gills Early Market, Golden Early Market, Spanish Gold and Sixty Day Golden which all produce larger ears than Bantam—Sixty Day Golden is preferred. In none is the quality quite as good as Bantam.

HERBS.—Many different kinds of herbs, both annual and perennial, have been tested to determine suitability of growth, which for all was satisfactory. There is, however, only a very limited market for most herb crops, the bulk of them being imported from foreign countries. Caraway seed is used in larger quantities than most other kinds which can be produced under coast conditions. An area of 2,400 square feet yielded a seed crop of 57 pounds.

LETTUCE.—Lettuce is a cool season crop and as such does not give the best results when planted to mature from the middle of July to the middle of August. There are, however, within the variety several different strains, and for summer maturity New York D has been found more satisfactory than other kinds. When planted about the middle of April lettuce required from 60 to 70 days to mature. Good fall crops can be obtained in September by planting from June 15 to June 25. One of the earlier maturing strains, such as New York 12, is the most satisfactory.

PRODUCING EARLY VEGETABLES.—Early production with many vegetables is important. It is influenced by season, soil conditions, application of fertilizer, and by planting early maturing varieties. Experiments have shown that maturity can be hastened by planting early in January or February as weather conditions permit, and by the use of hotbeds, but with variable results. Germination of seed depends on weather conditions, and poor results are often obtained if the seeding is followed by cold wet weather. Carrots, beets and turnips when planted early often tend to bolt at about the time marketable roots are forming. Plant foods are very low in the early part of the year, January, February, and March, and applications of complete fertilizer, 6-10-10, at 750 pounds per acre, should be given to hasten growth and maturity. There must be good fertility, especially for early transplanted crops, to enable plants to resist insect attacks. Hotbeds and cold frames can be utilized to advantage for starting some crops. The production of first early crops is somewhat of a gamble, but to a limited extent, both in hotbed work and seeding in the open, it is a worth while speculation. Locality and soil conditions are limiting factors. The following kinds of vegetables best lend themselves to early production: spinach, Prickly; lettuce, New York; carrots, Early Nantes; beets, Detroit Dark Red; peas, Alaska; radish, French Breakfast; turnip, Purple Top Milan; cabbage, Golden Acre; cauliflower, Snowball; onions, Yellow Globe Danvers when planted in hotbeds and transplanted to the open in April. Good fall crops of spinach may be obtained by seeding towards the latter end of June and in July. Spinach planted in early April will reseed itself and produce a fall crop.

POTATOES.—Blight has been a limiting factor in potato production during recent years, and unless an adequate spray program is followed the successful growing of this crop is largely a speculation. The disease varies in prevalence and injury from one year to another. Early planting and late harvesting causes greater susceptibility than late planting up to June 15. The early planted crop has, however, often produced a commercial size crop before infection takes place, while if the late planted crop does become infected there is very little production of marketable size tubers. Spraying is the only adequate precaution.

Some varieties of potatoes have been grown on the farm since 1895 and have produced satisfactory yields. From year to year, however, a variety, irrespective of the length of time that it has been grown, becomes infected with one of the virus diseases and will not longer produce satisfactory yields. Leaf roll has during recent years decreased yield more than has any other of the virus diseases. Tuber unit selection is the best method of maintaining disease free stock.

Northern grown seed has often been found to produce bigger crops than seed grown in more southerly districts. Less maturity seems to be the cause for this behaviour. Planting potatoes at two-week intervals, starting April 15 and continuing up to June 15, has shown in recent years that late planted crops, June 1 to 15, give higher yielding seed for the next year's main crop planted about May 15 than does earlier planting. The yield of the seed crop planted late is, however, less than when planted in April or May. The increased main crop more than offsets the decreased seed crop. The most productive seed crop is from potatoes left in the ground from 90 to 120 days.

Due to weather and other conditions, cutting sets several days in advance of planting is frequently an advantage. Experiments have shown that this is a safe practice up to fourteen days before planting—provided the cut sets are properly handled. They should be kept in a moist, warm place where there is free circulation of air. The sets should be turned or shaken in sacks several times during the first few days in order to prevent the cut surfaces from adhering. These various conditions help in forming a callous which acts as a protecting surface to the set when planted.

The question is often asked whether the cut surface is better if it is coated with gypsum or some other material. Completed experiments have shown no benefit from coating with gypsum either with sets coated and planted at once or with sets coated and held for ten days. Coated and uncoated sets either planted at once or held for ten days gave equal yields.

Early potatoes should always be grown from whole sprouted sets. The size of set to use is, however, a consideration. Experiments using 2-, 4- and 6-ounce sets have shown that the larger sizes will produce the biggest crops, but when the cost of seed is considered 2- to 4-ounce sets have proved more economical. Four-ounce sets are commercial size potatoes and when the selling price is attractive smaller sizes may be used. If the results obtained with seed production, which showed that sets from 90 to 120 days in the ground were the best, are borne in mind, the smaller size sets from the early crop will make good seed potatoes for the following year if their smallness is not due to disease.

The time to dig the early crop is an important point governed by three factors. If the land is to be utilized again by some other crop, the potatoes must be dug early enough to allow the second crop to be planted. When the potato crop is the only consideration, yield and price are the two factors, and as far as the latter is concerned there is no fixed trend. In the majority of years, however, price goes down as the season advances, although in some years there have been noted exceptions, a decrease from the first early price followed by price increases in July and August. As far as yield is concerned, the trend is definitely upwards from full bloom until the tops die. In completed experiments it has been shown that the first marketable tubers are formed at the time of full bloom, but that no appreciable crop is produced until about the third week after this period. During the period in which this experiment was run, 1931-1935 inclusive, three to four weeks after full bloom was the most profitable time to dig.

The potato crop is one which ordinarily responds profitably to applications of fertilizer. The kind of fertilizer recommended for potatoes will vary for different soil conditions, but in completed experiments on the farm in soils which vary from a loam to clay loam there was no significant difference between using a 4-10-6 or a 4-10-10. The quantities used, however, gave marked differences. An application of 750 pounds gave a profitable increase over no fertilizer and 1,500 pounds gave a profitable increase over 750 pounds when the crop sold for $15 a ton or better. The amount of fertilizer used when approximating the above mixtures is more important than the actual mixture and should be the chief consideration.

TOMATOES.—Recent tomato experiments have dealt mainly with pruning tests and methods of training, with some attention being given to early varieties. Abel and Bestal are both earlier than Bonny Best, a standard sort, but neither is as smooth. Blight in 1934 caused almost an entire loss of crop, and tomatoes are comparable to potatoes in requiring spray control for this disease. As far as pruning is concerned, the most satisfactory results have been obtained when plants are trained to a single stem. Results on distances of planting have shown that bigger yields are obtained with plants 12 inches apart in the row than at farther distances. Spacing has had no effect on maturity. For convenience in picking and pruning, rows must be approximately 3 feet apart. The

most convenient method for tying with close planting is to use two wires, one 6 inches above the ground and the other 54 inches. A string is tied to the top and bottom wire at each plant and the plant is twisted about the string as growth occurs. Stout, firmly embedded, end posts and 2- by 2-inch stakes every 15 feet along the row to support the top wires are required.

