DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

EXPERIMENTAL STATION

SAANICHTON, B.C.

RESULTS OF EXPERIMENTS

1932-1936 INCLUSIVE

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SUPERINTENDENT

Published by authority of the Hon. JAMES G. GARDINER, Minister of Agriculture,
Ottawa, Canada, 1937.

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RESULTS OF EXPERIMENTS, 1932-36

INTRODUCTION

The seasons during the five-year period 1932-36 have been much like others, exceedingly dry at times but with flood waters at others. The winter of 1935 had one period of frost, lower by one degree than any readings recorded at this station for very many years. In 1935, too, floods over the entire country damaged the farm property by erosion and destroyed roads and bridges. Though damage done on Vancouver Island was very great, the flood was not so serious as in the Fraser Valley. On Vancouver Island 1936 will perhaps be spoken of as "the good crop year." Excellent crops of hay and grain were harvested, but the root crop and potatoes were somewhat shortened by dry weather late in the season. These excellent crops were in direct contrast with those obtained in many parts of British Columbia and throughout Canada. The first frost recorded at the farm was on the evening of November 1. On the whole, the weather was all that could be asked for.

METEOROLOGICAL RECORDS

The average annual precipitation at this station for the past 23 years averaged 29·65 inches, but for the 5 years under review, 1932 to 1936, 34·68 inches. The heaviest annual precipitation ever recorded here was 41·55 inches in 1933. January of 1935 furnished a record for monthly precipitation— 12·74 inches, 11·74 of which was rain. A twenty-four hour record of 2·88 inches was also established during that month.

In 1935 the spring and summer months were extremely dry, only 2·19 inches of rain being recorded between April 1 and August 15. The hay crop that season was the poorest ever harvested at this station. Spring sown grains, grasses and legumes also suffered severely from drought. The total precipitation for 1936 was 0·57 inches above the average and quite uncommon in that it was more evenly spread over the growing season than usual. The average total rainfall for May, June and July, during the 23 years that records have been kept at this station, is 2·24 inches. In 1936 the precipitation for the same period amounted to 4·56 inches.

Hours of bright sunshine for the 5-year period 1932-36 averaged 2,146·9 per annum, compared with an average for the past 23 years of 2,075·9 hours.

No extremes of temperature were recorded during the period, the highest being 88 degrees and the lowest 10 degrees above zero.

FIELD HUSBANDRY

ROTATION "G"—FOUR-YEAR

First year—Hoed Crop.
Second year—Wheat (winter).
Third year—Clover hay.
Fourth year—Timothy hay or pasture.

The above rotation was begun four years ago on 19 acres of clay loam. Each year manure has been applied at the rate of 15 tons per acre to the land on

which the hoed crop was to be grown. The hay or pasture in the fourth rotation year has been given a dressing of 75 pounds of sulphate of ammonia, 150 pounds of superphosphate and 40 pounds of muriate of potash per acre.

This rotation provides one-fourth of the acreage in corn, one-fourth in wheat and one-half in hay. As one-quarter of the land in corn would produce a much larger amount of silage than could be profitably used, this difficulty is overcome by growing some other hoed crop, such as potatoes, on part of the corn land. Sun wheat and Northwestern Dent corn are used in the rotation. The hay mixture consists or 8 pounds of red clover, 2 pounds of alsike, and 10 pounds of timothy. Liberal amounts of clover and grass seed are important in suppressing weeds.

The following table gives the average yields of various crops in this rotation for the last four years:—

YIELDS ON ROTATION "G"

Crop	Year in rotation	Average yield per acre, 4 years
Corn	1st year	10·84 tons
Wheat	2nd year	34·9 bushels
Clover hay	3rd year	2·51 tons
Timothy hay	4th year	2·47 tons

COST OF PRODUCING CROPS

For some years careful records have been kept at this station in order to learn the exact cost of producing various farm crops. The profit derived from the production of farm crops depends upon yield and the cost of production. The rent is arrived at by charging the current rate of interest on the value of the land plus taxes. The manure is given a value of $1 per ton plus 50 cents for hauling and applying to the land. As it is difficult accurately to determine the benefit that each crop in a rotation will derive from the application of manure and chemical fertilizer, an arbitrary figure must be adopted. For crops grown under a 4-year rotation, as at this station, the following figures have been set: for the first year crop, 40 per cent of the value of the manure; for the second crop, 30 per cent; for the third year, 20 per cent; and for the fourth year crop, 10 per cent. Manual labour is charged at the rate of 33 cents, and horse labour at 10 cents per hour. The annual charge per acre for machinery is $2.85. The charge for the ensiling outfit is $3 per acre. The actual cost of seed, chemical fertilizer, twine, etc., is charged against the respective crops. The return values represent the market price of the various crops throughout the district.

By following a good rotation and by applying farm manure and chemical fertilizer regularly the fertility of the soil has been gradually improved. The use of ample seed when laying down land to hay and pasture crops, and care of manure before appying it to the land, has been responsible for a noticeable reduction of the weed population in the fields devoted to the growing of farm crops.

COST OF PRODUCING WINTER WHEAT

The average cost of producing winter wheat has been $45.65 per acre. An average yield of 35·5 bushels of grain, with a return value of 89 cents per bushel, and 2·15 tons of straw, at $10 per ton, has given profit of $7.97 per acre. The cost of producing a bushel of wheat, considering the value of the straw, has been 75 cents. The heaviest yield, 42 bushels per acre, was obtained in 1936.

COST OF PRODUCING OATS

During the 5-year period, 1932-36, an average yield of 60·6 bushels of oats per acre was secured. The cost of operation amounted to $40.52 per acre. The cost of producing a bushel of oats, considering the value of the straw, was 45 cents. The yields ranged between 51 bushels per acre in 1934 to 72 bushels in 1936. The 1936 yield exceeded the all time average at this station by 10·4 bushels. The value of the grain has averaged 50 cents per bushel, and that of the straw, $10 per ton. To many, $10 per ton for straw would seem high, but this commodity is always high in price on Vancouver island where large quantities are used by strawberry growers and others.

COST OF PRODUCING FIELD PEAS

Under favourable conditions field peas do exceptionally well on the clay loams of Vancouver island, yielding as high as 50 or more bushels of peas per acre when cultivated. Peas usually command a good price on the local market at $60 per ton. The demand, however, is more or less limited. Peas, as a source of protein, might well be considered by the farmer for feeding young animals, dairy cattle and hogs. One hundred pounds of peas will furnish an average of 16·8 pounds of digestible protein.

The average cost of operations in the production of field peas was $40.82. The average production was 34·7 bushels of peas and 1·31 ton of straw per acre. The average cost of producing a bushel of peas, considering the value of the straw, was $1.03. The largest yield of field peas ever secured at this station was grown in 1936, when a yield of 54 bushels of the small seeded variety, "Chancellor," was harvested.

COST OF PRODUCING CLOVER HAY

The yield of clover hay at this station during the 5-year period ending 1936 varied from 1·15 ton to 3·51 tons per acre. The average yield was 2·56 tons, slightly lower than the average for 14 years—2·72 tons. The heaviest crop was produced in 1934 at a cost of $8.29 per ton and the poorest crop harvested at this station was in 1935, when only 1·15 tons per acre was secured. The cost to produce a ton of hay in 1935 was $27.75. The average cost per acre for the years 1932-36 was $33.60, and the cost per ton for the same period was $15.20.

COST OF PRODUCING CORN SILAGE

The large amount of manual labour spent for hoeing and handling the corn crop is the main item of expense in the cost of production. It cost $71.67 per acre to produce silage corn with a yield of 11·67 tons in 1936. This yield is 0·83 of a ton above the average of 10·84 tons obtained during the past four years. The value of the corn was $69.20. The loss of 2·47 per acre in the production of this crop is due to the low percentage of dry matter—22·5 per cent. With an increase of 2·5 per cent in dry matter, the silage corn would have had a value of $77.02, and a profit of $5.35 per acre would have been obtained. The valuation of corn silage is made on the basis of its dry matter content in comparison with the dry matter in hay and the market price of the latter crop. It is considered that 300 pounds of corn silage containing 25 per cent of dry matter is equal in value to 100 pounds of hay. The average cost of producing corn silage at this station was $65.02 per acre, and the average value of the crop $53.01 per acre—a loss of $12.01.

WEED CONTROL AND ERADICATION

This experiment was undertaken to determine the value of certain cultural treatments and rotations on weed control. The work was carried out on an area of 19 acres devoted to the following 4-year rotation: first year, corn; second year, winter wheat; third year, clover hay; and the fourth year, timothy hay or pasture. The land was manured for the hoed crop and ploughed in the fall, and a dressing of commercial fertilizer was applied to the hay crop in the fourth year of the rotation.

On each field of the rotation 5 areas each 1 yard square were permanently located. A careful count was made of the numbers and kinds of weeds found on these square-yard areas. In 1936 the areas located in the wheat and clover fields showed a marked decrease in weed population. There was a slight increase in the number of weeds on the areas in the second year hay crop.

The composting of manure before applying to the land, the use of ample quantities of good, clean seed, thorough cultivation of the hoed crop, and the carefully judged use of the harrows on the hay and pasture lands are all of the utmost importance in suppressing weeds.

FIELD BINDWEED ERADICATION

This experiment was begun in 1933 to determine the value of various methods of eradicating field bindweed. Two areas, (*a*) and (*b*), of approximately one-quarter acre each were used for this work. The soil was a heavy black loam about 12 inches deep, and the subsoil, a stiff clay.

(*a*) The infested area was ploughed early in July, 1933, and worked down. It was then cultivated with a broad sharp-toothed cultivator at intervals of 10 days until the middle of November. Oats were sown on this area the following spring. Before the land was ploughed, 5 plots, each 1 yard square, were established and a count of the number of bindweed plants growing on each plot was recorded. After the oats were sown in 1934, the same areas were again staked, and on June 23 another count of the bindweed plants growing thereon was made.

The average number of bindweed plants per plot before cultural operations began was 29·4. On June 23, when the second count was made, the plants still averaged 25·6 per plot.

Besides the ploughing, disking and harrowing, the plots were given no less than fourteen cultivations. The results obtained after all this work were most disappointing, as the decrease in field bindweed plants per square yard was only 3·6. The expense involved in this attempted method of eradication was much too great for the small amount of benefit derived.

(*b*) This area was ploughed in November, 1933, worked down the following March, and cultivated once a week from March 19 to the first week in November. In the spring of 1935 this area was seeded to oats after two or three cultivations had been given. Five plots, 1 square yard each, were staked out before cultural operations began in 1933, and counts were taken of the exact number of bindweed plants present. The first counts showed 39·8 bindweed plants per square yard, and the second count 6·6 plants per square yard.

It is almost impossible, in a climate where the growing season extends over a period of eight to ten months, to eradicate field bindweed by cultural methods. Even if it could be completely destroyed by these means the cost would be prohibitive. As mentioned above, the result of the operations in method (*a*) was a decrease in field bindweed plants per square yard of only 3·6. Method (*b*) was also productive of far from satisfactory results. It is true that the

number of bindweed plants per square yard was reduced from 39·8 to 6·6, an average reduction of 32·6 plants per square yard, but the cost in labour and the loss of one year's crop was a heavy price to pay for the results obtained. In both experiments sufficient plants survived for a speedy reinfestation of the land.

THE EFFECT OF WEED GROWTH ON CROP YIELDS

For this experiment four plots, 1 square rod each, were marked out in a field of oats. Two of the plots were kept free from weeds and in two of the plots the weeds were permitted to grow. With ample rainfall during the summer season both oats and weeds made rapid growth. The average height of the oats in the weeded plots was 55·7 inches, while the average height of those in the unweeded plots was 52·5 inches. The weight of the oats from the weeded plots was slightly higher than that of those grown on the unweeded areas: the former weighed 38 pounds per measured bushel, and the latter, 37·2 pounds. The average yield per acre in 1936 from the weeded areas was 81·5 bushels, and from the unweeded plots, 66 bushels per acre. During the two years that this experiment has been under way the weeded plots have yielded an average of 57·4 bushels per acre, and the unweeded plots, 49·4 bushels.

ANIMAL HUSBANDRY

The breeding of live stock on Vancouver island is not a large industry. Little beef is produced as good pasture land is often either not available or too high priced. This, together with the high price of feed because of the long haul from the prairies, forces the cost of beef production to a figure beyond the price of beef laid down in Victoria.

The dairy industry, however, is one that has received considerable attention. Some excellent herds may be found on the Saanich peninsula, Duncan and Courtenay districts and other locations well scattered over the island. These herds consist of Jerseys for the most part, but Holsteins are common, and there is a sprinkling of other breeds with Ayrshire and Guernsey predominating. Several creameries are located at strategic points. Here butter and ice cream are the leading products, but some cheese is also made. In the vicinity of Victoria, Nanaimo and other centres, the whole milk business is of chief concern to the dairymen. In the Victoria district Jersey milk is so well known and its quality so well noted by the housewife that little other than Jersey milk is now offered. Scores of dairymen deliver their own milk directly to their own customers from their dairies, do their own collecting, and make the best trade possible under the circumstances.

The Experimental Farm herd consists at present of eight cows, seven heifers and calves and one bull. All these animals are fully accredited and blood tested. All the cows are entered in the Record of Performance, but no outstanding milk-producing animals have been developed recently. The herd bull at present is "Brampton Island Standard," born September 20, 1933, sired by "Brampton Standard Noble 2nd," and grandson of "Standard of Oaklands." His dam, "Island Lady Nixey," was sired by "Lord of the Isle." This young bull, which came to the farm on January 14, 1936, is an animal of good lines and solid colour.

CONTAGIOUS ABORTION PROJECT

For several years prior to the five years covered by this summary, contagious abortion in the station herd and the methods used to combat it had been reported. After all animals had been classed either positive or negative by blood tests, they were divided, the positive animals going to a rented barn, and

the negative animals to a barn at the station. All calves from the reacting herd were reared in a separate shed, and were allowed to join the negative herd only when they had undergone one or more tests and had been declared free from disease. The calves so reared were not given any of their mother's milk at any time. Olive oil made up for the deficiency in the milk given for the first few days.

This procedure has made possible the building up of a herd free from contagious abortion and without any of the manifestations usually associated with the disease, and proves the efficacy of the blood test in diagnosis.

The economy of using this method of building up a clean herd from an infected one is problematical. In this instance, although the reacting cows had high records, for some reason, possibly poor transmitting ability on their part or the unfortunate choice of sires for use on the reacting herd, the quality of the progeny saved has not justified the expense and trouble involved. Unless the reacting cows are exceptionally outstanding and can be bred to a high class sire, it will probably be found more economical to dispose of all reactors at once.

The small number of animals in the herd makes it impossible to carry on much experimental work other than the determination of such things as milk production and value, feed consumption and cost, cost of rearing animals from birth to first calving period, and problems relating to breeding. All this has been made available in tabular form from year to year. Further information may be had by applying to the Superintendent.

HORTICULTURE

Horticulture on Vancouver Island is of first importance. If horticulture should fail here, the whole farm structure would crumble, for the holdings are small and not well suited to many types of agriculture. The great drawback, especially on the southern end of the Island, is the lack of water. Contrary to the opinion of many, Vancouver Island, during the growing season, is one of the driest sections of Canada. So far as the Saanich peninsula, the location of the Experimental Station is concerned, adequate supplies of water for irrigation would double the crops and double the population.

Many of the people are in some way connected with horticultural work, either with the growing and marketing of fruits and vegetables, or with the preservation of them for future trade. The mildness of the climate permits many things to be grown that cannot be grown in many other parts of the Dominion. The marketing problem has given much concern. All systems of co-operation, forcible and otherwise, have been tried, with varying degrees of success, but with the usual dissatisfaction on the part of many. Markets farther afield are being discovered and the prospects for the future are somewhat brighter than they have been.

All the tree fruits, small fruits and vegetables, have in the past received a share of attention, while the "Elite" seed work and the culture of greenhouse crops are deserving of mention. Considerable attention has been given to the Arboretum. Many specimens have succeeded and many others of a semi-tropical nature have gone out. As certain trees have failed, the breaks have been filled by other introductions, bringing about a varying project and one difficult to end.

Tree Fruits

During the past twenty years a large number of varieties of the common tree fruits have been grown at this station to determine their hardiness, productiveness, quality of fruit or, in short, their general suitability for planting on Vancouver island. Main plantings were made in 1914. Since that time replacements have been necessary, and other varieties have been added to the already lengthy list under test.