PAPER MULCH.—Extensive trials in using paper mulch for vegetable growing have been tried with negative results except for cucumbers, muskmelons and egg plants: production of marketable crops of these three crops was more than doubled. No test was made with squash, but as it has similar growth habits to cucumbers and melons an equally good response is likely. The most satisfactory method of handling the paper is to put it in place after the seed has germinated. The edges next to the plant can be held down with laths or similar strips which are fastened down with 8-inch staples made from No. 12 or heavier wire.

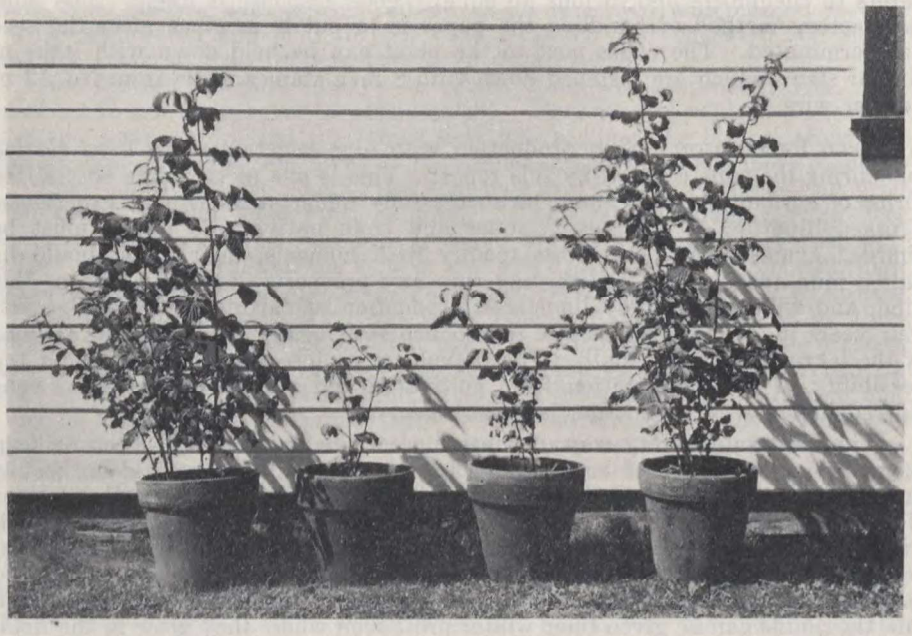
SEED PRODUCTION.—Seed production with nine vegetables has been carried out during the time covered by this report. This is one of the more specialized forms of agriculture and cannot be successfully undertaken without experience. Cross pollination of different varieties and from native wild plants must be guarded against. As beets cross readily with mangels, their plots should be half a mile apart. Wild radish may ruin any prospects of raising seed of this kind, and wild carrots may limit seed production of carrots. During the past four years it has been impossible to produce satisfactory pea crops on account of the larvae of the pea moth. The prevalence of insects and diseases and the possibility of cross pollination from cultivated and wild plants must be considered before seed production is undertaken.

The most satisfactory way of wintering carrots and beets has been to keep them in sand over winter in a storage basement. Cabbage have done best if pulled when the heads are well developed and replanted towards the end of November. They must be covered over with straw and soil to a depth which will keep frost out from the centre of the plants, and frequent examination before removing this covering should be made in the spring to assure that the heads are not rotting. Where there is little danger of the heads splitting in the fall, the plants can be given their winter protection where they grow in the field.

Small Fruits

RASPBERRIES.—During the past ten years, adverse conditions in raspberry production have been met with in the main berry-growing sections. A considerable amount of study has been given to these conditions, and as yet no satisfactory solution can be offered. The trouble very evidently lies in the soil as a single factor in the form of plant diseases, deficiencies of plant food, a toxic substance, or a combination of these three conditions. Under pot tests, using steam sterilized soil, the poor growing conditions are overcome. Such a practice is, however, not practical under field conditions. Various kinds of fertilizer have given no appreciable response, neither have green manuring practices for a two-year period. The only varieties which have shown any degree of resistance to the conditions found are the Antwerp and Newman. In trial plots gooseberries have failed under these soil conditions. The evidence from strawberries, blackberries and loganberries is adverse, but not as conclusive as with gooseberries. One condition that can be stressed is that, where growth is poor and where plants die out, if replanting is not successful after two years' green manuring the grower must look to some field of production other than small fruits. Poultry, seed production and specialized vegetable crops seem to offer the best possibilities because of the small acreages usually involved.

At Agassiz in recent years, raspberries have received more attention than any other horticultural crop. Growing green manure cover crops between the rows proved particularly beneficial during the severe winters of 1932-33 and 1935-36, plots so treated suffering considerably less injury than manured, fertilized or clean-cultivated plots. For cover crops, rye and vetch seeded in either the fall or spring at a rate respectively of 100 and 75 pounds per acre have proved the most satisfactory. The cover crops have been ploughed down before the picking season commenced. Applications of fertilizer and manure have occasioned more winter-injury than has been found in clean-cultivated areas.



Effect of steam sterilization on unproductive soil. The outside plants growing in sterilized soil from two unproductive areas, the centre pots represent the same conditions in unsterilized soil.

Fertilizer experiments in an area separate from the above have been carried on. These have shown that nitrogenous fertilizers more than any other kind increase cane growth, but that such increased growth is more subject to winter injury. Superphosphate of lime in combination with nitrate of soda occasioned less winter-injury than did nitrate of soda alone. Muriate of potash at 500 pounds per acre, either alone or with nitrate of soda at the same rate has caused injury. While the experiments with fertilizer are not complete, the recommendations at present are to use a fertilizer where necessary made up in the ratio by weight of 1 part nitrate of soda, 4 parts of superphosphate of lime and 1 part of potash, preferably the sulphate form.

The number of canes to a given length of row is important in raspberry production. Experimental rows have been trained to a hill system for comparison with a hedge row system. Canes have averaged less than 6 inches apart in the hedge row system and approximately 9 inches in the hill system. The hedge row system has consistently given the higher yield. In the winter of 1932-33, there was considerably less injury in hedge rows and fewer branching canes. Results have shown in severe winters that branching canes are more severely injured. After the third year in both series of plots no thinning out of

canes has been practised until the spring. The hedge row system offers a little more difficulty in hoeing and thinning, but where cover crops are grown, especially rye, annual weed growth has been markedly curtailed.

The Cuthbert variety throughout the years of commercial production has been the outstanding variety, and the extensive market that British Columbia has enjoyed for this berry crop is due largely to the quality of this variety. No variety so far tested measures up to the edible quality of the Cuthbert. All other varieties tested are hardier and none has the habit of fall growth that this kind has. Where the Cuthbert will grow and prove hardy enough it is still the best commercial berry. Next in line is the Viking, more hardy and of better habit of growth. The Lloyd George is a poor shipping variety but if properly handled is suitable for jamming and immediate consumption and is a good variety for home use. The Newman is a hardy variety of fair quality; it is a good shipper but a low yielder. The Count is a good early variety. The practice of growing only one variety of berry—especially the Cuthbert where there is danger of winter-injury, as there is in most parts of the lower mainland—is not advocated. A combination of Count, Viking and Cuthbert gives the best assurance of earliness, quality, and reasonable hardiness.

Diseases of raspberries have not received a great deal of attention in the past, but as there are evidences that they are on the increase, they must now be looked into more carefully. Virus diseases are on the whole not troublesome, except in isolated cases of imported stock. The Lloyd George is a susceptible variety to many of the more common diseases such as mosaic, anthracnose, and cane and spur blight, and for this reason extra precautions should be taken. Most of the varieties tested at the farm are immune or highly resistant to yellow rust. Unfortunately the Cuthbert variety is very susceptible and the Viking markedly so. No economic control for this disease is known.

STRAWBERRIES.—The only experiment with strawberries has been to determine the effect of deblossoming the plants the first year and to compare them with plants which have fruited normally. The results throughout the experiment have been consistent and have shown that plants deblossomed the first year produce bigger, stronger plants which give a higher yield of fruit in the following year. In the first year of planting from plants allowed to develop normally the crop is ordinarily light and of value chiefly for jam purposes. The size of this first-year crop is partly determined by the vigour of growth. On the whole, the first main crop is the chief consideration; and, in view of this, deblossoming during the first year of growth is recommended. All runners were kept cut from both lots of plants. Cropping was not carried out to the second main year of yield.

BLACKBERRY.—The thornless evergreen blackberry has been tested and found to compare well with the ordinary evergreen in date of maturity, hardiness and yield. Because of the thornless habit of growth it is much easier to handle.

YOUNGBERRY.—The youngberry has been given a limited test: in hardiness, productivity and growth habits it was found to be very similar to the loganberry. The fruit makes excellent jam and reports received in shipping tests indicate that the fruit carries well and would be popular with the restaurant trade for pie making. Canes are subject to anthracnose. Those grown here were destroyed on account of this disease.

Nuts

The nut orchard consists of a few walnut trees planted in 1931, a selection of seedling filberts planted in 1926, and varieties of filberts planted chiefly in

1931 and 1932. The walnut trees have made poor growth and an ice storm in 1935 severely injured the trees. Some mature trees suffered very severe injury from the same storm, and photographs on file show very severe damage to walnut trees from an ice storm in 1917. As the wood of these trees breaks easily and as ice storms are not of infrequent occurrence, serious losses can result. The filberts have made satisfactory growth, the heaviest yield from a seedling tree to date being $3\frac{3}{4}$ pounds and from a named variety planted in 1931, $1\frac{3}{4}$ pounds. The quality of nuts is good but several more years must pass before any reliable data can be given on yields. Nuts which do not fall or shell readily from the husk are usually found to be empty. The nut orchard should be clean cultivated during the harvesting season. Bud mite is a pest which requires control either by spraying or by picking off the affected buds, which are readily detected by their abnormal size. Blue jays are an important pest and commence to carry off the crop just before it is ready for harvesting. The only satisfactory control for these birds is to shoot them. There need be no hesitation over this as blue jays are destructive to nut and fruit crops and to other bird life. They are ranked in this respect with crows and magpies.

Tree Fruits

Tree fruit work has consisted chiefly of variety testing and the only variety which has come into bearing during the time covered in this report is the Gold plum. This is one of the Japanese varieties, mid-season as far as earliness, and of medium quality. The colour is described in the name given. The chief merit is its resistance to brown rot, the most serious disease of plums in the coast area.

During the ice storm of January, 1935, trees with weak crotches formed by branches arising from the trunk at sharp angles were clearly shown to be much more severely injured by breaking than those trees with branches coming off from the trunk at a wide angle. Careful pruning to assure firm attachment of limbs is a wise precaution and further strength may be added by central wire bracing. Cherry trees on the whole showed more resistance to breaking than did other kinds of fruit trees.

Weed Control

Control of couch grass and Canada thistle has been obtained with chlorate weed killers when sprayed on the plants or dusted over them at a rate of 1 pound to 100 square feet. Dusting is as effective as spraying and is less laborious, and with thistles, individual plants are more easily treated. These experiments were tried with plants in full growth. Since then it has been shown elsewhere that applications can be made at any time when green growth is showing. The fall of the year, from various results obtained, is satisfactory. Recommendations for rate of application vary to a considerable extent. The weight of evidence for all kinds of weeds mentioned indicates an application of approximately 300 pounds per acre.

Repeated trials have been made to control weeds in lawns with chlorate weed killers, coal oil, and bluestone, and although further tests are under way it has been shown that the broad-leafed plantain is satisfactorily controlled by an application of coal oil at the rate of 1 gallon to 200 square feet. The coal oil should be applied in a fine mist from a spray pump. Weather conditions affect the rate of kill. Some browning and yellowing of the grass occurs but complete recovery may be expected. Bluestone at the same rate as coal oil has proved very satisfactory for fall dandelion and catsear (*Hypochaeris radicata*). One pound of bluestone should be dissolved in 1 gallon of water and applied as mentioned for coal oil to 200 square feet.

Chlorate weed killers have been used on lawn weeds effectively at the rate of 1 pound dissolved in 2 gallons of water and applied to 300 square feet. From this treatment, however, more injury results to the grass than with either coal oil or bluestone. None of these applications should be made during hot dry weather. September or early October from tests made to date seem to be the most satisfactory times.

Calcium cyanamide applied to bare ground at the rate of 500 pounds per acre has markedly checked weed growth in the spring. The results from tests conducted indicate this to be a good method of weed seed control as well as an assured method of applying a nitrogenous fertilizer. The manufacturer's recommendation is to allow three days to elapse for each 100 pounds applied on an acre basis before any seed is sown. On areas treated in this manner and later seeded to grass, weed growth has been less while the grasses have been stimulated.

The following publications prepared at this office are available for distribution:—

Vegetable Growing in the Coast Area.
Pruning and Training Tomatoes.
Summary of Potato Experiments.
Growing Small Fruits.
Tree Fruit Cultivation.
Cover Crops and Winter Injury in Raspberry Plantations.
Raspberry Problems in the Lower Mainland.
Green Manuring and Cover Cropping.
Lawn Grasses, Weeds and Fertilizers.
Trapping Moles.

For other references the reader is directed to the list of publications available from the Publicity and Extension Branch, Department of Agriculture, Ottawa.