Section of Park
Cherry Orchard
Superintendent's Residence and Office.
The Dominion Experimental Station for Vancouver Island Saanichton B.C.
Rose-arbored approach to residence
Iris bordered walk in park section
Tulip bulb culture
Harvesting mangels

Throughout this twenty-year period much information was collected, and it is now felt that sufficient evidence concerning each variety has been obtained to speak with some degree of certainty as to its worth. An attempt is being made in this report to summarize the information obtained without resorting to tables.

Soil varies from light red to heavy clay loam with subsoil that, for the most part, is hard and impervious to water, tending to restrict root development. In the main, tree growth has been slow, particularly in the apple block, where most varieties fall short of what might be expected in vigour and tree spread.

The general plan of orchard cultivation has been to maintain a clean fallow through the whole summer season and until the end of September, when fall wheat (Sun) is sown with spring vetch at the rate of two bushels per acre. A fair amount of growth is obtained during the fall and early spring. Ploughing in late April returns a reasonable amount of humus to the soil. If ploughing is delayed beyond this date much loss in moisture is sustained and the vigour of the tree is affected throughout the remainder of the season. After ploughing, cultivation by disc, float and harrow is continued until a nice mulch is obtained; then frequent cultivations are made throughout the season.

THE APPLE

Yields of fruit in the apple orchard over a period of many years have been relatively low with most varieties and the quality only fair. Vigour of growth and tree spread also leave much to be desired. Gravenstein and King of Tompkins have been exceptions, and have shown themselves to be very satisfactory varieties to grow commercially.

Insects and Diseases.—These troubles, up to the present, have not been serious. Codling moth infestation, while severe in some districts, has not been serious in station orchards. Consequently, little or no damage has been done. Aphids make their appearance each season but are kept in check by proper sprays. Some years ago anthracnose (western canker) made its appearance on Cox's Orange Pippin, but has not spread to any extent since that time. Many orchards in the district have suffered severely from the ravages of this disease, and it is not to be wondered at that the station orchard should sooner or later show signs of infection. Scab has never been severe enough to cause much loss.

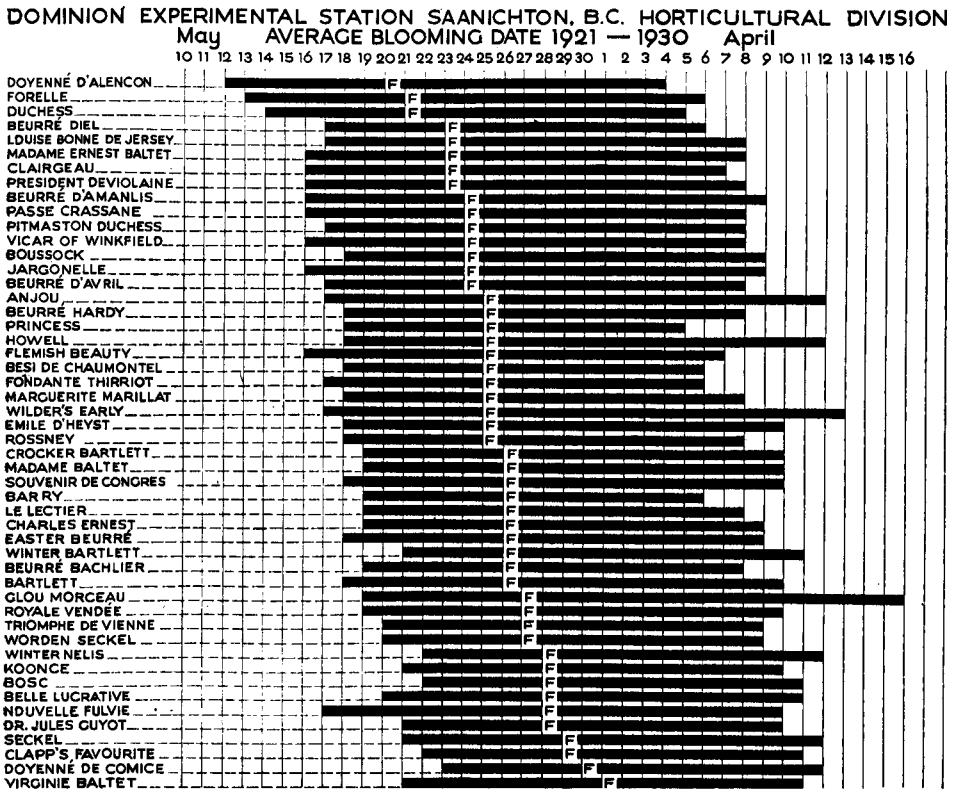
Sprays.—A dormant spray of lime-sulphur 1-9 has been applied before growth starts. Further applications of lime-sulphur 1-40 are made when blossoms are (*a*) showing pink, (*b*) in calyx stage and (*c*) two weeks later. In these three sprays black-leaf 40 is applied at the rate of 1 pint to 100 gallons for aphis control, and arsenate of lead 2½ pounds per 100 gallons for other insects. This program has been satisfactory in keeping trees clean and healthy over a long period of years.

Varieties Recommended.—Yellow Transparent, Gravenstein, McIntosh Red, King of Tompkins, Grimes' Golden and Wagener. Other varieties that have done very well and are worthy of a place, where a wider range of varieties is permitted, are Melba, Wealthy, Charles Ross, Blenheim and Rome Beauty.

Highest yielding varieties are Rome Beauty, Winter Banana, King of Tompkins, Linton and Grimes' Golden. Lowest yielding varieties are Peasgood Nonsuch, Duchess of Oldenburg, Sweet Bough, Cox's Orange Pippin, Jonathan, Wismer's Dessert and Petrel. Although Rome Beauty and Winter Banana appear in the heaviest yielding group they are not equal to the best in quality, and Winter Banana has proved disappointing in storage. In the lowest yielding group Cox's Orange Pippin and Duchess, two widely grown varieties, are to be found. Cox's Orange is of excellent quality and is popular as a dessert apple, but its yield and storage qualities are against it.

THE PEAR

The pear is the best of the tree fruits on the southern part of Vancouver island, yielding regularly heavy crops of good quality fruit. Much valuable information has been obtained from some fifty varieties which have been on trial at this station for many years. Many varieties have been found to be completely self-sterile or almost so. Because of this they are dependent on other varieties for a supply of suitable pollen before fruit can set. Interplanting of varieties has taken care of this problem. Insects have never been troublesome



in the pear block. Thrips are abundant but do not interfere seriously in obtaining a sufficient set of fruit to harvest a reasonably heavy crop. Scab has been a serious menace at all times, but has been kept in check by careful spraying. The same spray program as for apples has been used, and has proved very effectual in controlling this disease. Flemish Beauty and Beurre d'Anjou are two of the most susceptible varieties.

Varieties Recommended.—Bartlett, Louise Bonne de Jersey, Beurré Bosc, Howell, Beurré d'Anjou, Beurré Clairgeau and Winter Bartlett. A second group that has done well, and only slightly inferior to the foregoing varieties, includes Clapp's Favourite, Flemish Beauty, Souvenir du Congres, Marguerite Marillat, Conference and Vicar of Winkfield.

The chief outlet for pears on Vancouver island is through the cannery. Canning companies insist on first grade pears and pay accordingly. For some years past the prevailing price has been $40 to $50 per ton at the factory. Bartlett is by far the most popular variety, and is sometimes the only one

accepted for canning. Louise Bonne de Jersey, though small, is a good canning variety. Dr. Jules Guyot is similar to Bartlett in season, shape and size, though of inferior quality. While this variety is widely distributed throughout the district, nothing is to be gained in planting this sort rather than Bartlett, which is a heavier yielder.

THE CHERRY

More than fifty varieties have been on trial at this station for many years. As Baltet Nurseries, France, supplied most of the trees for the original plantings many of the varieties are not commonly grown. For the most part these lesser known varieties do not measure up to the standard sorts grown on this coast, and little need be said concerning them.

Next to the pear the sweet cherry is probably the best tree fruit at this station. It does well under very ordinary soil and moisture conditions. Blossom blight and brown rot have seriously interfered with the production of this crop for several years past. In recent years nearly all varieties have been affected to some extent by blossom blight. Frequently 80 per cent of the blossoms have browned off and died, leaving only brown masses of blossom clusters adhering to the dead fruit-spurs for months following.

Some of the most susceptible varieties are Empress Eugenie, Black Tartarian, May Duke, Olivet and Black Hawk. In the main crop varieties, Bing, Lambert, and Royal Anne, not so much loss from this disease has been experienced, though all have been affected. Spraying operations have been modified to meet the situation, but effective control measures have not yet been found. Lime-sulphur has been the chief spray material used, though Bordeaux and Buisol have both been tried. These trials have been carried out in conjunction with the Pathological Branch of the Provincial Department of Agriculture.

Varieties Recommended.—Bing, Lambert, and Royal Anne, with Deacon and Black Tartarian as pollenizers.

Sour or semi-sour varieties recommended are Montmorency, Olivet (Late Duke) and English Morello. Early Rivers is a good early sweet variety with much to recommend it, but it ripens somewhat unevenly. Pelissier is a variety, not commonly known, that compares favourably with the Bing in quality, size and yield. Indications are that this variety will make a satisfactory pollenizer for main crop varieties.

THE PLUM

Commercial plantings of plums on Vancouver island are few. Most farm homes have a few trees that give a surplus above home requirements. This surplus finds its way to the local markets in standard packages or in bulk. Canneries absorb considerable quantities, but prices paid are low—sometimes not more than half a cent per pound.

Plum trees have made very good growth and have been comparatively free from pests and diseases. As with cherries, blossom blight and brown rot have caused the greatest loss in recent years. A very large proportion of the potential crop is lost during the period of bloom. On the ripening fruit, brown rot causes more loss than with cherries. Mummying of fruit is common with most varieties, the small hardened fruits adhering until long after the normal time for harvesting. Efforts to find a suitable spray to control this disease are made each year, but so far without success.

Varieties Recommended.—Early Gold, Peach, Mallard, Victoria, Silver Prune (Coe's Golden Drop) and Greengage (Reine Claude de Bavay). Early Gold, while lacking somewhat in quality, is a tremendous yielder and sells well on the early market. Peach also sells well in the early season, and, although low in yield, it should be planted. Italian Prune, perhaps the best general purpose plum grown, possesses high dessert and canning qualities. Its fruiting

habit is such a serious handicap that, with its extremely low yields, it cannot be recommended for commercial planting. Black Diamond is a heavy and regular bearing variety, with splendid jam-making qualities. Several other varieties of the forty grown at this station, such as Damson, Pond's Seedling, etc., have value for certain purposes, but are hardly worthy of a place among the best.

THE PEACH

The story here is soon told. When planted in the open, trees soon become unthrifty and are extremely subject to leaf curl. Fruit produced under these conditions is small and poor in quality. On the south wall of a building tree growth and vigour is very satisfactory, leaf-curl is reduced to a minimum, and fruit is of good size and quality. Good varieties to plant are Early and Late Crawford, Rochester and J. H. Hale. Other promising varieties in various peach-growing areas have been developed in recent years, but as yet have not been put under trial here.

THE QUINCE

Eight varieties of this fruit have been under test for twenty-three years. Trees are thrifty and comparatively free from pests. Several of the varieties are irregular in cropping. As a rule the last of September finds the crop ready for picking. Rain near the time of ripening causes cracking of the fruit, which, if severe, renders the crop of no value. De Bourgeant, a variety obtained from France in 1914, has been the heaviest cropper, averaging 90 pounds per tree for the past five years. De Portugal is another good yielding sort. Demand for the fruit is somewhat limited, and up to the present is restricted to home canning use by relatively few people who are familiar with its excellent flavouring qualities.

POLLINATION STUDIES IN TREE FRUITS

Pollination of Pears.—A summary of eight years' work reveals many varieties to be completely self-sterile and others almost so. Self-sterile varieties are: Beurré d'Anjou, Beurré Diel, Madame Baltet, Passe Crassane, Pitmaston Duchess, Princess, Triomphe de Vienne, Virginie Baltet and Winter Nelis. Varieties almost self-sterile are: Barry, Beurré Hardy, Boussock, Crocker Bartlett, Doyenne d'Alencon, Doyenne du Comice, Koonce, Le Lectier, Louise Bonne de Jersey, Madame Ernest Baltet, Pulteney, Royale Vendee, Vicar of Winkfield and Worden Seckel.

Cross-pollinations have been carried out on the more important varieties used for pollenizers, on varieties that are commonly grown, and on those that are carried by local nurserymen. Anjou, Bartlett, Bosc, Boussock, Conference, Clairgeau, Howell, Hardy and Louise bonne de Jersey have all been used.

Pollenized Variety	*Best Pollenizer*
Bartlett,	Bosc, Conference, Clairgeau,
Beurré d'Anjou,	Clairgeau, Bosc,
Clairgeau,	Bartlett, Bosc,
Louise Bonne de Jersey,	Bosc,
Howell.	Bartlett.

It will be seen that Beurré Bose is an effective pollenizer for most varieties on which it has been tried. On Bartlett, Conference is also very effective. The importance of providing for cross-pollinations has been clearly indicated in work on all the tree fruits, not only in increasing the set of fruit but also in reducing the amount of seasonal drop. Fruit resulting from self-pollinated blooms shows a considerably higher drop than fruit resulting from cross-pollinations. Where bloom is abundant it is obvious that a relatively low set of fruit may ensure a commercial crop. The actual percentage set required for such a crop varies with the variety, amount of bloom and size of fruit. It has been shown that with most varieties a 6 per cent set will produce a good crop and with some even as low as a 4 per cent set will be satisfactory.

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Pollination of Cherries.—Data has been obtained on the pollination requirements of sweet cherry varieties of commercial importance over a period of six years. The value of this information is undoubted. The fact that Deacon is a good pollenizer for Bing, Royal Anne and Lambert is well established. Black Tartarian is also a good pollenizer for these varieties, but is not equal to Deacon. During the past two or three years attention has been given to Pelissier as a possible pollenizer. From results obtained so far it would seem that Pelissier may prove to be a valuable find; not only does it pollenize Bing, Lambert and Royal Anne well, but in yield and quality of fruit it is equal to Bing. Unfortunately, at the present time there is only one tree, received in 1914, upon which to base conclusions. Propagation of stock of this variety is in progress.

Pollination of Plums.—When the pollination of plums was first undertaken five years ago, only the determination of the degree of self-fertility or sterility was attempted. During the early years definite leads were established, and during the past two seasons cross-pollinations have been carried out on commercial varieties which have been shown to be almost or wholly self-sterile. The following varieties fall into this group: Black Diamond, Early Gold, Mallard, Michelson, Peach, Pond's Seedling and Washington. In the various crosses made the value of Victoria as a pollenizer is clearly indicated. In most crosses with Victoria pollen, a set greater than that from ordinary open-crossing conditions was obtained. Greengage, Silver Prune, Victoria and Yellow Egg are varieties that have shown themselves over a period of several years to be self-fertile to a marked extent.

Pollination of Apples.—A start has been made in securing information on the self-fertility or sterility of the more important apple varieties. Thirteen varieties have been under test for two years, and percentages of set have been obtained under both open-crossing and controlled selfing conditions. Blenheim Orange and Vanderpool Red seem to be completely self-sterile, and Cox's Orange Pippin, Gravenstein, Grimes Golden and Yellow Transparent give very low sets in the selfing bags.

SPRAYS FOR CONTROL OF PEAR SCAB

For many years past, lime-sulphur has been used as a spray for the control of scab in pears and apples with considerable success. In apples this disease does not attain the same importance as in pears. During the past season, two other spray materials, buisol and sulsol, were used in a part of the orchard for comparison with lime-sulphur. Plots were arranged so as to include six varieties: Beurré d'Anjou, Bartlett, Doyenné Boussock, Beurré Bosc, Beurré Clairgeau and Dr. Jules Guyot. Spray applications were made just before bloom buds opened, just after the petals fell, and two weeks later. An examination and count of large numbers of fruits from each of the sprayed trees showed that best results were obtained from buisol, with a ·6 per cent severe infection and a 3·4 per cent slight infection for all varieties. On the same basis sulsol gave next best control, and lime-sulphur showed 5·1 per cent severe and 10·2 per cent slight infection. Unsprayed check trees gave an infection of 5·1 per cent severe and 14·9 per cent slight. These figures are all based on counts of over 4,000 fruits.