CEREALS

Of late years experimental work with cereals has been considerably curtailed as compared to that of previous years, and more time and effort is now being concentrated on a study of crops better adapted to conditions in the Fraser Valley than are grain crops. The major part of the work consisted of variety testing of oats, barley, spring and fall wheats, peas and flax. A study of high protein mixtures was also carried on as, in a dairying district such as the Fraser Valley, it would seemingly be worth while to stress those crops which yield the highest digestible nutrients per acre with emphasis particularly on protein.

Of numerous varieties of oats tested for many years, Victory has taken the lead at Agassiz from the standpoint of yield and adaptability to general conditions throughout the district. Banner, Prolific and Abundance also gave good results, while, from the standpoint of earliness, Gopher gave the most satisfactory returns of any early oat tested. Of course, as is customary with early oats which do not give as satisfactory results as standard oats where conditions are favourable to the latter, Gopher did not yield as well as Victory or as any of the others mentioned.

In barleys, O.A.C. 21 gave consistently best results, with Star and Trebi following in close order. Of the two-rowed sorts, Early Chevalier gave most satisfactory yields.

The growing of spring wheats is always problematical here because of wheat-midge attack. Of the varieties tested, Marquis and Reward gave best results.

Results in the growing of winter wheats have been much more encouraging than they were with spring wheats. Dawson's Golden Chaff, O.A.C. 104 and

Red Rock gave most promise. Unfortunately, winter wheats also have their difficulties under Fraser Valley conditions. If they should happen to be growing in low-lying areas which may be covered with water during part or all of the winter season, the result may be a succession of bare spots where wheat is supposed to be growing.

Of many varieties of peas tested, Arthur, Chancellor and Early Blue are recommended; and of the flax varieties grown for feed purposes, Bison and Buda have given best results.

With the objective of growing a combination capable of producing the maximum amount of protein per acre, a mixture of peas and oats was sown. Fairly successful results were obtained with a combination of Chancellor peas at 75 pounds per acre and Victory oats at 50 pounds per acre. Another fairly satisfactory mixture is Early Blue peas at 75 pounds per acre and Gopher oats at 50 pounds per acre. While the proportions mentioned may be near the ideal required, it must be mentioned that the harvesting of a crop with such a heavy proportion of peas would lead to considerable difficulty under existing climatic conditions. Even a proportion of 60 pounds of peas with 80 pounds of oats frequently results in a crop which is almost impossible to cut with the binder because of the twining of pea vines around the canvasses.

FORAGE CROPS

Included in experimental work with forage plants during the five-year period 1931-1935 is an important study of grasses and legumes for permanent pasture purposes, associated with which is a series of tests of white clovers, these being, essentially, pasture clovers. Grasses and legumes for hay were tested extensively, while work with alfalfas and annual hays was also carried on. Field roots and corn for ensilage were studied in relation to their adaptability for local conditions. Other crops were tested also, such as sugar beets with respect to yield, sugar content and seed production, and also soybeans for seed. The possibilities of grass seed production are receiving consideration, while in the forage crop nursery are introduced from time to time new varieties and strains of forage plants. After preliminary trials, some of these introductions are discarded if they are found to be unsuitable for local conditions, while others may be included in standard plot tests for further study.

Grasses and Legumes for Permanent Pasture

In an area such as the Fraser Valley, where the dairy cow is so important, it naturally follows that permanent pastures should be of prime consideration. This is particularly true as climatic conditions are much more favourable than in most parts of Canada for the development of the best permanent pastures. Furthermore, grasses and legumes which are already known to be specially suitable for pasture purposes are highly adapted to this area. With these considerations in mind, a test of grasses and legumes for pasture was begun in 1933. These were seeded in replicated plots and cut frequently with the lawn mower to simulate grazing.

Among the grasses, perennial rye grass stands out as being particularly suited to the climatic conditions of the Fraser Valley and admirably adapted for grazing. Orchard grass has much in its favour when sown thickly, being even more promising as a pasture grass under existing local conditions than it is as a hay grass. Timothy has shown some desirable features as a pasture grass, notably its excellent palatability; but it is not as persistent under grazing as perennial rye grass. Wild white clover, from its persistent habits and density of stand, offers much promise. From the results of the six pasture mixtures which have been tested, one that suggests itself as being very applicable to local con-

ditions is: orchard grass, 10 pounds; perennial rye grass, 14 pounds; timothy, 4 pounds, and wild white clover, 2 pounds per acre. Another and simpler mixture which is equally promising consists of perennial rye grass, 30 pounds, and wild white clover, 2 pounds per acre. On the higher and drier soils orchard grass may sometimes be substituted for perennial rye grass with good results. These combinations may be seeded down in early spring with a nurse crop of oats, sown at one-half the usual rate, on a thoroughly prepared seed bed, following a well manured and well tilled hoed crop of the previous year.

White Clovers

As white clovers are essentially pasture clovers, a study of these naturally falls in line with investigations in permanent pasture mixtures. The varieties of white clover on test are English wild white clover, two strains of New Zealand wild white, Danish Morso, Stryno and Mammoth white. The method of testing is to seed the clovers in replicated plots with perennial rye grass and to cut the herbage frequently to simulate grazing. About nine cuttings per season are taken. Perennial rye grass and white clover thrive so well together that the clovers are given the best possible chance for normal development.

The wild white clovers which have been tested have given excellent results. Their density of sward, low-growing habits and persistence make them ideal for pasture purposes. Danish Morso, while it produces more herbage as a rule than the wild white clovers, does not produce so dense a sward, but it is nevertheless a very promising strain. Stryno has given less herbage than Morso and has not produced so dense a sward as the wild whites. White Dutch, in our tests, is not as persistent as the others just mentioned, but it may be used if wild white clover strains are not available. It is doubtful if Mammoth white clover, although very productive, should be used for permanent pastures, because it does not tolerate close grazing.

Grasses and Legumes for Hay

As the hay crop is a very important factor in the farm program of the Fraser Valley, considerable time and effort has been concentrated at the Agassiz farm in a study of various combinations of grasses and legumes for hay. One series of plots was laid down in 1928 and another in 1933. Results have shown timothy to be one of the most important grasses on test. Although this grass suffers in some years from rust attack, nevertheless it is one of the most highly favoured grasses in the district. Italian rye grass grows abundantly and is specially adapted to local conditions. Orchard grass grows profusely but is inclined to become rather coarse for best quality hay. Results show that grasses invariably do better when sown in combination with clover than when seeded alone. Red clover grows abundantly, but growing this crop alone is undesirable because it lodges badly. However, when seeded in a mixture with grasses, the grasses supply the necessary support to prevent lodging. A combination of red clover, 6 pounds; alsike, 2 pounds; timothy, 8 pounds; and Italian rye grass, 4 pounds per acre is recommended. A mixture of red clover, 9 pounds; alsike, 2 pounds; Italian rye grass, 3 pounds; and orchard grass, 3 pounds per acre also has its merits, especially because, while it frequently is ready for haying too early for local climatic conditions, it has generally proved to be a satisfactory combination for ensilage. A combination of red clover, 8 pounds; alsike, 2 pounds; and red top, 6 pounds per acre is also suggested for certain conditions where other rye grasses may not succeed very well. Red top will thrive in low-lying, wet areas.

Alfalfa

In certain favoured sections of the Fraser Valley alfalfa grows successfully, but tests in the growing of alfalfa at Agassiz have met with only indifferent success. While it is claimed that once alfalfa becomes established it can take

care of itself in fighting against weed growth, that has not held true of our experiments. Two or three years after establishment, volunteer growth of grasses and weeds has been effective enough to choke out any alfalfa where grown broadcast—despite repeated cultivation to clean out weeds and grass. Even with heavy applications of well-rotted manure to the land previous to seeding, lime at the rate of 2 tons per acre and superphosphate at 500 pounds per acre, alfalfa seeded with or without a nurse crop has given indifferent results. Whether tested in a mixture with other grasses or seeded alone broadcast on a well-prepared summerfallow or hoed crop land, alfalfa has not been a promising crop. The only method by which alfalfa has been grown successfully in our experiments has been in rows 30 to 36 inches apart. Fairly good results have been obtained in this way even when no lime has been applied, provided the land was thoroughly prepared before seeding. Although the land in the district is mostly acid, yet so long as alfalfa is grown in rows and these rows are kept cultivated continually the alfalfa will flourish. Desirable results can be obtained by growing such varieties as Grimm and Ontario Variegated at 3 to 5 pounds per acre in rows 30 to 36 inches apart.

Annual Crops for Hay

In the event of the regular hay crop being light or having failed, tests have been carried on in a study of various annuals which might fit in as emergency or substitute crops. Of all the annuals tested, oats were the most productive. Peas may be added to oats to increase the nutritive value. Experience indicates that weather conditions at Agassiz are not, generally speaking, favourable to millets as annual hays. Results of repeated trials with soybeans for hay have, as a whole, been far from encouraging. The possibility of success in growing soybeans for hay in the Fraser Valley is very questionable, as unfavourable weather conditions which frequently prevail at time of harvest make the hay difficult or impossible to cure. Recommendations for annual hays, therefore, are oats sown at 2½ bushels per acre and cut in the 'early-milk' stage, or a mixture of oats, 2 bushels and peas, 1 bushel per acre.

Field Roots

The mangel crop is of considerable importance in the area served by the Agassiz Farm. Swedes and fall turnips are of less importance, and only limited amounts of field carrots are produced.

MANGELS

For many years several varieties of mangels were tested annually. More recently the test was reduced to a comparison of three main types: Yellow Intermediate, Giant White Feeding Sugar and Giant Yellow Globe. Mangels of the long type were eliminated from the tests as it was inadvisable to recommend them because of the difficulty in harvesting them and the danger from loss in storage through breakage at harvest time. While the Giant Yellow Globe is a desirable type of mangel, it is comparatively low in dry matter and also has the disadvantage of growing so high out of the ground that many of the roots may be dislodged by cultivation. Notwithstanding the heavier tonnage of green weight per acre of the Giant White Feeding Sugar, the dry matter content of the Yellow Intermediate gives the latter the preference over all other varieties for local conditions.

Intermediate types of mangels are considered, therefore, as being the most desirable for general use. They are comparatively easy to harvest, produce good yields, and keep reasonably well in storage. The Yellow Intermediate is recommended for this district.

SWEDES AND FALL TURNIPS

The results for several years in attempting to grow turnips have coincided with those of the average farmer in the district. After repeated efforts it was decided to discontinue the experiments because of the fact that, owing to persistent flea-beetle attack, a crop could be grown only with extreme difficulty. While the tests showed that the flea-beetle can be controlled by the application of certain sprays, this method of control, though practicable in a small area such as a garden, cannot very well be recommended for large fields. Consequently many farmers have discontinued growing turnips, while others, with characteristic determination, manage from time to time to obtain a reasonable crop by repeated thick seedings of turnip or swede seed as the case may be.

FIELD CARROTS

Of the many types of field carrots tested for several years, including the Large, Long, Half-Long, Intermediate and Mammoth Short, the test finally resulted in a comparison of the Improved Intermediate White and the Mammoth Short White. Either of these is recommended not only from the standpoint of ease of harvesting as compared to the long types, but also from that of yield. The Oxheart and St. Valery (both red carrots), though not belonging strictly to the field type, were tested for a period and are considered valuable for feeding to poultry. The red carrot is generally recognized as more important for that purpose than is the white.

Corn for Ensilage

Corn varieties have been tested extensively for many years at Agassiz. As many as twenty-five strains have been on test at a time, the number being gradually reduced to a comparison of Golden Glow, Longfellow, Minnesota 13, Northwestern Dent and Wisconsin No. 7. While any of the five just mentioned has given good results, the most of them have frequently to be harvested prior to the glazed stage or what is generally considered to be the best stage for ensilage purposes. In other words, climatic conditions, generally speaking, are not altogether ideal for bringing corn along to a stage of maturity suitable for ensilage. Furthermore, to avoid the handling of the corn crop under the disagreeable conditions of wet weather which frequently prevail in the late fall, the crop is often harvested before it reaches a satisfactory stage of maturity for ensilage. Consequently, though the foregoing varieties can be grown successfully, recommendations as to these varieties are made with due regard to climatic conditions.

Sugar Beets

A study is being carried on with commercial standard varieties and improved strains of sugar beets with reference to yield, sugar content and seed production. Fourteen varieties are under test. Though as yet it is too early to arrive at final conclusions, some interesting features have been brought to light. Results show the significant fact that high yield of beets is a more important consideration than high sugar percentage in securing high yields of sugar per acre. Accordingly, "high tonnage" rather than "high sugar" varieties should be sought, because the majority of the "high sugar" strains were lowest in yield of sugar per acre due to low tonnage production. It is interesting to note that the highest yielding variety to date is a standard commercial variety. This particular variety, "Dippe E," has also given consistently good results with previous tests carried on in earlier years at the Agassiz Farm. While the yield and quality of beets may be considered to be quite fair, the yield of seed per acre has not been satisfactory so far. This has been due partly to poor fertilization of the flowers in some cases, attack by beet aphis in others, and to a certain extent unfavourable weather conditions when harvesting the seed.

Soybeans

For some years a study of the possibility of producing soybeans for seed has been carried on. Results to date cannot be given in terms of unqualified success. Although efforts in seed production have met with more encouragement than have the attempts to produce soybean hay, there is much left to be desired. Certain varieties would seem to have a place under conditions such as exist in the Fraser Valley, provided weather during harvest does not make the saving of the seed too difficult. Because of the unreliable harvesting conditions which frequently occur due to heavy fall rains, earliness of maturity is important. Of the varieties tested, Mandarin, Wisconsin Black and Manitoba Brown are of special interest. Manitoba Brown and Wisconsin Black have the quality of earliness in their favour, but they do not yield so well as Mandarin, which matures later. O.A.C. 211 is inclined to ripen too late in the season. With further selection and breeding it may be possible to evolve a strain or variety which will ripen as early as Manitoba Brown and yet yield as well as Mandarin.