BLOSSOM BLIGHT CONTROL

Heavy losses are being sustained most seasons through the ravages of this disease on cherries and plums. Preliminary work in the control of blossom blight on cherries by the use of Bordeaux spray was conducted during 1934. No definite results can be claimed for the work that season. However, it appeared that benefits might be expected from spraying just before the blossoms opened and again just as the petals fell. Various sprays were used in 1935 for the same

work, applications being made in the following bloom-stages: pink, early flower, full flower, calyx, and two weeks later. Sprays used were: buisol, Kopper's sulphur dust, lime-sulphur and lime-sulphur with arsenate of lead. A comprehensive spray program using these sprays was planned and carried out with the co-operation of the Provincial Plant Pathological Laboratory. Buisol gave definite indications of greater value than the others tried, but much remains yet to be done before satisfactory control measures can be offered.

FERTILIZER EXPERIMENT WITH FRUIT TREES

From nutritional studies carried out on fruit trees, it has been found that a ready response was received from applications of nitrate of soda in amounts up to 4 pounds per tree. This project has for its purpose the determination of how much nitrate of soda may be applied to a tree, and yet not affect it or the fruit adversely.

Trees being used in this project were planted in 1914 and consist of Beurré d'Anjou pear and Cox's Orange Pippin apple. Nitrate has been applied in the early spring at the rate of 2, 4, 8, 16 and 32 pounds per tree (in duplicate). The storage life of fruit from each tree has been determined under ordinary basement conditions. The following summary gives results obtained over a 6-year period:—

1. Nitrate increased the rate of growth of both apples and pears.
2. Excessive applications (32 pounds per tree) did not increase growth over the lower rates of application.
3. Yields were increased on the whole over the check trees but largest increases in both pears and apples were from the lower rates of application.
4. With apples there is nothing to indicate so far that storage quality has been affected adversely.
5. With pears there are marked indications that storage life has been lessened. In 1935, the greatest application of nitrate produced fruit with a storage life of 80 days from date of picking and the check trees produced fruit which kept for 119 days.

NUT CULTURE

Walnuts.—First plantings of walnuts were made in the spring of 1917 when five acres were set with trees of twelve grafted varieties and a large number of seedlings. Permanent trees were 40 feet apart, but the use of fillers brought the distance between trees to 20 feet. Most of these fillers were removed in 1933 to give more room, and tree growth is such that the remaining fillers should be removed in the near future.

At the time of planting, some of the holes were "blown" to shatter the close-lying sub-soil to make conditions more favourable for root penetration and development. Data obtained, however, shows but little difference in trunk or lateral growth between the "blown" and the "dug" holes. Yields have been greater from trees with holes dug, though this advantage may be brought about through other factors.

Walnut blight is prevalent most years, causing serious losses. So far the spray program employed has not controlled this disease. Full-sized nuts may become blank and fully matured nuts may be unmarketable through staining or breakdown of the shell at infected points.

Yields have been disappointing to date. Franquette (Vrooman), Mayette (rouge), Fertile and Ordinaire are the highest yielding varieties—with the exception of Coque Tendre, which is a very poor sort. The total crop per tree, since time of planting, amounts to less than 150 pounds from the best of the fore-

going varieties. With the numerous operations necessary in the growing and handling of the crop and yields obtained, the future of commercial walnut growing is not bright. At the same time it would seem highly desirable for every home orchard to contain perhaps two trees for home use.

Filberts.—About half an acre of these nuts were planted in 1915 and 1916. Trees included 25 known varieties obtained from various sources. The trees were set in rows 18 feet apart and 12 feet apart in the row. Growth has been satisfactory. Pruning has been such as to allow the trees to assume a semi-bush form. Growing a number of varieties in the same area seems to be the best arrangement to ensure proper pollination, for on some trees catkins ripen and shed their pollen before the tiny pistillate bloom is ready to receive it.

Yields have mostly been low from a commercial standpoint, but quality has been consistently good. Some loss is sustained each year through blue-jays before the nuts are mature enough to harvest. The only way to meet the situation seems to be to exterminate this pest by trapping. The following varieties are recommended: Fertile de Coutard, Kentish Cob, Du Chilly, Red Hazel and Gosford.

Almonds.—A survey of the behaviour of almond varieties, planted in 1917, gives no hope whatever for this crop becoming commercial or even suitable for home purposes. Trees of eleven varieties were planted, but most of them lived only a few years under orchard conditions. Out of 25 trees planted 7 were still living in 1933, when all were removed. The almond flowers in the very early spring when danger of frost injury is great; consequently there is frequently no fruit at all. Under favourable circumstances as high as 30 pounds of fruit has been obtained from Texas Prolific.

Sweet Chestnuts.—Three species or varieties have been grown under observation and test for many years. Spanish Chestnut (*Castanea sativa*) has consistently borne good crops, though weights of yields have not been systematically kept in recent years. This chestnut, with its large round head and dense foliage, is also valuable as an ornamental. There seems to be demand for the fruit. *Castanea mollissima* and *Castanea dentata* have also been grown, but they have not borne fruit.

Pecans.—The story of pecans at this station is soon told. Most of the trees of the four varieties planted died almost immediately. One tree, an Illinois Seedling, remained alive until 1933 when it was removed. During the whole period it made but little growth, being less than 5 feet in height after 17 years from the time of planting. No fruit was borne.

The Strawberry

Experiments with strawberries at the Saanichton Experimental Station during 1935 were confined entirely to propagation and breeding work. Fifty varieties in all were planted in the propagation bed, and 175 seedling plants were produced from reciprocal crosses between the Red Heart and the New Victoria.

The different varieties for propagation purposes were brought in from England, Oregon, the Central Experimental Farm, Ottawa, and various sections of British Columbia. The purpose of the project was to secure a strawberry that would meet the exacting needs of Saanich fruit men. Some of the primary qualities to be considered in selecting a variety for this district have been enumerated in a previous report from this station: "It must resist drought, it must yield well, the fruit must be firm and stand up well in storage, the fruit must be bright, of good flavour, and devoid of "monkey faces." The foliage must be strong and free from disease."

Most of the common commercial varieties, as found on our British Columbia markets, are represented in the propagation plot. Among these are the British Sovereign, Magoon, Early Bird, and Dunlap. Among the English importations, such varieties as King George V, Tardive de Leopold and Madame Kooi may prove suitable for Saanich conditions. United States introductions are Blakemore, Narcissa, Fairfax, Dorsett, Red Heart and others. Notes were taken on the growing habits, but considering the great variation in regard to planting dates, it was difficult to make any worthwhile comparisons between the varieties. Due to the unusually dry weather in the early part of the summer, many varieties suffered severely from drought, and despite careful cultural practices and irrigation, some sorts failed to make a creditable showing.

Strawberry breeding work was continued at the station in 1935 in an endeavour to secure a variety suited to Saanich conditions. On May 3, reciprocal crosses were effected using the New Victoria and the Red Heart. Two mother plants of each variety were caged and emasculated in the early flower-bud stage. When the pistils were judged to be receptive, the flowers were pollinated, using caged male blooms of the other variety. Direct transference of pollen from flower to flower was adopted, as this was considered to involve less error than by the camel-hair brush method.

In 1936, a strawberry plantation of considerable size was laid out, using the plants arising in the propagation beds set in 1935. The plants were set in quadruplicate plots, according to approved plan, and cared for throughout the year. As all blossoms were kept off, no systematic rating of the fruit was possible, except preliminary rating given the berries taken from the plants in the propagation beds. The work is being continued.

Bush Fruits

A new plantation of bush fruits in which our people are particularly interested was set in 1936. This included the new Boysen berry, Young berry, standard loganberries and loganberry and blackberry seedlings developed at the station farm. The Boysen berry is supposed to be an improved Young berry, while the Young berry is, in some respects, an improved loganberry. The Young berry is very highly spoken of by some people but is not well regarded by others. It is much darker in colour than the loganberry, is not so acid and, from preliminary tests is a good berry for canning. The seedling loganberries and blackberries have been on test at the station for several years. While Himalaya blackberry and blackberry seedlings vary little if at all, the loganberry breaks up and gives rise to almost as many varieties as there are seedlings. Some are early, some late, some large, some small, some heavy bearers, some light bearers, while others may be excessively sour or sweeter than the commercial sorts. Some selections from the loganberry seedlings have been set in the present plantation with the hope that they may demonstrate their worth. Out of the great amount of seedling material it has been hoped that something might arise less subject to disease than are the commercial plantations at present, and sweeter and finer flavoured. If these characters can be combined with the heavy yielding qualities of the standard loganberries, the result will be a berry of great worth.

Results with Fertilizer Tests on Greenhouse Tomatoes Growing in Ground Beds

A progress report on fertilizer experiments on greenhouse tomatoes is presented on the completion of three years' data. The object of the experiment was to determine the best fertilizer program suited to the growing of tomatoes in soil in the greenhouse on ground beds, over a period of years, without replacing

or renewing the soil. It was also intended to compare the effect of varying amounts of nitrate of soda (inorganic) and tankage (organic), on blossom end rot (B.E.R.) of tomatoes.

The soil under experiment was a sandy loam, low in humus. It has not been renewed for 7 years, during which time 5 crops of tomatoes and 2 crops of cucumbers have been grown. Artificial fertilizers only (complete) have been used annually.

Diseases and pests have not been troublesome. Root knot (nematode injury) is not apparent, although soil during the 7 years has at no time been sterilized with steam or other treatments.

There are indications that the physical condition of the soil where tankage has been used is better than where nitrate of soda has been used, the texture being softer and there being less puddling and caking after watering.

Blossom end rot appears more severe where readily available inorganic nitrogen has been added than it has where more slowly available organic nitrogen has been used. A slight increase in yield is also apparent on tankage plots over nitrate of soda plots.

Nutritional Studies and Investigations into Soil Troubles on some Types on Vancouver Island

The following important soil problems related to the growth of horticultural crops in this section are under investigation at this station:

1. Apparent deficiency or excess of one or more elements in the soil reflecting on leaf and growth condition of certain horticultural crops.

2. The serious hardening or cementing of certain types of soil during the summer and early fall.

3. The problem of moisture conservation in soils in summer and the necessity of making available for the plant a larger percentage of moisture from the subsoil.

4. The need for more satisfactory cover crops for soil building, the growing of which present a real problem under the existing dry summer conditions without irrigation.

5. The serious leaching of available nutrients from cultivated land during the rainy season.

A series of analyses of available nutrients have been made during the summer and fall from several soil types in the district. Except in fertilized garden soils, the Spurway spot tests have shown available phosphorus to be exceedingly low.

ANALYSES OF AVAILABLE ELEMENTS IN SOIL (Orchard) USED IN EXPERIMENT

Experimental Station, Saanichton, B.C. Spurway Method, Oct. 15, 1935.

—		Ppm.	lbs. A/6 in.
Nitrates	low	1½	10
Phosphorus	slight trace	—	less than 4
Potassium	low	2½	20
Calcium	high	100	800

Soil strongly acid, pH5.

Provincial Department of Agriculture, Victoria, B.C. (Spurway Method,) Aug., 1935.

—		Ppm.	lbs. A/6 in.
Nitrates		—	—
Phosphorus	low	½	4
Potassium	medium	10	80
Calcium	high	100	800

Soil strongly acid.

Division of Horticulture, Ottawa, (Spurway and Thornton Methods,) Sept. 11, 1935.

—		Ppm.	lbs. 4/6 in.
Nitrates	low	—	—
Phosphorus	very low	—	—
Potassium	medium	—	—
Calcium	high	—	—

Soil strongly acid, pH5·5.

In order to verify apparent deficiencies shown by the analyses, a preliminary experiment with chrysanthemum plants and tomato seedlings grown in pots was made. Soil from the station orchard was used and nitrate of soda, superphosphate, muriate of potash and lime singly and in various combinations were added to it.

The results obtained showed superphosphate to be a limiting factor, and that the combination of nitrogen and phosphorus was the most efficient as a fertilizer.

Accordingly, the experiment on orchard soil was repeated with two crops: tomato and wheat seedlings. Plants were grown in the greenhouse on orchard soil and feedings of dilute nutrient solutions were made weekly. The elements nitrogen, phosphorus and potash were supplied from nitrate of soda with superphosphate and muriate of potash (commercial fertilizers) respectively owing to the lack of chemically pure materials. The rate of application was low, and was based on the calculation of cubic content of soil in the pots in relation to the cubic content of an acre of soil to 6-inch depth (A/6 in.). Materials were dissolved in water to make up a stock solution for each series. This was rediluted on making the weekly feedings. As a proportion of the superphosphate used was insoluble, it was applied in suspension. In order that the suspended material might be more available to the plants, the dilute nutrient was applied well down into the soil in the pots by means of holes made with a pointed stick.

Results Tomato Seedlings

Although phosphorus is known to assist materially in the growth of young seedlings, the superior early and continued development of all the series containing this element was striking. This lead was maintained and increased throughout the life of the plants. Nitrogen appeared next in importance, but was a limiting factor only after the plants had attained size and had exhausted the small amount of that element from the soil. Potash appeared of least value. Nitrogen and phosphorus together gave marked results.

Microbiology of Mulched and Unmulched Soils, 1935

INTRODUCTION

For the past few years considerable work has been done with paper mulch on various crops at the Saanichton Experimental Station to demonstrate its value in stimulating crop yields. During the season of 1935, the experiments with mulched paper were confined entirely to tests with Hale's Best melon, not so much to determine the increased yield where paper was used as to have the material necessary for an intensive study of the microbiology of mulched vs. unmulched soils. As in past experiments, the use of mulch paper increased the yield of the total number of marketable fruits and weight nearly four times, as compared with unmulched conditions.

Various explanations have been advanced for the increase in crop yields resulting from the use of mulch paper. These have centred around the bacteriological, chemical and physical changes apparently brought about by the use of mulch paper. Certain bacteriological tests, begun in 1931, indicated an increase in the bacterial flora under the mulch paper to a depth of 3 inches. This phase of the problem was continued in 1935, but with less positive results than those reported in 1931.

OUTLINE OF MATERIALS USED AND METHODS ADOPTED

The laying of mulch paper was begun on May 29 and completed on June 4. The melons (Hale's Best) were planted concurrently with the paper, with the last planting on the unmulched area on June 4. On June 22 the first soil samples were taken in six sterile brass sampling tubes. The mulched and likewise the unmulched areas were each divided from north to south into three distinct sections: MA, MB, and MC and, correspondingly, UA, UB, and UC.

Samples from the mulched area were taken along the third row from the east, a distance of 15 feet from the unmulched area; and samples of the unmulched area were taken from the eastern or the outer of the two unmulched rows, at a distance of approximately 9 feet from the mulch paper.

An average of 5 borings were made at each stand, at a distance of 9 inches from the plant, by means of sterile sampling tubes. Borings were made to a depth of 6 inches each time, and the core was emptied into a sterile glass jar. The borings, comprising approximately 250 grams in each jar, were then sealed, taken to the laboratory, and at once mixed and screened through a 2-mm. sieve. Ten grams of each sample were taken and thoroughly shaken with 100 ccs. of sterile tap water for 5 minutes. Further dilutions were made with sterile tap water to give a dilution of 1:100,000 for plating.

When counting these plates poured on June 22, it was found that a dilution of 1:100,000, while apparently well suited for fungi counts, was not sufficiently great for bacteria, as too many small colonies appeared.

It was deemed advisable, therefore, on June 22 to make a dilution of 1:1,000,000 for the bacteria. Plates were incubated at room temperature and counted after 5-10 days.

Moisture determinations were made by taking duplicate 10-gram samples from each of the composite borings made and heating these to constant weight. They were as follows:—

—	Mulched	Unmulched
June 22	11·40 per cent	5·73 per cent
July 22	13·40 per cent	5·66 per cent

EXPERIMENTAL

Soil samples for bacteriological, chemical and physical purposes were taken on June 22 and again on July 22. From a study of the summary of the bacterial counts, it became apparent that there was no consistent variation between mulched and unmulched conditions. Because the bacteria colonies were often so small and so densely centred that an accurate count was impossible; approximate figures only were obtainable. The counts, consequently, were far from satisfactory.

The previous tests in 1931, which showed an increase in bacterial numbers under mulch paper, were based on soil samples taken only to a 3-inch depth. This superficial sampling, compared with the 6-inch depth taken in 1935, might account for the difference in results reported by two independent workers.

The fungi counts will be seen to show a more marked variation between the mulched and the unmulched conditions. There apparently is a significant difference in favour of the mulch paper, the fungi counts being consistently greater under these conditions. Further work is being done on the isolation and identification of pure cultures.