Grass Seed Production

Tests have been carried on to determine the possibilities of making grass seed production a profitable specialty. Experiments to date disclose the fact that, while certain grasses are not very productive of seed under existing conditions of soil and climate, others seed abundantly. Included in the latter are Italian and perennial rye grass, some of the fescues and tall oat grass. In the carrying on of such specialized work success depends very largely on the aptitude of the grower and also on weather conditions, which are frequently rather unfavourable at the time of harvesting the seed.

Plant Introductions

Of the miscellaneous plants introduced into the nursery, mention is being made at the present time of only one or two legumes which are of special interest. Our experience with perennial lespedeza, regarding which there has been con-

Forage crop nursery where new plant introductions are studied.

siderable inquiry, does not warrant its recommendation over other legumes which succeed much better under local conditions. Certain varieties of annual lupins have been successful, and the perennial forms have always grown profusely. The latter would appear to be of considerable value for ploughing down on light soil.

CHEMISTRY

During the period 1931 to 1935 inclusive a very comprehensive line of experiments was carried on to compare the value of various commercial fertilizers and different combinations thereof for the mangel crop. Eleven different treatments were involved, comprising one-eightieth acre plots in triplicate. The experiment was ended in 1935. From information gathered it is obviously impossible to grow mangels satisfactorily under local conditions of soil and climate without a liberal application of a complete fertilizer and this preferably in conjunction with a liberal dressing of well-rotted barnyard manure. The nature of the soil would call for an application of the latter if only for the necessity of returning humus to the soil. By a complete fertilizer is meant a mixture of nitrate of soda, superphosphate and muriate of potash in the proportions of, say, 200, 500, and 100 pounds per acre respectively. The value of superphosphate has been shown to be very pronounced throughout the entire experiment. The importance of nitrate of soda was clearly indicated also, but that of muriate of potash did not appear to be so significant, as did that of superphosphate and nitrate of soda. It was found practically impossible to obtain a crop of mangels where no fertilizer was applied. Apparently there was very little residual effect from the fertilizers on the succeeding crops of oats and clover. Probably due to the nature of the soil in question, which consists largely of a silt loam with outcroppings of sand and more or less gravelly subsoil susceptible to considerable leaching during the winter season, much residual effect could scarcely be expected.

POULTRY

The flock maintained at the farm consists entirely of Barred Plymouth Rocks. The number of birds on an average is 100 to 120 breeders and 200 to 230 laying pullets. During each season hatching eggs, cockerels for breeding, and surplus pullets for laying purposes are sold. Within the period 1931 to 1935 inclusive, 2,130 eggs were sold for hatching, 90 cockerels for breeding, and 366 pullets for laying purposes. By such means, therefore, considerable valuable stock has been distributed throughout the country at reasonable prices. Due, however, to a recently revised system in the breeding program, as directed by the scheme of Progeny Testing, practically no pullets are disposed of until they have completed their first year of laying.

Pedigree breeding, with all the detailed record keeping involved, has been followed for many years. Every bird on the poultry plant is pedigreed; its ancestry can be traced for generations back. All hens are trapnested and records are kept of every individual. By this means breeding is practised for standard type and production in order to develop high-laying strains of standard-bred poultry. Only birds that have given satisfactory production are bred. These must have laid in the pullet year at least 200 eggs weighing not less than 24 ounces to the dozen. Males used, while conforming to the type desired, are selected from dams which, besides having been high producers, have laid eggs weighing more than 24 ounces to the dozen. During the period in question some very creditable records were made. In their pullet years 16 birds laid over 300 eggs, 44 laid from 280 to 300, and 146 laid from 250 to 280 eggs. A total of 424 laid from 200 to 250 eggs, and 272 laid from 150 to 200 eggs in the pullet

year. These figures also go to show, however, that notwithstanding the utmost care in breeding, selection and culling, it is a matter of no small concern to maintain a flock up to a high standard of production while adhering at the same time to recognized type of the breed concerned. In conjunction with the program of pedigree breeding in the flock, which in its entirety is regularly subjected to the blood test for *bacillus pullorum*, information is also being collected every season on incubation with respect to fertility, hatchability and related matters.

In a study of several feeding experiments valuable information was obtained. Beef scrap as a source of animal protein gave very satisfactory results. A combination of equal parts beef scrap and fish meal also gave good returns, but when the latter was fed alone results were less satisfactory. Success with feeding fish meal obviously depends greatly on the quality of the product. Skim-milk also gave satisfactory results. Grain fed in a self-feeding hopper or in a trough by measure as against being fed in the litter depends for its success, as far as cost of production is concerned, very largely on the lower mash consumption which usually follows in consequence. In a test where powdered skim-milk was substituted for a combination of beef scrap and fish meal on an equivalent protein basis, results show that a ration containing powdered skim-milk at nine cents a pound, which was the price paid for it, is too expensive for egg production. Results in an experiment in which pilchard oil was compared with cod liver oil as a vitamin D supplement on day-old chicks, show that pilchard oil can be used with safety for cod liver oil for growing chicks. Minor tests in a comparison of certain green feeds for poultry demonstrated the value of clover, alfalfa and kale. Red carrots were also favoured—more so than mangels.

In the fall of 1935, 200 cockerels were used in an overseas shipping experiment to London, England, in conjunction with shipments from other stations of the Dominion Experimental Farms System, to obtain information on the possibilities of such an export market. The fattening ration consisted of equal parts of ground barley, ground wheat, and ground oats mixed with skim-milk. Reports on the project indicate that the distance from such a market makes the possibilities of profitable returns very questionable.