Moisture determinations made at the time the soil samples were taken in 1936 would indicate that the moisture is approximately twice as great under mulched conditions.

Temperature readings were also taken at the time of sampling, but there was no significant difference between the mulched and unmulched areas. As daily readings were not taken, it is rather unwise to place too much importance in temperatures taken only at time of sampling.

Acidity tests were also run throughout the season in both the mulched and the unmulched areas. The readings generally were alkaline under both conditions, varying in each from pH7·5 on June 22 to pH7·1 on July 22. As both areas had received heavy applications of fine clam shell from year to year, it was to be expected that the soil reaction would tend toward the alkaline.

Periodical nutritional tests were also run on the mulched and the unmulched soils, using samples taken from May to October. These tests were all conducted in October, using the samples which had been set aside for this purpose. The procedure of soil testing adopted and followed throughout was the one known as the Spurway method. The tests were confined to nitrates, phosphates, potash, calcium, magnesium and carbonates. A study of the nutritional table will indicate that the only significant difference occurred with the nitrates and the carbonates. Both the mulched and the unmulched areas were high in nitrates at the beginning of the season. As the season advanced, however, some of the nitrates on the unmulched area apparently were dissipated, giving only a medium reaction, as compared with a high test in the mulched area. With the carbonates this fluctuation was even more marked, the unmulched area beginning at high and running to low when the last test was made in October.

DISCUSSION

The presence of an abundant supply of carbonates under the mulch paper is taken to be of special significance for future investigations with the bacterial flora of the soil. It is known that bacteria give off CO_2 during their life processes. It is, therefore, a logical deduction that the extra carbonates found under the mulched conditions are due to the activity of these soil organisms. Considering the generally acknowledged inadequacy of the plate or of the microscopic method, it would appear that the measurement of the CO_2 evolution would serve as an index for measuring the bacterial activity of the soil. As this line of approach to the problem apparently has definite possibilities, it is intended to pursue further investigations along these lines.

SUMMARY

Work on mulch paper at the Saanichton Experimental Station during 1935 was confined entirely to experiments with "Hale's Best" melons. Compared with the yields from the unmulched areas, the number of fruits and trial yield was approximately four times as great under the mulched conditions. The importance of this project, however, does not centre around the increased yields that follow the use of paper mulch, but is concerned with the fundamental reason behind this stimulus to plant growth.

During this season, the investigations concerning the microbiology of mulched soils, begun in 1931, were again continued. While the results of 1931 indicated an increase in the bacterial numbers under mulch paper to a depth of 3 inches, the results in 1935 did not substantiate these findings. Soil samples were taken to a depth of 6 inches and plated out, but no appreciable variation was found in bacterial numbers between mulched and unmulched conditions. The difference in depth of soil sampling in all probability would explain the difference in the results of the two experiments, as one would expect relatively fewer bacteria in the dried out top 3 inches of unmulched soil.

Moisture tests showed that the mulched soils had approximately twice as much moisture as the unmulched, calculations being again based on a 6-inch sampling depth.

Acidity or pH tests indicated that the mulched and the unmulched soils gave much the same reaction, both being slightly alkaline—approximately pH 7·1.

Nutritional tests indicated that the supply of nitrates and carbonates was maintained much more effectively under the mulch paper than in the unmulched area. If the carbonates are taken as an index of of the CO_2 content of the soil, and if it is assumed that the CO_2 ratio is dependent on the bacteria in the soil, then the evolution of CO_2 can be used as an index of the bacterial numbers in mulched and unmulched soils. Considering the inadequacy of either the plate or the microscopic method for counting soil bacteria, it is purposed in future tests to employ the CO_2 evolution method in so far as the scheme appears feasible.

Microbiology of Mulched and Unmulched Soils 1936

The biochemical studies in mulched and unmulched soils at the Saanichton Experimental Station in 1936 were continued on that area of the tulip rotation previously sown to broccoli. The laying of the mulch paper was begun on May 26th and finished on May 30th. Continued cold wet weather which followed after planting until June 13th greatly retarded the growth of the melon plants, particularly on the unmulched area, where more than 50 per cent of the plants died. Unfortunately, this section of the rotation did not lend itself very well to the continued study of the microbiology of mulched soils, due in the main to the varying contours in the two areas. As a natural gradation existed from the mulched to the unmulched area, it was to be expected that a natural variation would occur between these two areas, and this would lessen the significance of any results.

Soil temperatures were taken at time of sampling, using in each area 3 thermometers which were placed in position at least twenty-four hours before readings were taken. Soil moisture and available nutrient tests were also run at time of sampling, but nothing significant developed.

All samples were taken with brass sampling tubes to a depth of 6 inches. Suitable locations in both areas were selected for sampling purposes, due care being taken to make choice of the "stands" with the least possible variation. Three borings made at each stand gave a composite sample of approximately

500 grs. from the mulched and the unmulched areas. These were collected in sterile paper bags, taken to the laboratory, and immediately screened through a 2 mm. sieve. For plating and moisture tests 10 gram portions were used.

It was found that the counts from the mulched area generally were higher than those from the unmulched, but on two occasions the variation was in favour of the unmulched area. Why this should be so is uncertain, unless as Thornton of Rothamstead has pointed out, there is a great natural fluctuation from day to day in bacterial numbers in many soils.

Soil temperature readings, being taken only at sampling periods, were too infrequent to be of any great value. Soil moisture tests showed little apparent variation between the two areas, except at different depths.

The Spurway method of soil analysis was employed for the testing of available nutrients at the different periods. When a composite soil sample taken to a 6 inch depth was used, there was no definite variation in the amount of available nutrients between the mulched and the unmulched area from June to September, but a study did show that there was a difference in the amount of available nutrients between the two areas. When the various soil depths were compared, as would be expected, most nitrate was found in the surface soil in both areas, with a more rapid falling away in the mulched at the lower depths.

The X-Ray in Horticulture

The purpose of the X-ray experiment, started at the Saanichton Experimental Station in 1935, was two-fold. The objects were first, to determine the effect of X-irradiation on the germination of seeds, and second, to note the effect of germinal variation on the parent plants, if any, and on the progeny from the exposed material. Germination counts would indicate that the varying X-ray exposures had no apparent effect on the time, percentage or vigour of germination in 1935.

Ten seeds each of Trebi barley, Sandover White Dwarf bean, Windsor broad bean, Early Dwarf Erfurt cauliflower, Hanson lettuce, Superb oat, Kootenay Windermere pea, White Icicle radish, Long Standing Bloomsdale spinach, Common Spring vetch and Early Red Fife wheat were used in the experiment. These were carefully selected for uniformity and vigour, and were subjected to the following exposures from the X-ray machine at the Resthaven Sanitarium: 6 minutes, 3 minutes, 1½ minutes and three-quarters of a minute at a distance of 20 inches from the X-ray lamp. The dosage from the X-ray machine was 60,000 volts with an electrical current of 30 milliampers. These 550 seeds constituted the germination tests.

Five seedlings from each variety under test, with the exception of spinach, were taken in pots and subjected to X-irradiation for 15 seconds. Another test, using 2 plants of each group, was conducted with exposures of 2 minutes on plants which were in the flower bud stage of growth. The same amperage was used on the plants as for the seeds, and it was hoped that germinal variation would have been induced by subjecting the dividing pollen cells to X-irradiation. The number of seeds planted in all totaled 550; the number harvested was 91,036 and of this number 85,800 came from X-ray material.

X-Ray Experiment 1936

The X-ray experiment begun at the station in 1935 was continued in 1936, using seed obtained from the X-rayed plants grown the previous year. A total of approximately 20,000 seeds were sown, the area devoted to this project comprising 0·25 acres. Planting was begun on April 27 and completed on May 7. Germination counts and general observations were recorded on May 27 and June 1. With the exception of certain series in the vetches and the lettuce, all plants were ready for harvesting on August 12.

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From the standpoint of induced variation in plant forms, the X-ray experiment has in the main been non-productive of results. With the exception of Trebi barley and Common spring vetch, little consistent or definite variation was observed from the time the germination counts were made until final observations were recorded at the close of the growing season. From the standpoint of choice of material, accurate-observations can be more readily made on barley, oats and wheat than on legumes. While radishes are a difficult enough subject material for variation studies, it would seem advisable to eliminate lettuce and spinach for X-ray studies.

Powdery mildew on barley, oats and wheat, despite dusting with sulphur, caused considerable fluctuation in plant vigour. Plant lice on the broad beans were held in check to a certain extent with nicotine sulphate, but undoubtedly they were responsible for some dwarfing. An apparent variation was detected in the plot of Superb oats, but this finally was traced to an impurity in the strain, and not due to the effect of X-rays as once supposed.

The approximate number of seeds planted per variety was as follows:—

	Seeds
Trebi barley	4,000
Sandover bean	543
Windsor board bean	700
Superb oat	4,000
Kootenay Windermere pea	1,800
White Icicle radish	2,000
Common spring vetch	2,400
Early Red Fife wheat	4,000
Hansen lettuce	1,000
Bloomsdale spinach	200

Out of the above list, only 4 selections will be carried over for further trial in 1937, viz., 1 barley and 3 vetch selections. The barley section, series 10, plant 10, obtained from seed exposed to X-ray light for 45 seconds in 1935, was taller and 7 days later in heading out than the check material. The 3 vetch selections were made from stock which had received 2 different X-ray treatments. One selection, 1 B8, was from dormant seed exposed 3 minutes, and the other 2 selections, 1 E2, 1 E3, originated from seedling plants in 1935 that had been exposed for 15 seconds to the X-ray light. These three vetch selections were all taller (12 inches) and nearly 2 weeks earlier than those plants in the check row. Work is being continued.

The Arboretum

The area known as the arboretum, given over to the testing of ornamental trees and shrubs, consists of approximately 10 acres, lying chiefly on the west side of the station and extending the full width of the property. Original comprehensive plantings were made in the spring of 1914, from material obtained from American, Oriental and European nurserymen—a very extensive collection of plants. Many specimens of native plants have been added from time to time.

The great majority of plants established themselves and have proved themselves hardy, but many others failed to become established, passing out during the first or second year from planting. No doubt this was due to the extreme arid conditions that obtain here during the greater part of the summer season, making it extremely difficult for newly set plants to survive without the use of water at the height of the dry season. A general planting plan, furnished by the Central Experimental Farm, Ottawa, provided for the systematic arrangement of plants in rows 10 feet apart with plants 5 feet apart in the row. There has been some crowding as the larger trees and shrubs have pressed their demands for room. Removals have been made where advisable to landscaped areas of the station to relieve crowded conditions.

The Annual Reports of this station for 1929-33 carried more or less detailed reports and gave, briefly, descriptions and behaviour of plants on trial. An effort is being made at this time to present a summary outlining the best varieties in each class of plants, based on their value as ornamentals. It will be seen that lists must of necessity be somewhat arbitrary, because of the human element which enters into such consideration.

EVERGREEN TREES

This class includes some of the finest ornamental trees that are to be found. That wonderful group known as Lawson's Cypress is quite hardy, furnishing many valuable specimens suitable for a great variety of landscape work. About twenty varieties of this group (*Chamaecyparis Lawsoniana*) have been grown at this station with splendid results. There is an increasingly greater use being made of evergreens, both for the small grounds and park areas. Many dwarf forms of *Chamaecyparis* are to be had for the small garden where space is limited. Specimens of the *Abies, Cedrus, Picea* and *Pinus* groups are suitable for parks, exhibition grounds, schools, etc., where space is not at a premium. In many parts of Canada trees of this type are used for windbreaks. Planting for this purpose is required but little on Vancouver Island.

BEST LARGE EVERGREEN TREES

Abies Nordmanniana.—This is a wonderfully symmetrical tree with dark green foliage. It grows fairly rapidly and is suitable for park planting.

Cedrus deodara (Indian cedar).—Native of Northern India. Its wide-spreading branching habit gives distinction and grace. As it does well under a variety of conditions, it is a very popular tree to grow. *Cedrus atlantica* and *C. libani* are both attractive and hardy in this area and desirable for planting.

Cryptomeria japonica elegans (Japanese cedar).—One of many varieties of *cryptomeria* brought from the Yokohama Nurseries in 1916. It has very handsome feathery foliage, dark green in colour, and is compact and dense in habit. Very ornamental.

Chamaecyparis Lawsoniana (Lawson's cypress).—It would be difficult to select the best variety from this wonderful group of evergreens. About eighty forms are reported to be under cultivation. They are remarkable for their graceful habit and high ornamental value. Some of the best are: *Alumii, erecta, albospica, Albrechtii, filiformis pendula, gracilis, argentea, lutea, minima glauca, stricta cœrulea,* Silver Queen, *Westermanni* and *Wisseli.*

Pinus ayacahuite (Mexican pine).—This is a very fine tree from Mexico with soft slender needles, silvery in appearance and with long graceful cones.

BEST SMALL EVERGREEN TREES

Cephalotaxus Fortuni.—Almost shrub-like and resembling the yew in habit of form and foliage. Its branches are long, slender and upright.

Ilex aquifolium (English holly).—No doubt the best of the broad-leaved evergreens for the coast. Its foliage and berries are alike decorative. About nine varieties have been grown here. Growth is rather slow, though trees of 30 feet in height are not uncommon on Vancouver island. The variegated forms are interesting and ornamental. Some of the better varieties of these are:—

Albo-argentea, compacta aurea, latifolia argentea, latifolia aurea and *wateriana variegata.*

Juniperus rigida (Juniper).—Of those grown here *J. rigida* is the best. They are hardy, spiny-leaved trees bearing ornamental berries. There may be some difference of opinion as to whether the juniper is entitled to a place among our best ever-greens, but they are interesting and a very valuable group of plants, especially when the spreading, prostrate and semi-prostrate forms are considered.

Picea pungens Kosteriana (Koster's Blue spruce).—Very valuable for lawn planting and probably the best of all the blue varieties.

Retinospora.—These interesting plants should be placed under *chamaecyparis.* Many of these are dwarf types suitable for rockeries. Two groups *C. obtusa* and *C. pisifera* are particularly valuable and suitable for lawns and rockeries where space is scarce.

Thuja gigantea (Giant Arbor Vitae).—The best of the thujas and highly recommended for lawns and parks. A large and rapid growing tree, thriving best on moist loamy soil.

BEST LARGE DECIDUOUS TREES

Acer saccharinum wieri (Wier's Cut-leaf maple).—This is one of the many garden forms of the white or silver maple. Its leaves are deeply cleft; branches pendulous. A very desirable ornamental among the large trees.

Ailanthus altissima (Tree of Heaven).—A rather tall and stately tree of spreading habit. Leaves are compound with leaflets 3 to 5 inches in length. Very handsome.

Betula pendula laciniata (Cut-leaf white birch).—The birches are very valuable garden trees with striking silver-white trunks and graceful branches; drooping in habit.

Fagus sylvatica atropurpurea (Copper beach).—One of the most desirable of our large trees with spreading head and purplish foliage. A variety of European beech (*Fagus sylvatica*). The Weeping copper beech is a very striking variation with branches that droop almost perpendicularly.

Quercus robur (English oak).—Strong and rugged. A splendid shade tree. There are many varieties. Two of the best are: *Q. robur fastigiata* with its pyramidal habit similar to a Lombardy poplar, and *Q. robur consordia* known as the Golden English oak.

Platanus orientalis (Oriental plane).—Probably the best shade tree for conditions here. Free from insect pests and diseases.

Populus nigra italica (Lombardy poplar).—A very valuable tree for avenues and wind-breaks; of well-known pyramidal habit.

BEST SMALL DECIDUOUS TREES

Acer palmatum (Japanese maple).—These dwarf maples are very attractive and showy. Several varieties have been grown. *A. palmatum atro-purpurea* (Japanese Purple Dwarf) is one of the best. All varieties tested seem to be quite hardy.

Castanea sativa (Spanish chestnut).—A fine ornamental with rounded head and dense foliage, making a splendid shade tree.

Liriodendron tulipifera (Tulip tree).—This is one of the best of our smaller shade trees, suitable for drives or planting singly on lawns. Its tulip-shaped flowers are not conspicuous. Its chief value lies in its attractive foliage.

Quercus palustris (Pin oak).—Valuable because of foliage which turns to bright crimson shades in the autumn.

Quercus borealis (Red oak). Leaves are larger than *Q. palustris,* brilliantly coloured and persist into the very late season.

Sorbus aucuparia (Mountain ash).—Very commonly grown and noted for its numerous clusters of berrylike fruit which follow small whitish flowers in springtime.

BEST FLOWERING ORNAMENTAL TREES

Catalpa speciosa (Catalpa).—The catalpas are noted for their large heart shaped leaves, and also for their large, showy panicles of flowers, and deserve a place among our best ornamentals.

C. bignonioides is a lower growing form with wide-spreading branches.

Cornus Nuttalli (Dogwood).—This is the large flowered variety native of the Pacific Coast areas.

Crataegus oxyacantha (Hawthorn, May tree).—There are many varieties of this fine spring-flowering tree all of which are highly desirable. Paul's Scarlet is perhaps the best double-red flowered variety. The form with double white flowers is also excellent.

Laburnum anagyroides (Golden-chain).—This makes a splendid small tree for lawn and garden planting. It is very showy with its drooping golden chain-like flowers. *L. adami* is a very interesting form bearing clusters of purplish, yellow and white flowers.

Prunus Pissardi (Japanese Flowering plum).—This is only one of many forms of this group, but the most commonly grown of all. It is particularly attractive because of its reddish-purple foliage. It flowers in early spring, when an abundance of pinkish white flowers are borne before the leaves appear.

Prunus pseudocerasus (Japanese Flowering cherry).—Many varieties are to be found in this group of flowering cherries, which gives us perhaps our most valuable spring-flowering trees. Flowers are borne in huge masses and are of various shades in softest tones of pure white, pink and rosy crimson. Some of the best varieties are Mt. Fugi, Shirofugen, Mikuruma, Washinomo and Yoshino.

Paulownia tomentosa (Empress tree).—Resembles very closely the catalpa with its large leaves. Branches are spreading and stout, while flowers are large, fragrant and pale violet in colour.

Malus (species).—As in *Prunus* there are many members that are excellent flowering trees of great value ornamentally. Some of the best varieties are: *M. baccata var. mandshurica,* with large crimson flowers; *M. Halliana Parkmani,* with drooping branches and double rose-red flowers on long stems; *M. ioensis plena,* pyramidal in habit and with large pink double flowers. *Malus Niedzwetzkyana* (Redvein crab) remarkable for its pinkish-purple flowers, reddish tinge to leaves and purplish flesh of the fruits.

BEST FLOWERING SHRUBS (DECIDUOUS)

Deutzia (Species).—Some twenty-five varieties have been tested since 1914. These bloom for the most part later than other spring flowering shrubs, varying from late in May to the middle of July. Flowers vary in colour from white to pinks. Some of the best are: *D. crenata rosea plena* (Pride of Rochester); *D. scabra candidissima plena,* with flowers double white; *D. gracilis eximia; D. gracilis rosea; D. Lemoinei; D. scabra watereri* and *D. Wellsii.* The last two varieties are especially fine vigorous shrubs

Forsythia (Golden Bell).—*F. intermedia* is probably the best of six varieties grown here. Flowers large, deep yellow, borne singly, arching branches. *F. suspensa Fortunei* blooms earlier than *F. intermedia,* appearing usually shortly after the middle of March.

Hydrangea paniculata grandiflora (Hydrangea).—This makes a fine lawn shrub and if properly cared for gives large showy individual blooms.

Lonicera tatarica (varieties).—Twenty-six varieties have been tested here with splendid results. *L. tatarica rubra* and *L. tatarica rosea* are two of the best varieties, and in common with others are fragrant. Flowers vary in colour from white to rose.

Philadelphus (Mock Orange).—These shrubs do well under a wide range of conditions and furnish a great wealth of sweet-scented flowers in June and July. Original plantings included twenty-eight varieties. Some of the best are: *P. coronarius, P. fantaisie,* Mont Blanc, Souvenir de Billiard, Manteau d'Hermine and Avalanche.

Spiraea: These are very ornamental shrubs of medium size and with rather small foliage. The best are: *Arguta, Billiardii longigemmis* and *Vanhouttei. Sorbaria Aitchisonii* is also a good ornamental shrub.

Syringa (Lilac).—One of the most popular shrubs grown and valuable for their large showy panicles of fragrant bloom. Some of the best are: Charles Joly, George Bellair, Leon Simon, Madame Abel Chatenay, Madame Casimir-Perier, Madame Francis Morel, Marie Legraye, Michael Buchner, President Grevy and Souvenir de Ludwig Spaeth.

Viburnum tomentosum (Japanese Snowball).—Very valuable, free flowering shrub.

Weigelia.—The value of these fine shrubs is not fully appreciated. Forty varieties were received and planted in 1914. Flowers are showy and vary from pure white to very dark crimson with the varieties. Some of the best are: Abel Carriere, *coccinea,* Eva Rathke, Isoline, John Witter, John Standish, Madame Lemoine and *rosea variegata.*

BEST FLOWERING SHRUBS (EVERGREEN)

Rhododendron.—A most valuable group of evergreens for the Pacific Coast. Varieties are very numerous. More than sixty varieties were in the original plantings at this station.

Azalea.—Most varieties are quite hardy. Partially shaded locations are desirable. Best varieties grown are: *A. amoenum, A. occidentalis* and several varieties of *A. ponticum.*

Thea japonica.—Valuable for its glossy foliage and large, rosette-shaped, waxy flowers. Red, white and pink coloured flowers are available.

Choisya ternata (Mexican Orange).—Bears large clusters of sweetscented flowers.

Viburnum Tinus (Laurestinus).—An excellent spring, free-flowering shrub.

BEST CLIMBING AND TRAILING SHRUBS

Parthenocissus tricuspidata.

Ampelopsis veitchii (Boston Ivy).

Ampelopsis quinquifolia (Virginia Creeper).

Bignonia capreolata (Trumpet-Flower).

Clematis species and varieties.

Hedera helix (English ivy).

Lonicera Periclymenum (Honeysuckle).

Wisteria.

BEST HEDGE PLANTS

Evergreen.

(*a*) Tall.—*Prunus Laurocerasus.* (Cherry laurel).
Ilex aquifolium (Holly).
Libocedrus decurrens (Incense cedar).

(*b*) Medium.—*Thuja plicata* (Giant cedar).
Lonicera nitida.

(*c*) Low.—*Buxus sempervirens* (Box).

Deciduous.

(*a*) Tall.—*Cotoneaster Simonsii.*
Crataegus oxyacantha (Hawthorn).

(*b*) Medium.—*Ligustrum ovalifolium* (Privet).
Spiraea Vanhouttei.

(*c*) Low.—*Berberis Thunbergii.*

Floriculture

THE PROBLEM OF THE TEN-WEEKS STOCK

From the standpoint of the seed-grower the stocks present some difficulty, for the doubles, the only ones wanted in the greenhouse or the border, produce no seed at all; while the singles, valueless as flowers, produce the seed. It is possible to save seed from individual plants which will give nothing but singles in the next generation with consequent disappointment to all concerned, while seed may arise from other plants which will give a large proportion of doubles the next year. What plants should be the seed bearers has perplexed seed growers for many years. Every grower of stocks thinks that he has discovered the secret, and some of the theories are most fantastic. In order to sift the wheat from the chaff, large numbers of stocks are being grown at Saanichton and the individual plants are being studied in detail. The plants are being photographed and the seed from the individual seed bearers is being saved. This seed will be given a number, planted in individual plots, and grouped according to its behaviour.

Progress is being made and before long it is hoped to present a paper covering the problem. A strain that will give much better than 75 per cent doubles may never be secured: it is much easier to secure 100 per cent singles. Unfortunately, the biggest and strongest plants that produce most seed are the poorest from the standpoint of doubles in future generations. On the other hand, something may be done by way of selection while the plants are in the seedling stage —a matter of considerable help to the seed grower, who must secure his seed from the singles, and to the flower lover, who wants only doubles.

The Tulip

The tulip has been grown at the Experimental Station for Vancouver Island since the beginning of work at the farm. Much information has accumulated during the past twenty years concerning the culture of this bulb; in fact, the problem has been attacked from every angle. The culture of tulips, though difficult enough, is not nearly so complex as many would have one believe. During the past few years considerable stress has been placed on the correct rotation. If tulips could always be planted on land that had never grown them before, much trouble would be avoided. As this is is not always possible, the next best thing is to plant in a rotation, working the tulips over the land once in three years. The other crops in the rotation are musk melons and broccoli. For the order of the rotation see the diagram.

Tulips at the station.

CULTURE OF THE TULIP

Soils.—Soils on the Saanich peninsula vary so much that a choice of the best for any crop should be possible. A light sandy loam that has not been cropped out has much to recommend it; but tulips may be grown on a great variety of soils. If soils consist of clay and sand it follows that if too much clay is present in the soil, the condition may be corrected by the addition of sand.

Fertilizers.—Bulbs of commercial size may be grown in a bowl of distilled water, or in clean sand—but that does not mean that no fertilizer is needed. Well-rotted manure is excellent and may be used freely; fish meal and bone meal are safe, and may also be used freely. Remember that mature bulbs will produce flowers almost anywhere, but baby bulbs must obtain their food from the soil during their growing period.

Culture.—For outdoor work, tulips should be set in September or October, preferably September. When they are set early the work is done before the advent of wet weather, and the flower itself is finer and has longer stems if the plant is set in time to permit of proper root development before the cold weather sets in. Plant from 4 to 6 inches deep and from 4 to 8 inches apart, depending upon the class and size of bulbs, the closer distances being for the early single kinds and the wider distances for the later and larger sorts. If the soil is made up into beds to permit of the easy disposal of surface water, the bulbs should be buried 2 inches deeper. In the colder parts of Canada a mulch is to be recommended at this time, but not on Vancouver Island. As the harvesting period approaches a mulch of straw may be placed over the beds and burned off to destroy the old flower stalks and sterilize the surface before the bulbs are dug.

Harvesting.—At the station the tulips are dug when the flower stalk has bleached white but before it has become too brittle. This condition will obtain about the 1st of July in this country. The tulips are dug each year, graded, and new plantations are set from the finest stock; the smaller ones are set in nursery rows until they reach the correct size. While the bulbs are being stored, say from July 1 to September, they should be placed not in a cool cellar, as is often advised, but in a shed, sheltered from the direct rays of the sun, with ventilators wide open.

Propagation.—The greater portion of tulip bulb increase is obtained through the natural method of increase known as splitting or offsets. So far as this bulb is concerned no special method of propagation need be attempted, as the natural method of increase will be rapid enough for ordinary purposes.

Elite Stock Seed

Elite stock seed has been defined as seed of known parentage—that is, capable of tracing its ancestry to one or more plants; that has by field inspection, where originally grown, followed by verification trials, shown its trueness to the variety, its uniformity, its vigour and its general worth. All this does not mean that such seed may not be attacked by insect pests or disease, or may not fail because of uncongenial soil or lack of care on the part of the gardener.

Elite stock seed is not many years old in Canada. A few years ago, when improvement in our vegetable seed work was sought, the plant breeders took stock to determine just what we had, for no one knew. At the various Experimental Farms seed of a given variety was purchased from as many sources as possible and planted in some quantity side by side under exactly the same conditions. On some farms the source of the seed was marked on the head stake, while on others the row was known only by number. It was found that many varieties were sold under the same name; that the one variety was sold under many names; that pure lines of a given variety, or anything approaching it, were almost unknown. Uniformity, in fact, did not exist.

Following this, the plant breeders, in co-operation with the Seed Growers' Association, assigned to each Experimental Farm in Canada a certain number of varieties of vegetables, having in mind that at some future time seed of these varieties might be presented as "Elite." To the Saanichton Farm was assigned the following:—

Early Erfurt cauliflower.
Hanson lettuce.
Advancer pea.
Kentucky Wonder bean.
White Portugal onion.
New Zealand spinach.

Seed of each variety was obtained from as many sources as possible and grown in plots of considerable size; from these plots the ideal plant or plants were to be chosen. Another difficulty arose. There were no standards. Eventually types of many plants were fixed in the mind of the breeder; plants were caged, where necessary, and a pure line, in so far as that is possible, was established. These plants were true to type, vigorous, of good quality and, above all, were uniformly true to the variety. If the variety so reproduced itself, much progress could be claimed to have been made, but constant vigilance was necessary, for a honey bee might wreck the entire structure. Thus was "Elite" stock seed produced.

Such seed is, of necessity, costly. It cannot compete with commercial seed in price and was never intended to be used as commercial seed is. It is the *foundation stock seed,* to be used by seed growers who wish to enter the registered seed field. "Elite" stock seed has a place, but the definition must be kept well to the fore.

If "Elite" seed measures up to the standard set for it, a commercial seed grower should find these stocks of value; for, if a grower goes back to commercial seed each year there is no hope of its becoming better,—and it may become worse. Constant selection with rigid elimination of everything but the best is the only hope for the variety. Once the correct foundation is secured, it is possible to go on for several years without trouble; but when such trouble does present itself, it is better to drop that line and to make a fresh start if better lines are available.

As an example as to how the work is done, the production of cauliflower seed at this station is outlined. Cauliflower seed has not been grown in Canada to any extent and its production presents many difficulties. A glance at any seed catalogue will show that this is true, for the price asked for the seed runs to many dollars per pound. At the beginning of the work here the plant was treated as an annual, with the hope that the long season would permit the seed to ripen on the plant the first year, if seed were planted early enough. A small quantity of seed was grown in this way, but it soon became evident that the plan would not work in the production of seed in any commercial quantity, unless the seed could be ripened before the fall rains came. The plan that has been in use for the last few years works so well that it has attracted wide attention. This plan is here outlined:—

The cauliflower belongs to the genus *Brassica,* which includes cabbage, cauliflower, kale, kohl-rabi, and Brussels sprouts. Members of this group are so closely related that they will freely intercross. This fact must be taken into account when growing seeds of many varieties, but especially is this true when growing seed from any of the cabbage tribe.

In the fall of 1929 the seed was sown in September in cold frames, and the seedlings were transplanted, about 4 inches apart, into other frames in October. Where the sash and water were regulated, the plants were kept in the best condition possible, notwithstanding the excessive cold weather.

Cold weather was experienced indeed, for 18 degrees of frost was registered later on. During that time the plants were covered with the sash; yet the soil in the frames was frozen hard. This is ample proof that the plants will stand a considerable amount of bad weather. About the first week in February the plants were lifted and planted in 4-inch pots. This procedure may not always be essential, but we have every reason to recommend it, as the plants when set in their permanent location receive no check when so treated. These plants were set in the field about the first week in March in rows 3 feet apart and 2 feet 6 inches apart in the rows.

If any difficulty should be experienced in obtaining clay pots, the paper pots which are now available at very reasonable rates may be used; or, failing

this, bits of sod may be cut about 3 by 3 inches or 4 by 4 inches, turned bottom side up, and covered with good soil. One plant set directly over each piece of sod will occupy it entirely, and, filling the sod with roots, can be handled without disturbance.

The plan as outlined was so satisfactory that fine marketable heads were produced, weighing 6 pounds each, about the middle of May. This is the time to root out any plants which may be off type, off colour, etc. In fact everything from which seed is not to be saved must come out. The object of the grower now should be to develop the flower stalk from what is technically known as the curd, the part eaten when the plant is used as a vegetable. To do this it may be found necessary to remove about one-half or two-thirds of the curd with a carving knife. This is not always done in Europe, but the removal of this curd seems to induce the formation of flower stalks in that part which is left. The free circulation of air, brought about by the removal of the curd, seems to discourage the development of the rot which causes black heads and sometimes the entire breaking down of the curd.

During the hot weather the cauliflower is subject to plant lice and flea beetles, as are cabbages. Unless these insects are controlled, the plants will be destroyed outright. If plant lice are allowed to develop during the seed pod formation, the pods will take on a dwarf appearance and the seed will be of the poorest quality. Many recommendations have been made for the control of these sucking insects. Nicotine sulphate is in common use, but is rather expensive for generous applications. A mixture of airslacked lime, 47½ pounds, and 2½ pounds of nicotine sulphate (Black Leaf 40) mixed and blown on the plants with some force with a powder gun is effective. This kills many of the insects and repels others. A mixture of oil in the form of an emulsion and Black Leaf 40 is coming into common use.

Whatever is used must be freely applied and blown on with force. The plants were ready to be harvested the first week in September at which time they were cut near the ground and placed erect on canvas sheets to dry. They were ready to thresh before the end of September. The harvest from the 250 plants in the plot yielded 12 pounds 8 ounces, equivalent to a yield of 362 pounds 8 ounces per acre.

There is no good reason why all the cauliflower seed required in Canada should not be grown on Vancouver Island.