Egg Laying Contest

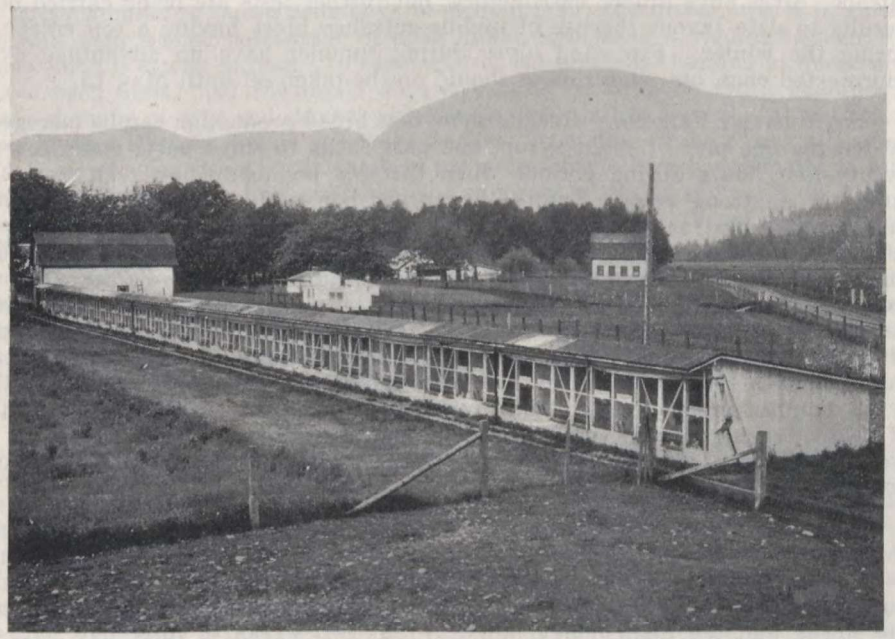
The Agassiz Egg Laying Contest has continued to have the support of British Columbia poultrymen for the years 1931 to 1935. During this period, 1,204 birds qualified for registration. Thirty-five hens got into the 300-egg class; the highest one being Dereen 10L, a White Leghorn owned by M. H. Ruttledge, of Sardis, B.C. This bird produced 357 eggs in the year, averaging 24 ounces per dozen. This was not a world's record, but the accomplishment gave world-wide publicity to British Columbian and Canadian poultry. Derreen appeared later in the larger cities of the continent in the motion picture news reels.

The highest pens in each of the five contests were as follows:—

	Eggs	Points
1931 J. Chalmers, Haney, B.C.	2,438	2,764.6
1932 University of British Columbia, Vancouver, B.C.	2,478	2,791.7
Smith Bros., Surrey Centre, B.C. (private pen)	2,285	2,655.2
1933 J. Chalmers, Haney, B.C.	2,546	2,925.5
1934 W. M. Fairweather, Hammond, B.C.	2,509	2,757.1
1935 C. Headey, Cloverdale, B.C.	2,496	2,874.3

Mr. Chalmers is the only breeder to make the highest score twice in the Agassiz contest, although Smith Bros., of Surrey, have twice had the highest scoring privately owned pens. A notable feature of the 1933 winning pen was the fact that six of the birds were full sisters, fourth generation birds, daughters of a 297, 26-ounce egg hen, a member of the 1931 winning pen. Two other full

Derreen 10.L., 357 eggs in 365 days, 1933.



Egg laying contest house on the Agassiz Experimental Farm, where the highest contest production in Canada is recorded.

sisters, fourth generation birds, were daughters of another member of the 1931 pen. A feature of the 1934 contest was the excellent showing made by the pen owned by F. C. Evans, of Abbotsford, B.C. This pen led the contest for the first forty-six weeks, something that was never before accomplished here. In this same contest two Barred Rock pullets produced 299 eggs in the first 150 days of the race.

BEES

From 1929 to 1934 the strength of the apiary averaged 65 colonies, but as in 1934 it was apparent that the district could not support so dense a population of bees, the count in 1935 was reduced to 45 colonies. This review of experimental work covers in a brief way the results obtained from 1931 to 1935.

Winter Protection Cases.—The Kootenay case for housing single wall colonies is the one most commonly used, and it offers adequate protection, especially when provided with insulation such as shavings. Wintering colonies in double and quadruple cases has, however, proved more economoical from two angles: the construction for such cases for a given number of hives is less, and the consumption of stores is less by 5 to 7 pounds than with Kootenay cases. The double case from the latter point of view is better than the quadruple case, and as it has only two openings it can be faced in the direction opposite to prevailing winds.

Hives.—Permanently insulated hives have not proved satisfactory, as the bees tend to gnaw the insulation. There is also a harmful condensation of moisture. Top-entrance hives have not proved satisfactory. A queen excluder is necessary to prevent the queen from laying throughout the hives, and the bees fill the brood chamber with honey. In top-entrance hives the amount of mould on combs in winter is less than in hives with a bottom entrance. Middle-entrance hives have proved satisfactory, but further tests are being carried out. Results to date favour the use of middle-entrance hives having a top entrance during the winter. Protected hives during summer have no advantage over unprotected ones, but winter cases should not be taken off until May 15.

Stimulative Feeding.—Results show that brood production can be increased by feeding one pint of sugar syrup, one part sugar to three parts water, every twenty-four hours during periods when there is no honey flow. In order to build up a strong colony before the spring honey flow commences, feeding should be started early in February. When the spring flow is over there is usually a period of dearth until the main crop is gathered. Feeding during this time will also stimulate brood production, resulting in stronger colonies. Strong colonies in productive years will give a larger surplus, but when the main crop is light the strong colonies will to a great extent consume the increased amounts of honey gathered. The surplus gathered in any one year does not much exceed the amount of food given. Another advantage from such feeding is that the syrup supplies an adequate amount of moisture and so prevents a large mortality of bees in spring months when bees alight on the cold ground or elsewhere in search of water. Feeding is also a factor in helping to control European foul brood.

Disease.—European foul brood, a disease prevalent on the Pacific slope, shows up in varying intensity every year. The first indications are apparent usually in March or April, yet infection in the colonies may not show up until June, depending to a great extent on the period of dearth of nectar between the spring and the main honey flows. From two weeks to forty-five days is required to clean up a colony. Requeening is not necessary, but is sometimes desirable—especially if the stock is inferior or if the disease does not respond to treatment. The best method found to deal with this disease is to take away

all frames except those that the bees actually cover, putting in a division board. Sugar syrup should then be fed, adding frames only when the bees actually require them, or in bee terms, when the bees are boiling over. This gives a weak colony a feeling of strength. In this way the bees have to clean out infected larvae not only to give the queen room to lay, but also to store the syrup fed. Strong colonies always show the most resistance to this disease. Weak or medium strength colonies in which the queen has too large an area to work on are almost impossible to clean up as some strains are inclined to move away from the brood nest rather than clean up infected larvae. This disease along with poor or failing queens is responsible for most colonies failing to make a surplus. The table on page 30 shows the percentage of colonies which have been affected during the years covered by this report.

DETECTING PREPARATIONS FOR SWARMING.—Using a double brood chamber and tilting the upper section forward to examine the under part has proved a satisfactory and rapid method of detecting swarm preparations. Queen cells are built when a colony is preparing to swarm or to supersede its queen. In 80 per cent of the cases an examination of the bottom of the upper super will indicate whether either of these conditions is being prepared for. Under swarm conditions queen cells have always been found at the bottom of the upper chamber when brood was present, and in 61 per cent of the cases queen cells for supersedure have also been found there. In the remaining 39 per cent they have been found only on the side of comb in the lower half. For swarm conditions an average of 8 cells have been found in the bottom bars of the upper chamber and 3 elsewhere. Under supersedure conditions queen cells are ordinarily less numerous. The respective figures as above have been 1·73 cells, and 1·47 cells elsewhere. A few cases have arisen where queen cells have been more numerous under supersedure than under swarm conditions. The following conditions will prevail: With few exceptions, the swarm colonies show that (*a*) a larger number of queen cells have been built; (*b*) the brood area is large and regular with a good percentage of open brood, indicating a vigorous queen; (*c*) the colony is strong in bees. In supersedure, (*a*) a smaller number of queen cells have been built; (*b*) the brood area is smaller or irregular, with generally a poor showing of eggs and larvae, which indicates a failing queen; (*c*) the colony can be any strength but is generally weaker, depending on how long the queen has been slowing down; (*d*) there is too much drone brood, especially if built in worker cells. The best evidence of a vigorous queen is the ratio of open to capped brood, the ratio of frames of brood to the frames covered by bees. Queen cells will not show under the top chamber unless there is brood in frames.