MELONS

Some very good watermelons have been grown this past year. Not only must plants of this crop be started in the greenhouse, but the cold frame must be employed in the field for a number of weeks; for the greatest enemy of all melons is cold, and Vancouver Island is never hot enough for tropical plants to grow in the open.

At present the chief concern at Saanichton is the small musk melon or cantaloupe, the melon with a hard furrowed rind and with flesh of a reddish orange colour.

Hearts of Gold and Hale's Best are both popular with growers, as they deserve to be. The seed should be planted in flats about the 1st of April and pricked out in 3-inch pots before they have made any true leaves. They may then be handled quite as easily as other plants, but when the plants become older they are transplanted only with difficulty. In the normal season, the young plants should be ready for the field, six weeks from seed planting, but it may be necessary to delay the planting for another week or so. Last year it was not warm enough much before June 1.

There is no place where the mulch paper may be used to greater advantage than in melon culture. Paper 3 feet wide should be used, which will permit of the plants being set 3 feet apart in the row, and the rows 6 feet apart. The paper increases soil temperature, conserves moisture and stimulates activity on the part of soil organisms. Beside the paper mulch, hot caps were used by several growers during the past season with success. The function of the cap is to increase the heat, the secret of success in melon growing.

If the paper has been well put down, very few weeds will be in evidence during the summer. If a weed does find a hole in the paper it may be removed by hand, as all hoeing is impossible.

Melons appearing in the tulip rotation.

Very elaborate schemes have been worked out as to how the plants should be pruned, the number of fruits to a vine, etc. Our recommendation is to let the plants alone. The amount of vine and the number of fruits are well looked after by the plant itself. Red spider and "wilt" may be found troublesome, but both may be controlled. By the 1st of September the crop should be ready for market. In melons Vancouver Island has a crop that the markets are really asking for.

BROCCOLI

Broccoli, another crop appearing in the tulip rotation, is a very popular vegetable in British Columbia. Very large quantities are imported every year, but more and more is being produced each year on Vancouver Island.

The confusion arising over what broccoli really is may be dispelled by the simple statement that broccoli is a cauliflower, but is more hardy than the ordinary sorts. At the station at present several varieties are being grown to determine what sort is best suited to climatic conditions.

The seed should be sown in cold frames sometime during the first week in May. They should be pricked out at the right moment either in paper pots or properly spaced in the cold frame. If the tulips on this area, as shown in the rotation, have been dug during the first week of July, the land may be prepared and the broccoli set toward the end of the same month in rows 3 feet apart with plants from 18 inches to 2 feet apart, depending upon variety. If the weather is favourable, some varieties will be fit for the table by the end of November, but others form the "curd" only in mid-winter or early spring. Some of the difficulties experienced in early spring planting may be avoided by planting in July, when, for example, cutworms may not be troublesome. Plant lice are very abundant at times. They may be controlled by nicotine sulphate. Extra care must be used in transplating in July as the soil and atmosphere are both dry at that season. If the plants when set are clean, root maggots should not be troublesome during the fall and winter. The character of the heads is almost entirely dependent upon the character of the seed used: if seed of guaranteed

Dominion Experimental Station. Sidney B.C.

— Rotation for the Tulip Crop —

	Year 1	Year 2	Year 3
Acreage No 1	Broccoli	Melons	Tulips
Acreage No. 2	Tulips	Broccoli	Melons
Acreage No. 3	Melons	Tulips	Broccoli

quality is not used, no success may be looked for. For broccoli planting the seed is more important than it is for many other crops, as all members of the genus *Brassica,* including cabbage, cauliflower, kale, kohl-rabi and Brussels sprouts are so closely related that they freely intercross. Very strange combinations, of no value whatsoever for any purpose, arise in this way. "Elite" seed stocks together with "Registered" vegetable seeds arising from them, of many varieties, may now be obtained in Canada, and should come into common use.

Due attention given to the early and late broccoli, and to the early standard cauliflowers which may be carried in cold frames during the winter and set in very early spring, provides for an almost continuous supply of this vegetable throughout the season on Vancouver Island.

CEREALS

WHEAT

Almost all the wheat grown on Vancouver Island is sown in the fall. Seeding may be done as soon as the autumn rains begin, which is usually in mid-September.

In a five-year test carried out at this station with seedings made at weekly intervals, beginning September 21st and ending November 2, the best yield of wheat was obtained from the plots sown on October 12. There was a distinct correlation between the date of seeding and the yield of straw. The later the seed was sown, the smaller the yield of straw. The average yield of straw from seed sown September 21st was 3·08 tons per acre, compared with 1·53 tons obtained from sowings made on November 2nd. Wheat sown on September 21st, October 12th and November 2nd gave average yields of 43·1, 44·5 and 36·4 bushels per acre, respectively.

During the past eleven years many varieties of winter wheat have been subjected to comparative tests, the following five averaging the highest in yield to date:—

Dawson's Golden Chaff.—This variety has always given a good yield here, producing an average of 42·9 bushels per acre during the past eleven years. It has a straw of medium strength, usually from 48 to 54 inches long. The kernel is white and soft; it shatters badly if subject to rain or heavy dew when in stook. It is strongly resistant to Hessian fly.

Imperial Amber.—A heavy yielder under plot conditions. It has a long, weak straw with a decided tendency to lodge. The heads are furnished with medium length awns; the kernels are long, dark in colour and hard, generally weighing from 60 to 63 pounds per measured bushel. It has a nine-year average of 40·8 bushels.

Red Rock.—Similar in most respects to Imperial Amber, except that the chaff and grain are slightly darker in colour. The average yield for eleven years is 40·4 bushels per acre. It is seldom attacked by Hessian fly.

O.A.C. 104.—Like Dawson's Golden Chaff, O.A.C. 104 is a white winter wheat, but, over a long period of years, it has not yielded as well as the former and, in addition, it is more subject to lodging. Over an eleven-year period O.A.C. 104 has yielded 38·8 bushels per acre and has averaged over 62 pounds per bushel.

Sun.—This is the most popular winter wheat grown on Vancouver Island. It has a strong stiff yellow straw of medium height. It is a Swedish wheat of the square-head type with a few short apical awns. The medium sized kernels are red in colour and soft. They do not shatter. It is susceptible to attack from Hessian fly, which often greatly reduces the yields.

WINTER OATS

During the past ten years many varieties of oats have been tested for winter hardiness. Seed has been procured from Europe and various places on the North American continent, but, so far, a variety suitable to the requirements of Vancouver Island has not been found. The yields, as a rule, are much below those to be obtained from early spring-sown oats, and there is also danger of severe winter killing two years out of five. Marvellous, a large-kerneled, strong-strawed, white oat, however, has given fairly satisfactory results when sown in late February or early March.

Early sowing is essential in growing winter oats. The seed should be sown not later than September 21st, or, better still, the 15th, provided there is enough moisture in the soil to ensure good germination and rapid growth. It is also important that plenty of seed be sown. Three bushels per acre seems the correct amount to use. The results of a date of seeding test conducted at this station are given in the following table:—

KANOTA WINTER OATS—COMPARATIVE YIELDS FROM DIFFERENT DATES OF SEEDING

Date of seeding	Average yields per acre for five years	
	Straw	Grain
	tons	bushels
Sept. 21	2·61	46·2
" 28	2·52	45·9
Oct. 5	2·03	38·0
" 12	1·75	32·2
" 19	1·41	26·8
" 26	1·22	21·5
Nov. 2	1·05	17·4

The average yield of spring oats at the station farm is 62·4 bushels per acre.

The following are the varieties of winter oats tested at this station: Bountiful (Black), Grey Winter (Grey), Hardy Prolific (Black), Joanette (Black), Kanota (Red), Marvellous (White), Plentiful (White), Unique (White), White Winter C 1994 (White), White Winter C 1995 (White), and Winter Turf (Grey). Of these, White Winter 1994 and Unique are the best, the former yielding an average of 54·1 bushels per acre and the latter 53·0 bushels.

SPRING SOWN OATS

More land is devoted to oats than to any other spring sown cereal in this district. Early seeding is desirable if the best results are to be obtained. March is a good time to sow, provided the land is well drained and is in a fit state for the proper preparation of the seed bed.

Gopher and Victory have outyielded other varieties over a period of five years. The former is early maturing and is comparatively short in the straw. Victory, a medium late maturing variety, is widely adapted to soil and climate and is grown extensively.

Newer varieties, tested for a shorter period, have shown up well and are promising. Among the best of these are Alaska 236, Lanark, Vanguard and Legacy.

BARLEY

If fall sown barley is to succeed on Vancouver Island, it must be sown during the last two weeks of September. It demands a well drained, well fertilized loamy soil. Sandy loams are well suited to the production of winter barley, because ample moisture is available in early spring for the development of the crop and maturity is reached in early July before the soil is dried out. Weather conditions at this time are, as a rule, ideal for harvesting. The following varieties have been found to be winter hardy at this station, surviving temperatures of 10 degrees above zero: Barks, Glabron, Ottawa 1014, Peatland, Regal, Sanalta, Trebi, and Velvet. Barks and Trebi are heavy yielding varieties. The former has given an average of 73·7 bushels per acre and the latter 86·6 bushels when sown in the fall.

SPRING SOWN BARLEY

Spring sown barley requires a moisture-retaining soil well stocked with humus. Rich medium clay loams are best suited to its requirements. It should be grown in rotation with other crops.

Duckbill, one of the best of the two-rowed type, has under test for nine years in the spring sown group, produced an average of 39·2 bushels per acre. Barks and Trebi have a six-year average of 46·3 and 45·3 bushels, respectively, when spring sown. Other varieties that have been tested for six years are Charlottetown 80, Hannchen and O.A.C. 21 which gave average yields ranging from 34·9 bushels for O.A.C. 21 to 37·6 bushels for Hannchen.

FIELD PEAS

Peas on Vancouver Island do remarkably well. The abundant moisture in early spring, when peas are making their best growth, and the cool days and nights are conditions particularly favourable to the culture of the pea; moreover the clay loams produce a crop of the very highest quality. In ordinary field work, yields as high as 54 bushels per acre have been obtained at this station. However, 35 bushels is generally considered a fair crop, but in the test plots which are cultivated, fertilized and carefully harvested, yields two or three times as great are secured. In a study of plot yields, therefore, the relative yields of each variety rather than actual yields should be considered.

Over a period of seven to ten years, the premier place, so far as yield is concerned, is held by Early Feed followed closely by Mackay, Capital, Early Blue and Prussian Blue. The group next highest from a yield standpoint includes Gryllen, Maple, Early Raymond, Concordia, Chancellor, Stirling and Solo.

If the crop is to be used as food for stock, Early Feed is probably the best variety to grow here; if an exhibition pea is desired, Stirling or Gold Crown should be chosen. For general purposes, the small-seeded, white variety, Chancellor, is recommended. Gold Crown is a large, white variety resembling Stirling, but having a longer vine and ripening a few days earlier. Austrian Winter is a tall-growing variety with coloured flowers. The peas are very small, resembling Solo somewhat in colour. It is very prolific and exceedingly hardy. Planted during late October or the first week in November, it will survive the winter on south Vancouver Island, and will produce an abundant crop of succulent green fodder for use in early spring. It is a very promising variety for use in fall-sown silage mixtures.

FORAGE CROPS

The forage crop work at this station consists of three main projects: The introduction of new grasses, legumes and miscellaneous plants; the testing of various grasses and legumes for pasture, and a variety test of sugar beets.

INTRODUCTION OF GRASSES, LEGUMES AND MISCELLANEOUS PLANTS

The forage crop nursery was established in the spring of 1933. The first planting consisted of 18 varieties of perennial grasses and 22 varieties and strains of annual grasses and clovers. Many forage plants have since been added to the nursery. A brief description of the most promising plants for Vancouver Island follows:—

ALFALFA (*Medicago media*) is one of the most satisfactory legumes to grow on acid free soils on Vancouver island. Having a strong tap root it is able to penetrate the subsoil to a great depth, and for this reason is able to resist

prolonged drought. Alfalfa is an excellent hay and pasture plant in some localities, beginning to grow early in March and continuing its growth until late in the autumn. Under careful grazing, alfalfa will produce large quantities of forage, at a time when other clovers and grasses have ceased to grow. Alfalfa may be sown broadcast or in rows. For large areas the former method is recommended, as the cost of seeding and cultivating is less than in the latter, and better harvesting conditions are also obtained. On the other hand, an increased yield can be obtained by sowing in rows, but extra labour is required to keep the plot free from weeds. The results obtained at this station indicate that the most satisfactory returns from the row method will be obtained when the rows are 18 to 24 inches apart. Under these conditions an upright stem of fine quality, well furnished with leaves, is produced. Plants grown in rows 30 inches apart produced the greatest yield. The herbage, however, was coarse, and, owing to its recumbent growth, was difficult to cut by machinery. Four varieties are under test in the nursery: Ontario Variegated, Grimm, Wisconsin No. 892 and Ladak. Of these the first two mentioned are the best for south Vancouver Island. Ladak, a comparatively new introduction from the United States, where it has done very well, has not out-yielded Ontario Variegated or Grimm at this station. From records taken during 1935 and 1936 Ladak was less subject to leaf spot *(Pseudopeziza medicaginis)* and was more subject to downy mildew *(Peronospora aestivalis)* than the other varieties mentioned.

Awnless Brome *(Bromus inermis)* is a valuable forage plant, worthy of consideration as a permanent pasture grass. It is strongly perennial, has an extensive creeping root stock similar to that of couch-grass, and is able to produce satisfactory yields of forage even if precipitation is low during the growing season. Sown along with alfalfa it is very promising as a perennial pasture grass for Vancouver Island.

Orchard Grass *(Dactylis glomerata)*, or Cocksfoot as it is called in England, is an excellent grass for both hay and pasture, providing large yields of nutritious fodder. If thinly sown, orchard grass grows in thick clumps, an undesirable habit either for hay or pasture. This may be overcome by sowing plenty of good seed, 25 to 30 pounds per acre. On Vancouver Island farms, this grass has not been given the place it deserves. It grows remarkably well on almost any kind of soil, provided it is not too wet. It is strongly resistant to drought, and has the ability to "come back" quickly after cutting or grazing. Orchard grass is one of the first grasses to begin growing in the spring and continues to grow until mid-December. The crown of the plant is susceptible to injury from close grazing. There are great differences in quality between the various strains under test; many are far too coarse for use as hay, while others are not suitable for pasture. Among the several strains now under observation, Okaroa and one known as No. 707 from Aberystwith are the most promising. The latter is an ideal strain for pastures.

Perennial Rye Grass (*Lolium perenne*) is a long-lived, perennial grass suitable for permanent pasture on Vancouver Island, where it grows exceptionally well. It is about 2 weeks later than orchard grass in beginning active growth in the spring, but it continues to grow until the second week of December. Very little growth, however, is made during July and August. Perennial rye grass makes a closer turf than orchard grass, and also produces a larger amount of pasturage. For grazing purposes it is unexcelled.

Italian Rye Grass (*Lolium multiflorum*) is one of the best of the hay grasses. When the plants are young they may be readily distinguished from perennial rye grass by the leaves being rolled together in the bud. The stems of Italian rye grass feel rough to the hand when rubbed upwards just below the

inflorescence, whilst those of perennial rye grass are quite smooth. The inflorescence differs from that of perennial rye grass in some important points. The spikelets contain a greater number of flowers, usually from ten to thirty. Like perennial rye grass the flowers are enclosed within two glumes, but the outer glume is furnished with a long awn at its top. Some varieties, however, are awnless and the rolled leaf and rough stalk must be relied upon for identification. Italian rye grass is suited to most kinds of soils, but does not thrive on heavy clay or on very dry soil. It will respond readily to manuring, and produces an excellent quality hay if cut just before coming into flower. It is useful as a temporary filler when laying down permanent meadows. On Vancouver Island, autumn sowing is preferable to spring sowing.

Reed Canary Grass (*Phalaris arundinaceae*). This very hardy grass is a native of Canada and the United States. It is strongly perennial, thriving best on low wet land, and for this reason it is one of the most profitable grasses to grow on low land which is flooded periodically. Strange to say, it is also very resistant to drought, remaining green through hot dry weather on soil that is very dry. Under these conditions, however, it is not very productive. Reed canary grass is suitable for hay or pasture, and when once established will last for many years, spreading by coarse underground stems. For hay, it should be cut before it becomes too coarse, just before the heads appear. The best results will be obtained if it is sown without a nurse crop. Shallow seeding is necessary. If the seed bed is well prepared ten pounds of seed will be enough to sow an acre.

Tall Oat Grass (*Avena elatior*) is a tall-growing, drought-resisting grass, perfectly hardy on Vancouver Island. It thrives on almost any kind of soil, spreading rapidly by volunteer plants when permitted to ripen seed. Growth begins about the last week in February, maturity being reached by the middle of June. To make the best hay, tall oat grass should be cut as soon as it begins to bloom, after which a good aftermath may be looked for.

Serradella (*Ornithopus sativus*). Serradella is an acid-tolerant leguminous plant especially adapted to light sandy soils. Under favourable conditions it attains a height of 24 inches. Such a stand will yield from 10 to 12 tons of green fodder per acre. The leaves are odd-pinnate with numerous leaflets; the flowers, pale pinkish-purple in colour. The greyish-fawn coloured seeds, five to nine in number, borne in the form of a loment, ripen in mid-August. Fed in the form of hay or pasture it is readily eaten by sheep and cattle and is comparable in value to the clovers.

The seed, always high in price, is generally imported from Germany and is at times difficult to obtain. Very satisfactory yields of seed were harvested from the plants in the forage crop nursery at this station in 1933 and 1934. It was therefore decided to grow the plant for seed production on a larger scale. In 1935 one-quarter of an acre of serradella was sown, and in spite of the lack of rain during the growing season, 223 pounds of cleaned seed, weighing 38 pounds per measured bushel, was produced. In 1936 one acre of serredella was grown for seed. The seed was sown on May 1 in rows 22 inches apart on a gravelly loam at the rate of 12 pounds per acre. The crop was cut on August 12. The best time to harvest is when the majority of the plants have turned yellow and the leaves begin to drop. If cut too early there is much loss from undeveloped seed, while, on the other hand, if the harvest is too long delayed there is considerable shattering of seed. Cutting was done with an ordinary mowing machine with the pea harvester and buncher attached. The seed is easy to thresh and clean. The straw, after it had been put through the chaff cutter and moistened, was eagerly eaten by cattle. The yield of serradella seed in 1936 was 616 pounds, produced at a total cost per acre of $65.83. Manual labour was the largest item in the bill of expense, 94·7 hours at 33 cents per hour being charged against the

crop. In estimating the value of the crop it was assumed that the seed was worth 10 cents per pound. The straw was given a value of one-third that of clover hay. The various items of expense, the yield and the value of the crop per acre is given in the following table.

COST OF PRODUCING SERRADELLA AT SIDNEY, B.C., IN 1936

Item	Statement		Amount
			$
Use of land	Rent or interest on value of land plus taxes and upkeep		15·15
Share of manure	40 per cent of 15 tons at $1.50 per ton		9·00
Seed	12 pounds at 10 cents		1·20
Machinery	Total annual charge		2·85
Manual labour	94·7 hours at 33 cents		31·05
Horse labour	35 hours at 10 cents		3·50
Threshing and cleaning	616 lbs. at 0·5 cents		3·08
	Total cost per acre		65·83
Yield per acre	Seed, 616 pounds		
	Straw, 1,628 pounds		
Value per acre	Seed, 616 pounds at 10 cents	$ 61·60	
	Straw, 1,628 pounds at $6.66 per ton	5·42	
	Total value of crop per acre		67·02

Cost per pound of seed, considering the value of the straw, 9·82 cents.
Cost per ton straw, considering the value of the seed, $6.54.
The average yield of serradella seed per acre at this station for two years was 754 pounds.

SWEET CLOVER

The plants belonging to the genus *Melilotus* are chiefly herb-like biennials, with strong tap roots and vigorous upright stems, well furnished with trifoliate leaves. The flowers, produced in spike-like racemes are usually white or yellow in colour. The characteristic odour of sweet clover, said by some to resemble that of vanilla, readily distinguishes it from alfalfa, which plant it slightly resembles, particularly during its early stages of growth. Being a deep rooted plant it is strongly resistant to drought, and during very dry seasons it can be depended upon to yield a large amount of fodder. In some parts of Canada sweet clover can be grown economically as a fodder or pasture plant, but in localities where alfalfa may be successfully grown it is not always to be recommended. While the chemical analysis of sweet clover is much the same as that of alfalfa, it is inferior to alfalfa as a feed for live stock because of its coarseness, its excessive leaf shedding character during the process of curing for hay, and its lack of palatability.

As a green manure for improving poor, run-down soils sweet clover has few equals. Soil lacking in nitrogen and humus can be greatly improved by ploughing down heavy crops of this clover. Of the three varieties of sweet clover grown in the forage crop nursery, Zouave, a yellow flowered sort, produced the greatest amount of material suitable for ploughing down. Cut on June 11, when the plants were in full bloom, it gave a yield of 31·9 tons of green matter per acre. The average height of the plants was 88 inches. Arctic and Alpha gave yields of 29·5 and 22·4 tons per acre, respectively.

Being a strong vigorous grower, it is very useful as a "smother" crop, as few weeds can compete with it. Once the plant is established it readily becomes a weed unless careful cultural methods are practised. Mowing before the first flowers set seed will quickly exterminate it.

MILLETS

The millets are suitable for use as a catch crop after early maturing crops have been harvested or when crops have been destroyed. They may be used for hay, pasture or silage, but are best used as a soiling crop. The best time to sow is when the corn is planted, but seeding may be delayed for four or five weeks longer if the moisture content of the soil is sufficient for the germination of the seed. On the whole, the proso type produces more seed than the fox-tail, and the barnyard type gives the heaviest yield of green fodder.

Eighteen strains and varieties of millets have been under test at this station during the past four years. For forage we recommend Japanese, a barnyard type of millet which has consistently out-yielded other strains and varieties at this station. It has not ripened seed in this locality.

SOYA BEAN

From the standpoint of grain and fodder production the Soya bean is not a practical crop to grow on Vancouver Island. It may, however, have a place as a soil renovator. For this purpose, the large bushy growing varieties are the most satisfactory. Innoculation sometimes is necessary. Soya beans should not be planted until the soil has warmed up and danger of heavy frosts is past. The middle of May is usually the most suitable time. Plant in drills about 15 to 22 inches apart, allowing the plants to stand two or three inches apart in the row. Three to four pecks of seed will be required to sow an acre. Of several varieties grown at this station, Manitoba Brown has proved the best, yielding as high as 13·98 bushels of beans per acre.

SUGAR BEET SEED PRODUCTION

Mother beets for the production of seed have been selected, stored and planted at this station for the past three years. Each year highly satisfactory results have been obtained. The roots are selected in the fall at the time of harvesting the season's crop. For winter storage they are pitted out of doors in the shelter of a wood-lot. In the spring, about the first week in March, the roots are planted in rows 4 feet apart each way. The seed is usually ready to harvest during the month of August. The yield of marketable seed per acre for the past three years has been as follows:—

1934—2,091	pounds	per	acre
1935—1,978	"	"	"
1936—2,721	"	"	"
Average—2,263	"	"	"

These yields are calculated on the basis of a perfect stand. The increased yield in 1936 was due to the abundant rains during June and July.

Sugar beet seed in Canada has, for the most part, been imported from Europe. The price has been low and the quality fairly good. Considerable work has been done at this station to demonstrate the feasibility of sugar beet seed production on Vancouver Island to meet the Canadian need. The old method of growing the roots one year, storing them and replanting them the next year is standard procedure; but it is expensive. It was thought well to capitalize on the mildness of our climate and to attempt the wintering of the beets in the open ground. At the beginning of the work the seed was planted as soon as the land could be worked, the crop was properly thinned, and the mature beets were wintered. Though this scheme was partially successful it was found that the loss was greater with the large beets than with the small. A project was therefore outlined which provided for seeding at regular intervals throughout the spring

and early summer. It has been found that seeding later than the latter half of June or the first of July is too late, but that if the land has been properly prepared, the soil moisture husbanded, etc., the young beets make excellent growth throughout the autumn. Under these conditions they winter well and produce an abundance of seed the following year.

After harvesting the beets in the autumn of 1934, twenty-five roots of each variety were replanted as a test for winter hardiness. The results are given in the following table:—

Variety	Number of plants surviving March 1, 1935	Percentage winter-killed
1. R. & G. "Z" type	None	100
2. R. & G. "N" type.	None	100
3. R. & G. Normal	None	100
4. Home Grown "A"	None	100
5. Stokes A1	2	92
6. Zapotil	5	80
7. G. & W. (Cercospora res't.)	7	72
8. Dippe "E"	4	84
9. Swedish Improved	None	100
10. U.S. No. 1	8	68

The lifting and topping of the roots was no doubt responsible, in some measure, for the heavy loss. Undisturbed roots in a two-acre field under observation wintered much better than any variety in the above plots, the loss in the field being about 60 per cent. It was also observed that the small roots wintered better than the large ones. As an outcome of these observations, sowings of beet seed were made in the fall of 1935 at regular intervals of one week apart, beginning September 16. In all four sowings the seed germinated well. The plants of the last two sowings were winter-killed. The others, however, made slow but steady growth during the late fall and early winter season. In the following May when the flower-stalks were produced the plants were still very small; consequently no seed of any value was harvested.

In 1936 seed was sown on the following dates: May 1, June 1, July 2, July 16, August 1, August 15, and September 1. The plants of the first two sowings were fully grown by December 1; the stand was patchy and the plants were badly infected with rust. The July seeding produced plants of medium size with clean foliage; the stand was perfect. Seed sown on or after August 1 did not develop plants large enough for profitable seed production.

The results of our investigation have led us to make the following recommendations:—

1. Plant in rather late season, the end of June or early in July.
2. Leave the plants standing fairly thick in the row.
3. Complete the thinning in the spring as found necessary.

SUGAR BEET VARIETY TEST

The variety test of sugar beets has been conducted at this station for many years. In 1934 the procedure was revised and put upon a more comprehensive basis. Data were obtained on the yield of beets per acre, the percentages of sugar and nitrogen in the beets, and the yield of sugar per acre. In 1934 and 1935 the three highest yielding varieties of the fourteen under test were the standard commercial varieties Zapotil, Dippe "E," and R. & G. Normal. The highest mean yields of sugar were produced by the "high tonnage" commercial varieties. The specially selected "high sugar" strains R. & G. "Z" type, Home Grown A, and Stokes A.1, again produced the lowest mean yields of sugar. The "high sugar" selections had the highest mean percentages of nitrogen,

while the "high tonnage" producers were generally lowest in this respect. Since the "high sugar" strains are low tonnage producers, the results indicate an association between yields of beets and percentage of nitrogen.

The figures for 1936 are not yet available. The average of the results for 1934 and 1935 are given in the following table:—

SUGAR BEET TESTS AT SAANICHTON, B.C., 1934 AND 1935

	Varieties	Average yield beets per acre	Average percentage of sugar	Average yield of sugar per acre	Average percentage of nitrogen
		tons	%	lb.	%
1.	R. & G. "Z" type	14·53	17·75	5,214·22	0·161
2.	R. & G. Normal	17·75	17·07	6,098·50	0·123
3.	R. & G. "N" type	16·76	17·22	5,810·22	0·141
4.	Home Grown "A"	13·74	16·30	4,536·75	0·142
5.	Stokes A.1	13·55	15·95	4,357·00	0·152
6.	Zapotil	18·65	17·27	6,447·25	0·123
7.	G. & W. (Cercospora res't.)	15·27	16·72	5,124·12	0·123
8.	Dippe "E"	18·20	16·90	6,184·37	0·119
9.	Swedish Improved	16·34	17·80	5,882·12	0·151
10.	U.S. No. 1	15·67	16·70	5,308·75	0·135
*11.	Eagle Hill No. 360	16·06	16·10	5,177·75	0·114
*12.	Eagle Hill No. 472	16·00	16·10	5,154·75	0·113
*13.	Khun	13·62	17·35	4,736·50	0·132
*14.	Udcyz	17·20	16·60	5,723·50	0·110

*One year only.

PERENNIAL GRASSES AND LEGUMES FOR PASTURE

This project was begun in the fall of 1934 to determine the adaptation, production and general suitability of the various grasses and legumes, and the best mixture of these for pasture. The plots were set out in the form of strips 7 feet wide and 100 feet long. The majority of the plots were sown in duplicate without a nurse crop. In the spring of 1936 a further block of plots was laid down. Owing to the dry weather in the long summer months the grasses were slow in establishing themselves. Wild white clover, while slow in taking hold, spread rapidly during the open fall of 1936. Many of the plots were completely covered with this clover by the first of December.

The test consisted of the following mixtures:—

1. Perennial rye and wild white clover.
2. Orchard grass and wild white clover.
3. Perennial rye, orchard grass and wild white clover.
4. Creeping red fescue and wild white clover.
5. Kentucky bluegrass and wild white clover.
6. Timothy, Kentucky bluegrass, red top, and wild white clover.
7. Awnless brome.
8. Crested wheat.
9. Meadow fescue.
10. Awnless brome and alfalfa.
11. Crested wheat and alfalfa.
12. Orchard grass and alfalfa.
13. Orchard grass (grazing strain).
14. Non-creeping brome grass and alfalfa.
15. Creeping red fescue, orchard grass, perennial rye, timothy and white clover.

In addition to the above plots, mixtures No. 3 and No. 15 have each been established in two-acre fields. Three acres of brome and alfalfa, 1 acre of orchard grass and alfalfa and one-half acre each of crested wheat and alfalfa, and non-creeping brome and alfalfa have also been laid down.

Pasture work at this station is still in its initial stage and the results are not yet available for publication.

EXPERIMENTS WITH FERTILIZERS

The growing season of 1936 was one of the most favourable on record at this station. Ample precipitation and the absence of excessive heat provided ideal conditions for the potato crop. The yields from the fertilizer plots were almost three times as large as in 1935, and considerably above the average for the last ten years, Up-to-Date was the variety grown.

FERTILIZERS FOR THE POTATO CROP

This project was undertaken in the spring of 1923, and revised in 1927, to determine the influence of nitrogen, phosphoric acid and potash on the yields of potatoes. Quadruplicate plots, each one square rod in size, were used. To overcome the variations of the soil the plots were randomized. The yields for 1936 and the average for 10 years are given below.

Fertilizer material per acre	Yield, 1936	Average 10 years
	tons	tons
1. Nitrate of soda 400 pounds Superphosphate 800 pounds Muriate of Potash 250 pounds	19·30	9·90
2. Sulphate of ammonia 300 pounds Superphosphate 800 pounds Muriate of Potash 250 pounds	17·60	9·97
3. Superphosphate 800 pounds Muriate of potash 250 pounds	18·70	9·18
4. Nitrate of soda 400 pounds Superphosphate 800 pounds	18·34	9·24
5. Nitrate of soda 400 pounds Muriate of potash 250 pounds	18·92	9·34
6. Check (no treatment)	15·22	7·92

In every trial a marked increase in yield of potatoes was obtained by the application of chemical fertilizers. Over the ten-year period the plots receiving a complete fertilizer, viz., plots 1 and 2, gave a much higher yield (approximately 25 per cent) than did those in which the fertilizer was omitted. The three plant food elements—nitrogen, phosphoric acid and potash—appear to have been about equally effective in increasing yields. The increased yield of potatoes is sometimes insufficient to offset the cost of the fertilizer.. This is invariably true in years of drought. The residual effect of the fertilizer on succeeding crops should, however, be considered, as in a 4-year rotation only 40 per cent of the value of the fertilizer is charged the first year. It should also be borne in mind that if no fertilizer is applied, the original supply contained in the soil will in time be depleted, resulting in a gradual decrease in crop yields.

TABLE OF YIELDS, FERTILIZER FOR POTATOES, 1936

Replication	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
A	243	275	257	245	195	176
B	191	187	181	248	142	105
C	280	162	239	132	265	243
C	196	210	151	230	206	227
Total yield for 1935 in pounds	910	834	828	855	808	751
Total yield for 1935 corrected to 100 per cent stand	965	880	935	917	946	761
Average yield in tons per acre for 4 plots in 1935	19·30	17·60	18·70	18·34	18·92	15·22
Average yield per acre for 10 years	9·90	9·97	9·18	9·24	9·34	7·92

POULTRY

During the past five years more attention has been given at Saanichton to breeding than to any other phase of the work with poultry. The White Wyandotte is kept exclusively. All birds are trap-nested and individual records are kept of all chicks hatched; the result is a line of White Wyandottes, excellent from the utility standpoint and of first-rate appearance. The birds are line-bred, with out-crosses appearing only as found necessary. The production of pedigreed breeding cockerels to supply the public with male birds of "bred-to-lay" strains has been regarded as a definite project since the inauguration of our poultry work.