This method is recommended as a quick and easy way of determining the condition of a colony as regards swarming. It does not, however, replace the value of a close examination for detecting foul breed and other diseases and the condition of the brood chamber with regard to the vigour of the queen. The table on page 30 gives the yearly percentage of colonies superseding or preparing to swarm.

SWARM CONTROL.—If preparations to swarm have been detected, there remains the problem to prevent it. The only satisfactory method of those tried is to remove the old queen and destroy all queen cells. Ten days later again destroy all queen cells and introduce a young laying queen. By this method 75 per cent control is obtained. The two chief causes of the 25 per cent failures are that the young queens are not accepted, or that in spite of acceptance preparations to swarm will continue. The chief disadvantage of this method is that the colony is queenless for at least ten days. Dequeening and requeening after raising all but one frame of brood into a super, while overcoming this queenless period, has not controlled swarming; the majority of colonies swarm with the young queen introduced.

QUEEN REARING.—New queens have been raised without any great amount of trouble. Two methods may be used to carry the procedure through. Young worker larvae up to 48 hours old are grafted into specially made wax cells and placed in queenless colonies which have no uncapped brood and which should be strong in young bees. When these queen cells are capped, individual ones are transferred to mating boxes. The second method consists of taking natural queen cells from established colonies and placing individual bees in mating boxes. Either of the above methods may be followed, using a mating box or a super with two or three frames of brood and adhering bees and placing these in a super over a super clearer on an established colony. A few hours later a queen cell is introduced. Both the mating box and the super method with a back entrance have proved suitable, the young queens becoming satisfactorily mated. Introducing queen cells to queenless colonies is not satisfactory, as large numbers of the emerged queens become lost during the mating flight. The mating box should be well separated from the other hives to facilitate the queen's return. The practice of taking queen cells from colonies which show signs of swarming is not advocated. Queens have been raised in March, though normally they cannot be expected until May.

INTRODUCING QUEENS.—It is often difficult to have the bees accept a queen in a queenless colony in the spring that is worth while saving. The easiest way to overcome this is to take the queen and one or two frames of brood with adhering bees from a queen right colony and then to requeen the colony from which the brood was taken. During periods when there is no honey flow and with irritable colonies it is sometimes difficult to requeen. In such instances the best method is to place the queen in a wire cage (push-in-comb type) by herself and push this into comb over capped brood. The bees will eat out the sugar block and release her. With swarming colonies and supersedure colonies this method of introduction is the most satisfactory when there is no nectar flowing. Practically always when there is an abundant honey flow, the introduction of queens may be successfully carried out by following the instructions given on the mailing cage.

The following table summarizes various conditions which can be expressed numerically. Figures are based on an annual average of 55 colonies for the five-year period:—

TABLE I.—SUMMARY OF SWARM, SUPERSEDURE, SURPLUS, DISEASE, MORTALITY AND REQUEENING

——	1931	1932	1933	1934	1935
Percentage of colonies requeened.....	60·3	80·6	74·6	93·7	No record
Percentage of colonies swarming.....	19·1	11·3	23·7	13·3	"
Percentage of colonies superseding.....	25·0	38·7	22·0	26·6	"
Percentage of colonies with foul brood...	20·6	35·5	5·1	5·0	19·4
Percentage of colonies lost in winter*....	8·7	7·3	12·5	9·1	1·5
Average surplus per colony in pounds....	23·0	5·0	21·0	38·0	48·0
Surplus from highest colony in pounds...	79·0	89·0	65·0	85·0	114·0
Surplus from lowest colony in pounds**...	−43·0	−40·0	−16·0	−22·0	19·0

* Includes dead, queenless or very weak colonies.

** Minus yields represent colonies which have been heavily fed to overcome disease.

FIBRE PLANTS

Previous to 1931, considerable work had been carried on in testing flax varieties for fibre purposes. As years of experimenting had shown that flax of excellent quality can be grown successfully in the Agassiz district, as far as climatic conditions are concerned, it was decided to expand activities during 1931 and undertake some work whereby information from the commercial standpoint could be obtained. However, just as plans were being prepared to make arrangements with about twenty farmers in the district to grow two acres apiece of fibre flax, the whole scheme had to be dropped because of the state of economic conditions generally. Since then the only work carried on has been the testing of fibre flax varieties, and that in a small way.

GENERAL NOTES

The only new building erected during the period covered by this report was one to provide accommodation for work with field crops in 1931. A new silo was built the same year to supply storage space for an unusually large corn crop. The following year the Health of Animals Laboratory work was transferred to Vancouver Island and the old buildings here were removed, except the barn, which has since been remodelled and used as a veterinary hospital. An inadequate amount of repairing, reshingling and painting has been provided for the other buildings.

Exhibition work consisted mainly of staging an agricultural exhibit at Vancouver and Chilliwack and showing horses, sheep and swine at Vancouver in 1931 and horses at Vancouver in 1935. Seeds were exhibited at the Provincial Seed Show and at the World's Grain Show in 1933. The superintendent judged live stock at many of the class A and B shows in the province and at Saskatoon and Calgary as well.

In 1932 a direct hook-up was made in this district with the main Stave Lake power line via Chilliwack. Three small motors now assist in useful power work, especially in pumping during a dry season.

The assistant in charge of field crops and poultry, Mr. K. MacBean, B.S.A., has had full charge of experimental work in these sections and is responsible for recording and reporting on this work. Mr. J. J. Woods, M.S.A., in charge of horticultural work and bees, has spent much time on the major project of raspberry decline in the Fraser Valley, and, besides concentrating on the problem here, established a small fruit station at Hatzic to enlarge the scope for study. Mr. R. M. Hall, B.S.A., Supervisor of Illustration Stations for British Columbia, with headquarters in this office, succeeded in establishing five new stations in the province during the five-year period. These illustration stations provide an excellent means of contact with agricultural problems in districts distant from the experimental farms.

Radio talks, press articles and correspondence continue to provide means of assisting with agricultural extension work. Visitors more frequently than ever make use of the farm as a centre for information on farm problems. On June 15, 1935, 1,902 people attended the annual Fraser Valley Milk Producers' Field Day held on this farm.

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