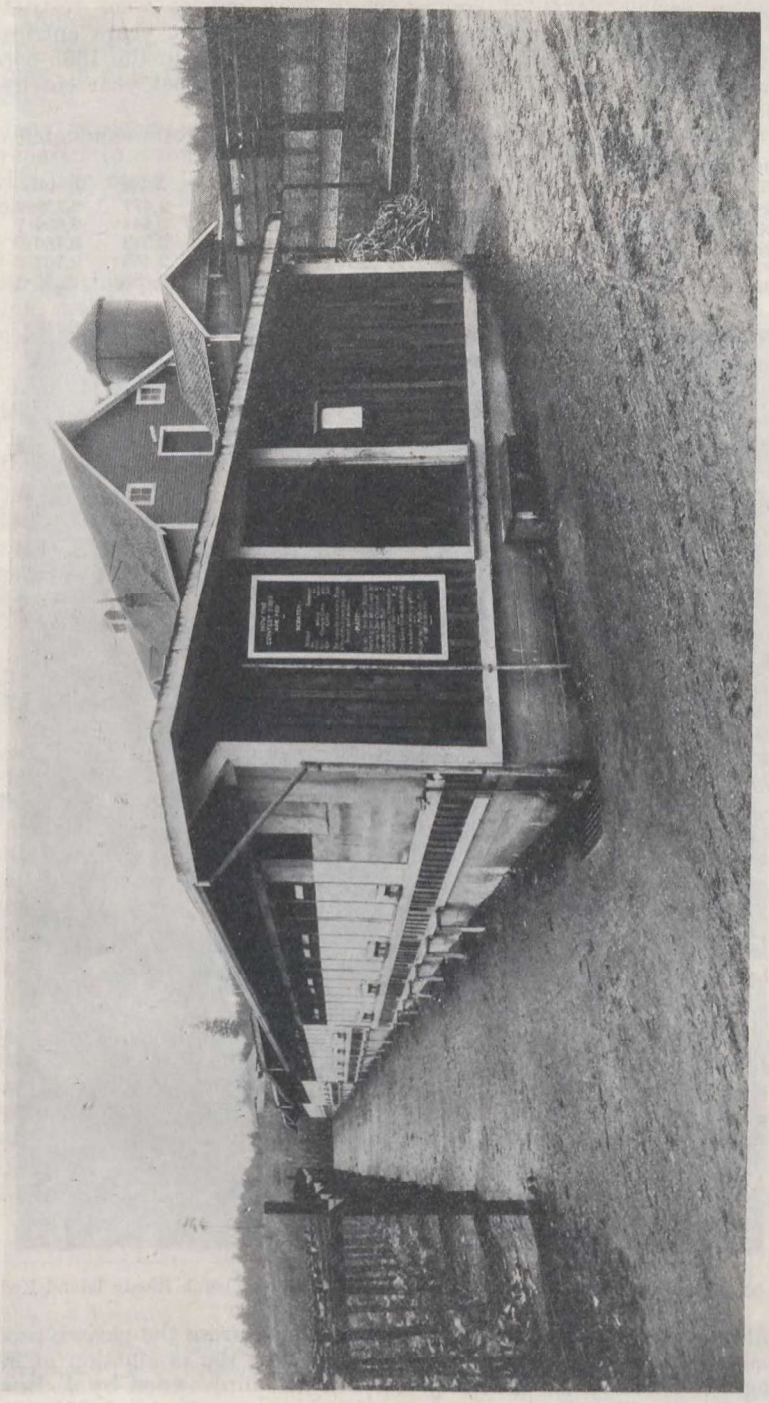
The development of high-producing strains or families was begun in 1916. A strain that would produce 250 eggs in pullet year and 550 eggs in three years was the object sought, but with due reference to standard qualifications. During recent years this registration policy has been kept well to the fore.

In order that the breeders would have the opportunity to reap the benefits of such policy, a contest has been conducted at the station during the entire time. The records made by the breeders have been satisfactory, large numbers of birds have been registered—the real object of the contest—and some outstanding records have been made by individual birds. This contest furthered the interests of the registration policy, and worked hand in hand with the poultry work conducted at the station farm.

Much difficulty with internal parasites in poultry was experienced in the past, but a scheme developed here has reduced losses at the station to a minimum. The field given over to poultry work is run in a three-year rotation, grass and roots or other crop. The chicks are reared on the turf, on land, consequently, over which poultry has run only once in three years. In this way the life cycle of the parasite is broken. We strongly recommend this procedure to poultrymen whose yards become polluted. Though the yards appear large, crops are grown which the poultry industry requires, such as straw, grain, roots, etc. The manure maintains the crops; in fact, the crops appear to be better with each succeeding year.

VANCOUVER ISLAND EGG LAYING CONTEST

During the years 1932-6 contests have been conducted at this station under the National Policy. The general health and quality of birds entered have been good. No serious outbreak of disease has occurred, and such diseases as have appeared yielded to prompt treatment. Many breeders have adhered to the practice of returning in their pen entry as many daughters from registered dams as possible, but others have not whole-heartedly followed this plan.



Where the contest birds are housed.

While in earlier years of contest work here entries were restricted to breeders from Vancouver and the Gulf Islands, in recent years entries have been accepted from mainland breeders as well. Previous to the 1935-6 contest the accommodation, 34 pens, was filled, but during the past year entries have fallen off considerably.

The highest pens (graded on points) for the five contests conducted during the period covered by this report were as follows:—

	Eggs	Points
1931-2, Westwood Poultry Farm, Duncan, B.C.	2,477	2,729·9
1932-3, T. Wilkinson, Cobble Hill, B.C.	2,444	2,600·7
1933-4, J. McCurrach, New Westminster, B.C.	2,512	2,780·7
1934-5, J. Smyth, Nanaimo, B.C.	2,453	2,707·7
1935-6, J. Burgess, Qualicum Beach, B.C.	2,283	2,535·1

Redcroft 3N. Production: 327 eggs, 24 oz. to the dozen. Single comb Rhode Island Red, (1935)

While no very outstanding records were made during the period, production was consistently good. Probably the highlight was the production of 327 eggs averaging 24 ounces to the dozen by a S.C.R.I.R. bird owned by J. Burgess of Qualicum Beach. This bird registered and is known as Redcroft 3N. Fourteen birds have laid 300 eggs or more. Several breeders whose birds qualified have not applied for registration. For the period 624 birds were registered.

Mention should be made of J. Burgess, Qualicum Beach; Westwood Poultry Farm, Duncan; and W. Bradley, Langford, B.C., for their consistently good showing over many years. While no one breeder has won top honours more than once in this contest, yet each has finished in high positions on many occasions.

Many breeders are still interested in registration and contest work, and are prepared to enter their birds again when inspectors have been provided and when the necessary machinery has been set up for correct carrying out of the policy.

DISEASE

During this period the general health of the farm flock has been good. Intestinal parasites have been almost completely eradicated because of the system of raising chicks on turf over which birds have run only once in three years. Infectious bronchitis has made its appearance on a few occasions. The worst outbreak was in the winter of 1931-2 when approximately 25 per cent of the flock was carried off before effective control measures could be worked out. More information is now available on this disease, and successful control of an outbreak is now reasonably assured.

The entire flock has been blood-tested for *Bacillus pullorum* in recent years. In 1933-4 there were 3 reactors and 12 suspicious birds in the flock. In 1935-6, 4 were suspicious. Reports from the Health of Animals Branch showed no trace of *Bacillus pullorum* during the past year.

MORTALITY IN PULLETS

An analysis has been made of casualties occurring during the past five years in pullets from the time they entered the laying houses to the end of the year. A summary of this data shows a mortality of 15·9 per cent per annum based on an aggregate of 886 pullets. The mortality was greatest in 1931-2, when infectious bronchitis brought the percentage up to 20·3. The lowest mortality was 10·8 per cent in 1935-6. Probably the fairest figure for the pullet mortality would be based on the four generations since 1931-2, when casualties from all causes amounted to 13·7 per cent per annum. It has been the practice over this period to do no culling, and when a bird was placed in the laying house to leave her there, even when it became apparent that she had no future as a layer.

RELATION OF BODY WEIGHT TO EGG PRODUCTION

Data have been compiled covering the past four years to determine the relationship of body weight to egg production, and to arrive within reasonable limits at the optimum weight for best production from White Wyandotte pullets. The average yearly body weight of 374 pullets has been taken; the birds were weighed each four-week period throughout the year, and were grouped according to body weight as follows:—

Group	Number of birds	Production
		eggs
1. Weighing to 5·0 pounds	39	212·4
2. Weighing from 5·1 to 5·5 pounds	111	218·8
3. Weighing from 5·6 to 6·0 pounds	112	213·3
4. Weighing from 6·1 to 6·5 pounds	75	215·5
5. Weighing from 6·6 pounds up	37	212·7

Birds shown above include only normal birds which completed their laying year, and which fell into the weight-groups indicated. It would seem from the above table that good birds can be found in all groups. For the two years 1932-3, 40·2 per cent of the pullets completing their laying year had an average body weight of over 5·6 pounds: for the two years 1934-5, 73·69 per cent were over that same weight. This increase in average body weight is in line with the effort made during the past two or three years to raise the average weight of the station's flock. This increase in body weight has been accomplished without loss in production.

HATCHING RESULTS

The following summary sets forth results obtained for the five years 1932-6 from eggs set and hatched:—

	Per cent
Fertile eggs	76·7
Total eggs hatched	58·0
Fertile eggs hatched	75·6
Number of chicks alive when wing banded	94·3
Total eggs required for one chick hatched	1·7
Fertile eggs required for one chick hatched	1·3
Total eggs required for one chick when wing banded	1·8

REGISTRATION

In all breeding work there is grave danger of the breeder concentrating on the correction of one fault to the exclusion of others. This may be small eggs, low body weight, poor type, lack of vigour or any of a dozen faults. The program of registration is all-embracing and closely ensures production, freedom from standard disqualifications, and type. Birds qualifying under this program must conform to a very high standard of excellence. Such policy followed carefully, generation after generation, would be expected to give, and has given, marked results in the Wyandotte flock at this station.

To illustrate this, attention may be drawn to a mating made in 1934 between Sidney 14L (male) and Sidney 3L (female, legband B.C.L.C.M. 507). The male, Sidney 14L, has five generations of registered birds on the sire's side, and four generations on the dam's. The female, Sidney 3L, has four generations of registered birds on the sire's side and two generations on the dam's. From this mating 14 pullets were produced. One was sent to the Vancouver Island Contest, 12 were trap-nested in the Registration Progeny Test and 1 died. Production of these daughters is shown below.

Leg band	Eggs	Egg weight	Leg band	Eggs	Egg weight
R.P.T. F104	217	27	R.P.T. F200	202	24
R.P.T. F121	169	25	R.P.T. F215	208	26
R.P.T. F139	183	24	R.P.T. F221	212	24
R.P.T. F172	221	26	R.P.T. F243	188	26
R.P.T. F178	243	25	R.P.T. F244	207	25
R.P.T. F190	238	25	V.I.L.C. L133	252	25
R.P.T. F192	203	24			

Nine of the thirteen daughters qualified for registration. The average production per bird of the family amounted to 211·0 eggs weighing 25 ounces to the dozen.

Another male, Sidney 15L, has in two years left 66 daughters of high standard and value. In 1934, 47 of his daughters entered the laying houses, and

39 of them completed their year with an average of 213·7 eggs weighing 24·8 ounces per dozen. In 1935 he left 32 daughters, 27 of which finished their laying year with an average of 211·5 eggs weighing 24·3 ounces per dozen.

An approved male C.N.P.R.A. N2980 in 1935 produced 58 daughters, 50 of which finished their laying year in the R.P. Test with an average of 225·7 eggs weighing 23·3 ounces per dozen.

Selection was made by the committee in charge, of an approved male and two registered females which were sent to the World's Poultry Congress in London, England. Another pen consisting of a registered male and two registered females was sent in 1936 from the station to the Poultry Congress in Berlin, Germany.

FLOCK PRODUCTION, 1936

Production has been satisfactory for the year: 138 pullets laid 27,773 eggs, an average of 201·2 eggs. If based on 123 birds living at the end of the year, the average is increased to 215·4 eggs per bird.

HATCHING SUMMARY FOR FIVE YEARS 1932-36

Year	Total eggs set	Number fertile	Percentage fertile	Number of chicks	Percentage of total eggs hatched	Percentage of fertile eggs hatched	Number of chicks alive when wing banded	Percentage of chicks alive when wing banded	Total eggs required for one chick hatched	Total fertile eggs for one chick hatched	Total eggs required for one chick when wing banded
1932	1,308	1,095	83·7	738	56·4	67·4	707	95·8	1·8	1·5	1·8
1933	1,403	1,051	74·1	768	54·7	73·2	712	92·6	1·8	1·3	1·9
1934	769	560	72·8	460	59·8	83·0	446	96·9	1·7	1·2	1·7
1935	960	712	74·1	576	60·0	80·9	521	90·4	1·6	1·2	1·8
1936	775	583	75·2	484	62·4	83·0	468	96·6	1·6	1·2	1·6
	5,215	4,001	.....	3,026	.....	.....	2,854	.....	.....	.....	.....
Average	1,043·0	800·2	76·7	605·2	58·0	75·6	570·8	94·3	1·7	1·3	1·8

APIARY

The apiary at the station for the past five years has been carried on, as heretofore, more for the sake of demonstration than as a commercial enterprise. The number of colonies remains at about 20 from year to year, with a few colonies placed singly in different parts of the Island to determine the honey flow in various sections, the plants worked by bees, and the character of the honey obtained from them.

British Columbia is often spoken of as a land abounding in honey and honey plants. This may be true of certain sections, but it is not true of the the southern end of Vancouver Island. Flowers are everywhere and they bloom over a long period, but there are not enough real honey plants to support any great number of colonies. Bees from the commercial standpoint must be moved out to the fireweed or other districts where autumn plants abound if a surplus is to be hoped for. The Saanich peninsula will just about maintain the bees, but not if large numbers of colonies are kept. The mild winters and the changeable springs bring about an excessive amount of spring dwindling. A few hours of bright sunshine may bring out the bees at any month in the year, but a passing cloud will so chill them that they will not return. Though bees are never wintered in cellars on Vancouver island, some type of inside wintering may be devised that will overcome the disadvantages of wintering outside.

The colonies at the station are all run for extracted honey and are wintered outside in Kootenay cases, but these cases are not used during the summer. They are cumbersome and demand much more handling than is necessary during the time of the honey flow, because of the extra number of parts.

As soon as weather conditions permit in the spring, the colonies are examined for strength, quantity of stores and condition of the brood nest. Where needed, 33 per cent sugar syrup is fed and weak colonies are strengthened by frames of brood and bees from stronger colonies. All colonies are examined about every nine days, watch being kept for queen cells, and every facility is given to encourage the queen to lay.

Spring feeding is imperative until the maple trees come into flower. Considerable honey is obtained from this tree if it escapes the frost, and from that time onward bees are able to maintain themselves until the time of white clover, when whatever surplus there may be is gathered. If extracting is done in July and the bees are deprived of their stores, close observation must be maintained or the bees may starve. If fall honey plants are not abundant in the district at this time, starvation is certainly in the offing. If winter feeding is to be done, attention to this should be given early, as the proper maturing of the syrup is not possible during very wet weather. Unmatured stores will result in mildewed combs and loss of bees from dysentery during the winter and early spring. Starvation is the real cause of much of the loss during the winter.

FOUL BROOD

Foul brood, that dread disease of all beekeepers, has not been very common in the past on Vancouver island; but several outbreaks have been reported, widely distributed over the country. This troublesome disease will show up year after year if once introduced. Many cures have been advocated, but they have not proved of great value. The one sure method of control is to burn the bees, hives and other equipment that have come in contact with the diseased bees. If

the difficulty is detected early, and if the colonies are destroyed by fire, further spread is likely to be prevented. Everything should be kept clean, no old combs should be allowed to accumulate, no bees should be purchased on the comb unless they are known to be free from disease, and great care should be exercised concerning the disposal of old honey cans and jars. Many bees may be found in trees throughout the country. Like others, they are subject to disease, and if they are diseased they form a source of infection difficult to locate and impossible to eradicate.

We have found the Alberni district, Lake Cowichan and Sandwick the most favourable localities from the beekeepers standpoint, but there may be many others.

OTTAWA: Printed by J. O. PATENAUDE, I.S.O., Printer to the King's Most Excellent Majesty, 1938.